5/15/92

APPENDIX VII-1

GROUNDWATER INVESTIGATION OF PROPOSED MINE PERMIT AREA

Exhibit 7-1
Non 7-5

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SPRING AND SEEP SURVEY
SMOKY MOUNTAIN AREA, KANE COUNTY UTAH

INTRODUCTION

At the request of Andalex Resources, Inc., Roger F. Holland, Geological Consultant, conducted a spring and seep survey around Smoky Mountain and the surrounding area during the period of September 27 through September 30, 1990. The survey area was within Township 41 South, Range 3 and 4 East of the SLBM and was designed to cover at least a quarter of a mile beyond the projected mining area of the 30 year mine plan (refer to Exhibit V-5A).

SURVEY METHODOLOGY

The survey was done using on site visual observations from plateau promontories and canyon bottoms. Aerial photos as well as topographic maps and structure maps were utilized. A familiarity with the local geology and topography was also a considerable aid.

Anomalous vegetation clusters and canyon wall coatings of carbonate, sulfate and/or manganese oxide (desert varnish) were used as possible "wet area" indicators.

A total of five (5) seeps and damp areas were located within the study area. Only three were located within a mile of the proposed permit area. (Refer to Exhibit VII-1). All five seeps are confined to the upper portion of the Drip Tank Member of the Straight Cliffs formation. The water in all five cases was issuing from the base of a thick paleochannel sandstone deposit underlain by finer-grained impervious sediments.

Photographs were taken at each location to record the vegetation, geology and extent of the seep area.

AREA GEOLOGY

The geology of the mining area is made up of coal bearing members of the Cretaceous Straight Cliffs Formation. The projected mine workings are to be located in the John Henry Member of the Straight Cliffs Formation within the Christensen coal zone.

The four units of the Straight Cliffs Formation are, in ascending order; the Tibbet Canyon, Smoky Hollow, John Henry and the Drip Tank Members.

The Tibbet Canyon Member is a cliff forming sandstone with interbedded mudstone. The base of this unit interfingers with the massive Tropic Shale, a regional aquitard, below.

Above the Tibbet Canyon is the Smoky Hollow Member which is comprised of interbedded sandstone, mudstone, carbonaceous mudstone and coal. It is subdivided into three informal units: a basal coal zone, a medial barren zone and an upper fluvial sandstone unit referred to as the Calico Sandstone bed. The Calico ranges from several to over fifty feet thick within the mining area, but generally averages approximately thirty feet in thickness. Areal variation in thickness is the result of differential erosion which took place prior to deposition of the overlying John Henry Member.

The major coal beds are interbedded with sandstone, mudstone and carbonaceous mudstone in the John Henry Member. This member is informally subdivided into six zones by Peterson(1969) based on the presence or absence of coal. Mining is projected in the Red seam within the lower portion of the Christensen coal zone.

The upper member of the Straight Cliffs Formation is the Drip Tank Member. It is generally seen forming the plateau tops and edges within the mining area. The unit is primarily composed of sandstone with lesser amounts of mudstone and conglomerate interbedded. Contacts are gradational between the mudstones of the overlying Wahweap Formation and the John Henry below.

Structure in the project area is dominated by the Smoky Mountain Anticline immediately to the east and the Warm Creek Syncline further to the west. In the vicinity of the proposed mine the regional dip on the west flank of the anticline is approximately 2-3 degrees to the south west.

SEEPS AND SPRINGS

Although all formations within the project areas were examined for evidence of seeps or springs, only the Drip Tank Member showed any signs of water occurrence. Water encountered was relatively inconspicuous and in most cases not present in pool form.

The following discussion briefly describes the seep or spring, its location and characteristics.

Location S-1: NE 1/4 NW 1/4 Section 20, T. 41 S., R. 4 E.

Seep area is located in the bottom of two converging drainages containing colluvial materials. The vegetation is anomalously healthy for the present drought conditions and Tamarisk are present. Moist soil was prevalent but may be related in part to the recent heavy rainfalls. The seep is within the Drip Tank Member. The seep appears to be at the base of paleochannel sandstones with underlying claystones and very fine grained sandstones. No significant wildlife usage was noted. The site would not be useful for stock or wildlife usage due to the lack of volume and surface flow.

Because of its location near the top of the plateau, the water most likely is the result of surface water infiltration and concentration in low, colluvium filled areas.

Location S-2: Center of NW 1/4 Section 20, T. 41 S., R 4 E.
Seep areas is located at the base of a massive paleochannel sandstone in the Drip Tank Member. The seep is underlain by a thick bed of claystones which act as an aquitard. It is located near the top of the plateau and near the top of the anticline. The regional dip on the west flank of the anticline is toward the southwest, therefore, the recharge area is quite limited in extent. The water in the pool is most likely from infiltration of surface water into surficial materials and cracks with the flow of the water down dip along an impervious layer until outcrop is intersected. The seep area was noted due to the vegetation (reed type and Bull Thistle). A small pool of water approximately 6' x 4' x 2 inches deep is hidden by the vegetation and the overhanging sandstone. A set of samples was taken. Wildlife trails leading to the water source were observed.

Location S-3: NE 1/4 NE 1/4 Section 14, T. 41 S., R. 3 E.
Seep area is located at the base of a thick paleochannel sandstone sequence with underlying finer grained impervious sediments. The seep is in the upper portion of the Drip Tank Member. The seep is mostly defined by carbonate and sulfate coatings and wet sandstone. No running or standing water was noted. No heavy concentration of vegetation exists at this site and no wildlife trails were observed.

Location S-4: NW 1/4 NE 1/4 Section 18, T. 41 S., R. 4 E.
Seep area is located at the base of a thick paleochannel sandstone sequence with underlying finer grained sediments acting as an aquitard. The seep is located in the upper portion of the Drip Tank Member. The seep area promotes a moderate to lush growth of small vegetative types at the base of a massive ledge. Fern type vegetation is attached to the sandstone at the points of greatest discharge. The seep is represented by wet sandstone and a few drips. An estimate of 6-8 hours for one drip to fill a 16 ounce container was made. No wildlife usage was noted.

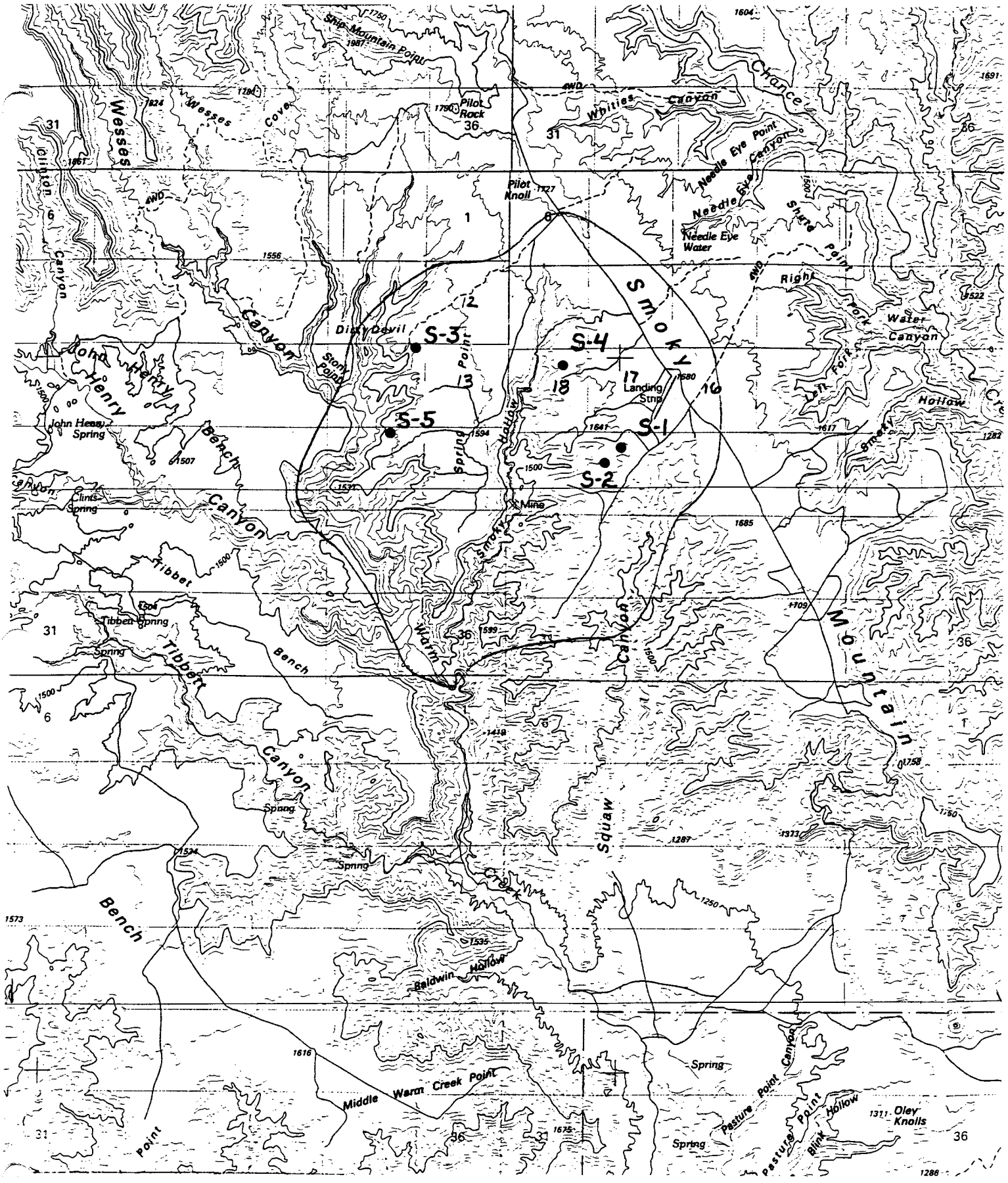
Location S-5: NW 1/4 NE 1/4 Section 23, T. 41 S., R. 3 E.
Seep area located at the base of a massive sequence of paleochannel sandstone with underlying finer grained material acting as an aquitard. The seep area is in the upper portion of the Drip Tank Member and is manifest by wet sandstone and a very few, minor drips. Carbonate and sulfate coatings are prevalent. Only a slight increase in vegetation was observed. No wildlife usage was note.

CONCLUSIONS

All of the seep areas observed are located in the upper portion of the Drip Tank Member of the Straight Cliffs Formation at the bottom and are underlain by fine grained impervious claystones. All but one (S-2) are located at points where surface runoff drainage intersects these paleochannel sandstones. It is suggested that the discharge from the seeps is closely associated with direct infiltration of surface runoff and could dry up as a result of prolonged drought conditions.

The potential exists that the two month period of greater than normal precipitation prior to the seep and spring inventory may have influenced the seepage if the aquifers have a low storage coefficient.

It appears that the recharge area for these seeps are relatively limited and rely primarily on surface water infiltration into colluvium and cracks in bedrock to recharge the seep. Lack of significant accumulations of mineral deposits around the seeps seem to indicate relatively low flows. The absence of larger vegetation of a significant age, such as cottonwood trees, appear to indicate that the seeps are not a dependable source of water.



SEEP AND SPRING SURVEY

AREA OF HYDROLOGIC INVESTIGATION

APPENDIX VII-2

BASELINE GROUND WATER ANALYSES

SEEPS

GROUNDWATER MONITORING DATA
LOCATION: SEEP S-2
1990-1991

Parameters	Units	Sample Dates				
		9/30/90 (A)	2/9/91 (B)(f)	5/13/91 (B)	8/23/91 (B)(f)	12/17/91 (B)
Water Level or Flow		pool	pool	pool	small pool	pool
Temperature (Field)	°C		9.1	14.9	20.9	.1
pH (Lab)	S.U.	a	7.4	7.9	7.4	7.6
pH (Field)	S.U.	a	6.4	6.9	6.9	8.7
Conduct. (Field)	umhos/cm @ 25c	a	700	995	1304	b
Conduct. (Lab)	umhos/cm @ 25c	a	1720	1690	1690	1610
Total Dissolved Solids	mg/l	1705 (d)	1320	1330(d)	1390	1360
Total Settleable Solids	mg/l	<1.0	<1.0	<0.1	a	<0.1
Total Suspended Solids	mg/l	3.0	17	23	a	52
Total Hardness as CaCO3	mg/l	1311	978	1020	1030	992
Total, Ortho-phosphate	mg/l	<0.01	0.25	0.02	0.05	<0.02
Fluoride	mg/l	0.49	0.55	0.40	0.41	.33
Sulfide as H2S	mg/l	<0.01	<0.01	<0.1	0.12	<0.1
Nitrate	mg/l	<0.01	a	a	a	<0.02
Nitrite	mg/l	<0.01	a	a	a	<0.02
Total, Nitrate/Nitrite	mg/l	<0.01	<0.04	<0.04	<0.02	a
Ammonia	mg/l	<0.04	0.70	<0.04	0.83	0.05
Oil and Grease	mg/l	1.5	<5	<5	<5	<5
Bicarbonate as HCO3	mg/l	300	317	336	354	323
Carbonate as CO3	mg/l	<1	0	0	<1	0
Chloride	mg/l	25.0	15.3	12.3	13.8	12.9

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: SEEP S-2
1990-1991

Parameters	Units	Sample Dates				
		9/30/90 (A)	2/9/91 (B)(f)	5/13/91 (B)	8/23/91 (B)(f)	12/17/91 (B)
Sulfate	mg/l	1050	758	782	769	763
Calcium	mg/l	266.3	206	242	211	203
Magnesium	mg/l	157	113	100	121	118
Potassium	mg/l	1.13	5.39	5.5	5.9	5.12
Sodium	mg/l	23.8	25.7	26.4	25.8	25.4
Major Cations	meq/l	27.24	20.8	21.6	21.8	21.1
Major Anions	meq/l	27.55	21.4	22.1	22.2	21.6
Arsenic	mg/l	<0.002	0.006	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.002	0.0027	<0.002	<0.002	<0.002
Mercury	mg/l	<0.002	<0.0002	<0.001	<0.001	<0.002
Lead	mg/l	<0.05	<0.004	<0.02	<0.02	<0.02
Selenium	mg/l	0.003	<0.0002	<0.005	<0.005	<0.005
Aluminum	mg/l	<0.01	0.3	0.2	<0.1	0.1
Boron	mg/l	0.55	0.18	0.18	0.12	0.23
Barium	mg/l	<0.03	0.10	<0.5	<0.5	<0.5
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/l	<0.01	0.01	<0.01	<0.01	<0.01
Iron	mg/l	<0.02	0.22	0.18	0.05	0.05
Manganese	mg/l	<0.01	<0.02	<0.02	<0.02	0.02
Molybdenum	mg/l	<0.1	<0.01	<0.02	<0.02	<0.02
Nickel	mg/l	<0.02	<0.01	<0.01	<0.01	<0.01
Zinc	mg/l	<0.1	5.5	<0.01	<0.01	0.02

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Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA
LOCATION: SEEP S-4
1990-1991

Parameters	Units	Sample Dates				
		2/9/91 (B)	5/13/91 (B)(f)	8/23/91 (B)(f)	12/17/91 (B)	
Water Level or Flow		e	slow drips	slow drips	slow drips	
Temperature (Field)	°C	19.1	14.0	20.3	1.8	
pH (Lab)	S.U.	e	8.2	7.8	7.7	
pH (Field)	S.U.	6.8	7.5	7.9	b	
Conduct. (Field)	umhos/cm @ 25c	194	174	212	b	
Conduct. (Lab)	umhos/cm @ 25c	e	301	271	278	
Total Dissolved Solids	mg/l	e	172	178	176	
Total Settleable Solids	mg/l	e	a	a	<0.1	
Total Suspended Solids	mg/l	e	a	a	<1.0	
Total Hardness as CaCO3	mg/l	e	137	124	124	
Total, Ortho-phosphate	mg/l	e	0.03	0.03	<0.02	
Fluoride	mg/l	e	0.34	0.30	0.25	
Sulfide as H2S	mg/l	e	<0.1	<0.1	<0.1	
Nitrate	mg/l	e	a	a	0.78	
Nitrite	mg/l	e	a	a	<0.02	
Total, Nitrate/Nitrite	mg/l	e	0.76	0.02	a	
Ammonia	mg/l	e	0.11	0.91	0.04	
Oil and Grease	mg/l	e	<5	<5	<5	
Bicarbonate as HCO3	mg/l	e	131	120	124	
Carbonate as CO3	mg/l	e	0	0	0	
Chloride	mg/l	e	4.46	4.39	2.59	

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(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: SEEP S-4
1990-1991

Parameters	Units	Sample Dates				
		2/9/91 (B)	5/13/91 (B)(f)	8/23/91 (B)(f)	12/17/91 (B)	
Sulfate	mg/l	e	31.5	34.2	28.2	
Calcium	mg/l	e	42.6	36.9	43.5	
Magnesium	mg/l	e	7.36	7.87	3.77	
Potassium	mg/l	e	1.74	2.5	1.40	
Sodium	mg/l	e	4.0	3.65	3.30	
Major Cations	meq/l	e	2.95	2.71	2.66	
Major Anions	meq/l	e	2.98	2.79	2.74	
Arsenic	mg/l	e	<0.005	<0.005	<0.005	
Cadmium	mg/l	e	<0.002	<0.002	<0.002	
Mercury	mg/l	e	<0.001	<0.001	<0.002	
Lead	mg/l	e	<0.02	<0.02	<0.02	
Selenium	mg/l	e	<0.005	<0.005	<0.005	
Aluminum	mg/l	e	<0.1	<0.1	<0.1	
Boron	mg/l	e	0.07	0.05	0.12	
Barium	mg/l	e	<0.5	<0.5	<0.5	
Chromium	mg/l	e	<0.02	<0.02	<0.02	
Copper	mg/l	e	<0.01	<0.01	<0.01	
Iron	mg/l	e	<0.05	0.08	0.07	
Manganese	mg/l	e	<0.02	0.02	<0.02	
Molybdenum	mg/l	e	<0.02	<0.02	<0.02	
Nickel	mg/l	e	<0.01	<0.01	<0.01	
Zinc	mg/l	e	<0.01	0.01	0.01	

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GROUNDWATER MONITORING DATA
LOCATION: SEEP S-2
1992

Parameters	Units	Sample Dates				
		2/4/92 (C)	5/30/92 (B)	8/15/92 (B)	12/04/92 (B)	
Water Level or Flow		pool	pool	small pool	small pool	
Temperature (Field)	°C	4.0	16.7	29.6	4.2	
pH (Lab)	S.U.	a	7.53	7.46	8.15	
pH (Field)	S.U.	7.6	7.4	7.3	7.8	
Conduct. (Field)	umhos/cm @ 25c	1460	763	1226	444	
Conduct. (Lab)	umhos/cm @ 25c	a	1570	1600	1650	
Total Dissolved Solids	mg/l	1354	1480	1450	1380	
Total Settleable Solids	mg/l	a	a	0.3	0.1	
Total Suspended Solids	mg/l	a	a	39	49	
Total Hardness as CaCO3	mg/l	997	945	995	978	
Total, Ortho-phosphate	mg/l	.04	.10	0.05	P 0.2	
Fluoride	mg/l	.639	.37	0.32	0.29	
Sulfide as H2S	mg/l	a	<.10	a	<1.0	
Nitrate	mg/l	.059	<.02	0.11	<0.01	
Nitrite	mg/l	<.005	<.02	<0.02	<0.01	
Total, Nitrate/Nitrite	mg/l	a	a	a	a	
Ammonia	mg/l	<.2	.23	0.12	0.11	
Oil and Grease	mg/l	a	.59	0.3	a	
Bicarbonate as HCO3	mg/l	400	289	324	326	
Carbonate as CO3	mg/l	6.4	0	<0.10	<0.10	
Chloride	mg/l	12.7	11.5	14.4	13.6	

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Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: SEEP S-2
1992

Parameters	Units	Sample Dates				
		2/4/92 (C)	5/30/92 (B)	8/15/92 (B)	12/04/92 (B)	
Sulfate	mg/l	686	778	775	761	
Calcium	mg/l	199	186	202	201	
Magnesium	mg/l	115	117	119	116	
Potassium	mg/l	6.2	9.23	50.4	6.28	
Sodium	mg/l	22.7	31.3	5.52	25.4	
Major Cations	meq/l	20.54	20.5	21.4	20.8	
Major Anions	meq/l	21.41	21.3	21.9	21.6	
Arsenic	mg/l	<.05	<.005	<0.005	<0.005	
Cadmium	mg/l	<.01	<.002	<0.002	<0.002	
Mercury	mg/l	<.0005	<.001	<0.001	<0.001	
Lead	mg/l	<.01	<.02	<0.01	<0.02	
Selenium	mg/l	<.0005	<.005	<0.005	<0.005	
Aluminum	mg/l	<.05	<.1	<0.1	<0.1	
Boron	mg/l	.086	.20	0.32	0.25	
Barium	mg/l	.01	<.5	<0.5	<0.5	
Chromium	mg/l	<.01	<.02	<0.02	<0.02	
Copper	mg/l	<.01	.03	<0.01	<0.01	
Iron	mg/l	.06	.17	0.08	<0.05	
Manganese	mg/l	<.01	<.02	<0.02	<0.02	
Molybdenum	mg/l	.01	<.02	<0.02	<0.02	
Nickel	mg/l	<.01	0.02	<0.01	<0.01	
Zinc	mg/l	.013	0.02	0.33	<0.01	

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Comments

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(d) Calculated value.
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(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA
LOCATION: SEEP S-4
1992

Parameters	Units	Sample Dates				
		2/4/92 (C)	5/30/92 (B)(f)	8/15/92 (B)	12/04/92 (B)(f)	
Water Level or Flow		drips	drips	slow drips	drips incr.	
Temperature (Field)	°C	3.0	18.3	20.5	6.6	
pH (Lab)	S.U.	a	7.84	7.81	8.22	
pH (Field)	S.U.	8.4	8.8	7.6	8.3	
Conduct. (Field)	umhos/cm @ 25c	293	1650	359	165	
Conduct. (Lab)	umhos/cm @ 25c	a	258	325	283	
Total Dissolved Solids	mg/l	158	188	208	168	
Total Settleable Solids	mg/l	a	a	a	<0.1	
Total Suspended Solids	mg/l	a	a	a	4	
Total Hardness as CaCO3	mg/l	135	117	160	134	
Total, Ortho-phosphate	mg/l	<.01	<.02	<0.02	P <0.1	
Fluoride	mg/l	.33	.28	0.31	0.25	
Sulfide as H2S	mg/l	a	.47	1.60	<1.0	
Nitrate	mg/l	.88	.12	6.38	0.04	
Nitrite	mg/l	<.005	<.02	<0.02	<0.01	
Total, Nitrate/Nitrite	mg/l	a	a	a	a	
Ammonia	mg/l	<.2	.05	.11	<0.01	
Oil and Grease	mg/l	a	<.25	<0.25	<0.24	
Bicarbonate as HCO3	mg/l	123	118	146	133	
Carbonate as CO3	mg/l	2.3	0	<0.10	<0.10	
Chloride	mg/l	3.4	3.55	5.14	2.42	

Codes: Laboratory

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(C) Chemtech

Comments

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(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: SEEP S-4
1992

Parameters	Units	Sample Dates				
		2/4/92 (C)	5/30/92 (B)(f)	8/15/92 (B)	12/04/92 (B)(f)	
Sulfate	mg/l	27.1	30.9	46.1	31.3	
Calcium	mg/l	40.6	33.7	39.4	43.5	
Magnesium	mg/l	7.98	7.9	15.0	6.32	
Potassium	mg/l	1.8	1.84	27.8	1.6	
Sodium	mg/l	3.1	5.7	4.83	3.8	
Major Cations	meq/l	2.86	2.63	4.12	2.89	
Major Anions	meq/l	2.75	2.69	3.96	2.91	
Arsenic	mg/l	<0.05	<0.005	<0.005	<0.005	
Cadmium	mg/l	<0.01	<0.002	<0.002	<0.002	
Mercury	mg/l	<0.0005	<0.001	<0.001	<0.001	
Lead	mg/l	<0.01	<0.02	<0.02	<0.02	
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	
Aluminum	mg/l	<0.05	<0.1	<0.1	<0.1	
Boron	mg/l	<.05	.07	.13	0.16	
Barium	mg/l	.147	<.5	<0.5	<0.5	
Chromium	mg/l	<0.01	<0.02	<0.02	<0.02	
Copper	mg/l	<0.01	<0.01	0.13	<0.01	
Iron	mg/l	.033	<.05	0.08	<0.05	
Manganese	mg/l	<0.01	<0.02	<0.02	<0.02	
Molybdenum	mg/l	<.01	<.02	<.02	<0.02	
Nickel	mg/l	<.01	<.01	.01	<0.01	
Zinc	mg/l	<.01	.01	.18	<0.01	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA
LOCATION: CALICO SEEP
1989-1990

Parameters	Units	Sample Dates				
		12/27/89 (A)	7/12/90 (A)			
Water Level or Flow		1 gal/ 1.5 hrs	1 gal/1.5 hrs			
Temperature (Field)	°C	a	25			
pH (Lab)	S.U.	a	a			
pH (Field)	S.U.	8.9	8.1			
Conduct. (Field)	umhos/cm @ 25c	1170	1460			
Conduct. (Lab)	umhos/cm @ 25c	a	a			
Total Dissolved Solids	mg/l	854	820			
Total Settleable Solids	mg/l	<1.0	a			
Total Suspended Solids	mg/l	2.0	5.0			
Total Hardness as CaCO3	mg/l	10.0	68			
Total, Phosphorus	mg/l	.01	<1.0			
Fluoride	mg/l	3.17	1.53			
Sulfide as H2S	mg/l	<0.1	1.0			
Nitrate	mg/l	0.14	0.06			
Nitrite	mg/l	0.03	<0.01			
Total, Nitrate/Nitrite	mg/l	a	a			
Ammonia	mg/l	0.14	0			
Oil and Grease	mg/l	<1.0	<1.0			
Bicarbonate as HCO3	mg/l	608	649			
Carbonate as CO3	mg/l	<1.0	<1.0			
Chloride	mg/l	35	40			

Codes:

Laboratory	
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments

(a)	Not analyzed.
(b)	Field instruments malfunctioned
(c)	Temperature may not be accurate due to sample collection technique.
(d)	Calculated value.
(e)	Not enough water could be collected to run laboratory analysis.
(f)	Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: CALICO SEEP
1989-1990

Parameters	Units	Sample Dates				
		12/27/89 (A)	7/12/90 (A)			
Sulfate	mg/l	180	250			
Calcium	mg/l	2.6	26.6			
Magnesium	mg/l	0.96	0.48			
Potassium	mg/l	1.80	0			
Sodium	mg/l	327.7	350.4			
Major Cations	meq/l	14.35	16.44			
Major Anions	meq/l	14.48	16.74			
Arsenic	mg/l	<0.002	<0.002			
Cadmium	mg/l	<0.002	<0.002			
Mercury	mg/l	<0.002	<0.002			
Lead	mg/l	0.05	<0.05			
Selenium	mg/l	<0.002	<0.002			
Aluminum	mg/l	<0.01	<0.01			
Boron	mg/l	0.90	0.84			
Barium	mg/l	<0.03	0.15			
Chromium	mg/l	<0.02	<0.02			
Copper	mg/l	<0.01	<0.01			
Iron	mg/l	0.05	<0.02			
Manganese	mg/l	<0.01	0.10			
Molybdenum	mg/l	<0.1	<0.1			
Nickel	mg/l	<.02	<0.02			
Zinc	mg/l	<0.1	<0.1			

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA
LOCATION: CALICO SEEP
1991

Parameters	Units	Sample Dates				
		2/09/91 (B)(f)	5/13/91 (B)	8/23/91 (B)(f)	12/17/91 (B)	
Water Level or Flow		2 gal/hr	2 gal/hr	1 gal/1.5 hrs	2 gal/hr	
Temperature (Field)	°C	14.7	27.0	22.3	5.8	
pH (Lab)	S.U.	8.7	8.6	8.9	8.3	
pH (Field)	S.U.	7.5	7.8	8.4	8.6	
Conduct. (Field)	umhos/cm @ 25c	753	894	942	411	
Conduct. (Lab)	umhos/cm @ 25c	1430	1420	1450	1310	
Total Dissolved Solids	mg/l	826	892	930	908	
Total Settleable Solids	mg/l	20	<0.1	a	4	
Total Suspended Solids	mg/l	132	36	a	190	
Total Hardness as CaCO3	mg/l	7.75	9.97	8.85	21.0	
Total, Ortho-phosphate	mg/l	0.16	0.08	0.03	<0.02	
Fluoride	mg/l	2.78	1.75	1.90	1.74	
Sulfide as H2S	mg/l	<0.01	<0.1	0.27	<0.1	
Nitrate	mg/l	a	a	a	<0.02	
Nitrite	mg/l	a	a	a	<0.02	
Total, Nitrate/Nitrite	mg/l	0.06	<0.04	<0.02	a	
Ammonia	mg/l	0.33	0.04	0.83	0.26	
Oil and Grease	mg/l	<5	<5	<5	<5	
Bicarbonate as HCO3	mg/l	459	561	487	552	
Carbonate as CO3	mg/l	41.1	0	40.8	0	
Chloride	mg/l	36.8	32.3	33.1	34.2	

Codes:

	Laboratory
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: CALICO SEEP
1991

Parameters	Units	Sample Dates				
		2/09/91 (B)(f)	5/13/91 (B)	8/23/91 (B)(f)	12/17/91 (B)	
Sulfate	mg/l	229	237	229	235	
Calcium	mg/l	1.55	2.98	2.41	6.12	
Magnesium	mg/l	0.94	0.62	0.69	1.40	
Potassium	mg/l	1.50	1.63	2.03	1.34	
Sodium	mg/l	326	336	314	332	
Major Cations	meq/l	14.4	14.9	14.8	14.9	
Major Anions	meq/l	14.7	15.1	15.0	14.9	
Arsenic	mg/l	0.004	<0.005	<0.005	<0.005	
Cadmium	mg/l	<0.0007	<0.002	<0.002	<0.002	
Mercury	mg/l	<0.0002	<0.001	<0.001	<0.002	
Lead	mg/l	<0.004	<0.02	<0.02	<0.02	
Selenium	mg/l	<0.002	<0.005	<0.005	<0.005	
Aluminum	mg/l	<0.1	0.1	<0.1	0.2	
Boron	mg/l	0.78	0.77	0.94	0.92	
Barium	mg/l	0.13	<0.5	<0.5	<0.5	
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	
Copper	mg/l	<0.01	<0.01	0.01	<0.01	
Iron	mg/l	0.13	0.31	0.08	0.31	
Manganese	mg/l	<0.02	0.03	<0.02	0.03	
Molybdenum	mg/l	<0.01	<0.02	<0.02	<0.02	
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	
Zinc	mg/l	3.45	0.03	0.01	0.04	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: CALICO SEEP
1991

Parameters	Units	Sample Dates				
		2/09/91 (B)(f)	5/13/91 (B)	8/23/91 (B)(f)	12/17/91 (B)	
Sulfate	mg/l	229	237	229	235	
Calcium	mg/l	1.55	2.98	2.41	6.12	
Magnesium	mg/l	0.94	0.62	0.69	1.40	
Potassium	mg/l	1.50	1.63	2.03	1.34	
Sodium	mg/l	326	336	314	332	
Major Cations	meq/l	14.4	14.9	14.8	14.9	
Major Anions	meq/l	14.7	15.1	15.0	14.9	
Arsenic	mg/l	0.004	<0.005	<0.005	<0.005	
Cadmium	mg/l	<0.0007	<0.002	<0.002	<0.002	
Mercury	mg/l	<0.0002	<0.001	<0.001	<0.002	
Lead	mg/l	<0.004	<0.02	<0.02	<0.02	
Selenium	mg/l	<0.002	<0.005	<0.005	<0.005	
Aluminum	mg/l	<0.1	0.1	<0.1	0.2	
Boron	mg/l	0.78	0.77	0.94	0.92	
Barium	mg/l	0.13	<0.5	<0.5	<0.5	
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	
Copper	mg/l	<0.01	<0.01	0.01	<0.01	
Iron	mg/l	0.13	0.31	0.08	0.31	
Manganese	mg/l	<0.02	0.03	<0.02	0.03	
Molybdenum	mg/l	<0.01	<0.02	<0.02	<0.02	
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	
Zinc	mg/l	3.45	0.03	0.01	0.04	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA
LOCATION: CALICO SEEP
1992

Parameters	Units	Sample Dates				
		2/04/92 (C)	5/30/92 (B)	8/15/92 (B)	12/04/92 (B)(f)	
Water Level or Flow		1 gal/1.5 hrs	2 gal/hr	1 gal/hr	2 gal/hr	
Temperature (Field)	°C	7.0	20.4	25	7.8	
pH (Lab)	S.U.	a	8.43	8.29	8.73	
pH (Field)	S.U.	8.9	8.8	8.3	8.6	
Conduct. (Field)	umhos/cm @ 25c	1210	898	858	468	
Conduct. (Lab)	umhos/cm @ 25c	a	1400	1410	1390	
Total Dissolved Solids	mg/l	858	934	936	906	
Total Settleable Solids	mg/l	a	a	.3	0.5	
Total Suspended Solids	mg/l	a	a	66	80	
Total Hardness as CaCO3	mg/l	5.3	15.5	13.1	8.26	
Total, Ortho-phosphate	mg/l	0.096	<0.02	<0.02	P <0.1	
Fluoride	mg/l	0.506	1.69	1.69	1.61	
Sulfide as H2S	mg/l	a	<0.10	a	<1.0	
Nitrate	mg/l	0.072	0.09	0.12	2.79	
Nitrite	mg/l	0.006	<0.02	<0.02	<0.01	
Total, Nitrate/Nitrite	mg/l	a	a	a	a	
Ammonia	mg/l	<0.2	0.04	0.12	0.13	
Oil and Grease	mg/l	a	<0.25	a	<0.24	
Bicarbonate as HCO3	mg/l	535	549	550	519	
Carbonate as CO3	mg/l	36.1	6.90	<0.10	16.8	
Chloride	mg/l	32.5	32.3	33.9	32	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: CALICO SEEP
1992

Parameters	Units	Sample Dates				
		2/04/92 (C)	5/30/92 (B)	8/15/92 (B)	12/04/92 (B)(f)	
Sulfate	mg/l	232	244	249	235	
Calcium	mg/l	2.05	4.63	3.83	2.67	
Magnesium	mg/l	0.80	0.98	0.87	0.39	
Potassium	mg/l	3.0	1.41	570	1.56	
Sodium	mg/l	347	347	2.07	345	
Major Cations	meq/l	15.27	15.4	14.9	15.2	
Major Anions	meq/l	15.72	15.2	15.2	14.8	
Arsenic	mg/l	<0.05	<0.005	<0.005	<0.005	
Cadmium	mg/l	<0.01	<0.002	<0.002	<0.002	
Mercury	mg/l	<0.0005	<0.001	<0.001	<0.001	
Lead	mg/l	<0.01	<0.02	<0.01	<0.02	
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	
Aluminum	mg/l	<0.05	0.2	0.1	<0.1	
Boron	mg/l	0.275	0.87	0.97	0.91	
Barium	mg/l	<0.01	<0.5	<0.5	<0.5	
Chromium	mg/l	<0.01	<0.02	<0.02	<0.02	
Copper	mg/l	<0.01	0.03	<0.01	<0.01	
Iron	mg/l	0.20	0.67	0.12	<0.05	
Manganese	mg/l	<0.01	0.04	<0.02	0.02	
Molybdenum	mg/l	<0.01	<0.02	<0.02	<0.02	
Nickel	mg/l	<0.01	0.01	<0.01	<0.01	
Zinc	mg/l	<0.01	0.04	0.34	0.09	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

MONITORING WELL

GROUNDWATER MONITORING DATA
LOCATION: MONITORING WELL MW-1
1990

Parameters	Units	Sample Dates				
		9/30/90 (A)				
Water Level		-				
Temperature (Field)	°C	a				
pH (Lab)	S.U.	a				
pH (Field)	S.U.	a				
Conduct. (Field)	umhos/cm @ 25c	a				
Conduct. (Lab)	umhos/cm @ 25c	a				
Total Dissolved Solids	mg/l	707				
Total Settleable Solids	mg/l	a				
Total Suspended Solids	mg/l	a				
Total Hardness as CaCO3	mg/l	33				
Total, Phosphorus	mg/l	<.01				
Fluoride	mg/l	1.40				
Sulfide as H2S	mg/l	<0.1				
Nitrate	mg/l	<0.01				
Nitrite	mg/l	<0.01				
Total, Nitrate/Nitrite	mg/l	a				
Ammonia	mg/l	<0.01				
Oil and Grease	mg/l	a				
Bicarbonate as HCO3	mg/l	672				
Carbonate as CO3	mg/l	<1				
Chloride	mg/l	30.0				

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: MONITORING WELL MW-1
1990

Parameters	Units	Sample Dates				
		9/30/90 (A)				
Sulfate	mg/l	145				
Calcium	mg/l	12.4				
Magnesium	mg/l	0.57				
Potassium	mg/l	8.08				
Sodium	mg/l	312.2				
Major Cations	meq/l	14.30				
Major Anions	meq/l	14.63				
Arsenic	mg/l	<0.002				
Cadmium	mg/l	<0.002				
Mercury	mg/l	<0.002				
Lead	mg/l	<0.05				
Selenium	mg/l	0.003				
Aluminum	mg/l	1.21				
Boron	mg/l	0.77				
Barium	mg/l	<0.03				
Chromium	mg/l	0.06				
Copper	mg/l	<0.01				
Iron	mg/l	0.62				
Manganese	mg/l	<0.01				
Molybdenum	mg/l	<0.1				
Nickel	mg/l	<0.02				
Zinc	mg/l	<0.01				

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA
LOCATION: MONITORING WELL MW-1
1991

Parameters	Units	Sample Dates				
		2/09/91 (B)(f)	5/13/91 (B)(f)	7/25/91 (B)(f)	8/23/91 (B)(f)	12/17/91 (B)
Water Level (feet below ground level)		126	126	131.5	132.7	131.6
Temperature (Field)	°C	17.8	21.8	22.5	21.9	11.6
pH (Lab)	S.U.	11.5	10.2	10.4	10.4	10.8
pH (Field)	S.U.	10.0	9.4	10.1	10.1	10.9
Conduct. (Field)	umhos/cm @ 25c	891	1119	1150	1268	406
Conduct. (Lab)	umhos/cm @ 25c	2490	1590	1400	1700	1690
Total Dissolved Solids	mg/l	856	876	874	870	870
Total Settleable Solids	mg/l	a	a	a	a	<0.1
Total Suspended Solids	mg/l	a	a	a	a	18
Total Hardness as CaCO3	mg/l	11.6	5.81	16.5	6.04	8.45
Total, Ortho-phosphate	mg/l	0.16	0.03	<0.02	0.03	<0.02
Fluoride	mg/l	2.22	2.05	2.17	1.90	1.89
Sulfide as H2S	mg/l	0.08	0.31	<0.1	0.1	<0.1
Nitrate	mg/l	a	a	a	a	<0.02
Nitrite	mg/l	a	a	a	a	<0.02
Total, Nitrate/Nitrite	mg/l	<0.04	<0.04	<0.02	<0.02	a
Ammonia	mg/l	1.71	1.19	1.64	1.88	1.02
Oil and Grease	mg/l	<5	<5	<5	<5	<5
Bicarbonate as HCO3	mg/l	188	659	112	63.4	<0.1
Carbonate as CO3	mg/l	298	0	282	296	327
Chloride	mg/l	30.6	48.1	44.2	53.4	50.2

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: MONITORING WELL MW-1
1991

Parameters	Units	Sample Dates				
		2/09/91 (B)(f)	5/13/91 (B)(f)	7/25/91 (B)(f)	8/23/91 (B)(f)	12/17/91 (B)
Sulfate	mg/l	105	155	166	153	149
Calcium	mg/l	3.1	1.43	1.84	0.48	2.74
Magnesium	mg/l	0.95	0.54	2.89	1.17	0.39
Potassium	mg/l	46.3	17.1	15.5	15.2	14.4
Sodium	mg/l	324	351	350	352	337
Major Cations	meq/l	15.5	15.8	15.9	15.8	15.2
Major Anions	meq/l	16.1	15.4	15.9	15.6	15.2
Arsenic	mg/l	0.022	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/l	0.0003	<0.002	<0.002	<0.002	<0.002
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	<0.002
Lead	mg/l	<0.004	<0.02	<0.02	<0.02	<0.02
Selenium	mg/l	0.0002	<0.005	<0.005	<0.005	<0.005
Aluminum	mg/l	1.0	0.3	0.4	<0.1	0.5
Boron	mg/l	0.57	0.68	0.65	0.73	0.67
Barium	mg/l	0.14	<0.5	<0.5	<0.5	<0.5
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/l	<0.01	<0.01	0.01	0.02	<0.01
Iron	mg/l	0.16	0.13	0.22	0.59	0.22
Manganese	mg/l	<0.02	<0.02	<0.02	0.12	<0.02
Molybdenum	mg/l	0.01	<0.02	<0.02	<0.02	<0.02
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	mg/l	7.44	0.01	0.01	0.02	0.02

Codes:

	Laboratory
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments

(a)	Not analyzed.
(b)	Field instruments malfunctioned
(c)	Temperature may not be accurate due to sample collection technique.
(d)	Calculated value.
(e)	Not enough water could be collected to run laboratory analysis.
(f)	Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA
LOCATION: MONITORING WELL MW-1
1992

Parameters	Units	Sample Dates				
		2/05/92 (C)	4/07/92 (B)	6/20/92 (B)(f)	8/15/92 (B)	12/04/92 (B)(f)
Water Level			150	144	163	150
Temperature (Field)	°C	16.0	24.6	22	24.5	15.8
pH (Lab)	S.U.	a	7.55	9.26	9.83	8.96
pH (Field)	S.U.	11.5	7.6	7.5	9.2	8.8
Conduct. (Field)	umhos/cm @ 25c	1530	195	112	b	535
Conduct. (Lab)	umhos/cm @ 25c	a	554	1990	2050	2110
Total Dissolved Solids	mg/l	868	1290	1240	1290	1330
Total Settleable Solids	mg/l	a	a	a	a	a
Total Suspended Solids	mg/l	a	a	a	a	a
Total Hardness as CaCO3	mg/l	0	9.65	11.5	10.7	10.8
Total, Ortho-phosphate	mg/l	0.11	<0.02	<0.02	<0.02	P <0.1
Fluoride	mg/l	2.09	3.29	3.09	2.94	3.49
Sulfide as H2S	mg/l	0.2	<0.10	<0.1	19.2	<1.0
Nitrate	mg/l	0.016	<0.02	<0.02	0.09	2.3
Nitrite	mg/l	0.010	<0.02	<0.02	<0.02	<0.01
Total, Nitrate/Nitrite	mg/l	a	a	a	a	a
Ammonia	mg/l	1.84	1.09	0.99	1.24	1.03
Oil and Grease	mg/l	0.58	<5.0	4.7	3.4	1.91
Bicarbonate as HCO3	mg/l	0	597	609	277	514
Carbonate as CO3	mg/l	270	0	0	167	36.6
Chloride	mg/l	50.4	153	141	143	153

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

GROUNDWATER MONITORING DATA (continued)
LOCATION: MONITORING WELL MW-1
1992

Parameters	Units	Sample Dates				
		2/05/92 (C)	4/07/92 (B)	6/20/92 (B)(f)	8/15/92 (B)	12/04/92 (B)(f)
Sulfate	mg/l	152	324	303	310	361
Calcium	mg/l	6.37	2.99	3.74	2.49	3.03
Magnesium	mg/l	0.21	0.54	0.55	1.09	0.78
Potassium	mg/l	21.2	2.63	4.30	804	2.42
Sodium	mg/l	304	460	441	3.22	488
Major Cations	meq/l	14.21	20.3	19.5	20.9	21.5
Major Anions	meq/l	13.70	20.8	20.3	20.6	21.5
Arsenic	mg/l	<0.05	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.01	<0.002	<0.002	<0.002	<0.002
Mercury	mg/l	0.002	<0.001	<0.001	<0.001	<0.001
Lead	mg/l	<0.01	<0.02	<0.02	<0.02	<0.02
Selenium	mg/l	<0.005	<0.005	<0.005	0.006	<0.005
Aluminum	mg/l	0.54	2.0	0.2	1.0	<0.1
Boron	mg/l	0.101	1.36	1.01	0.78	0.97
Barium	mg/l	0.11	<0.5	<0.5	<0.5	<0.5
Chromium	mg/l	<0.01	<0.02	<0.02	<0.02	<0.02
Copper	mg/l	<0.01	0.03	0.01	0.06	<0.01
Iron	mg/l	0.293	1.97	0.23	0.83	<0.05
Manganese	mg/l	<0.01	0.08	0.03	0.05	<0.02
Molybdenum	mg/l	0.011	<0.02	<0.02	<0.02	<0.02
Nickel	mg/l	<0.01	0.01	0.06	0.01	<0.01
Zinc	mg/l	0.015	0.09	0.02	0.18	<0.01

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
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(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 963-9300
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

January 12, 1990

Job No.: 59 10234

Date Rec'd: January 3, 1990

Date Sampled: December 27, 1989

Sampled By: ANDALEX RESOURCES, INC.

Andalex Resources
P.O. Box 902
Price UT 84501

Sample ID: ANDALEX RESOURCES, INC.

CALICO SANDSTONE SEEP
SMOKEY HALLOW
Flow 1 gal/1.5 hrs.
No Temperature
Rec'd 0800 hr.
No Sampling Time
FEILD MEASUREMENTS
pH 8.9
Conductivity 1170

WATER ANALYSIS

All TOTAL

Aluminum 01-10-90	0.01<	mg/l	Copper 01-10-90	0.010<	mg/l
Alk., Bicarbonate 12-28-89	608	mg/l HCO3	Fluoride 01-09-90	3.17	mg/l
Alk., Carbonate 12-28-89	1<	mg/l CaCO3	Hardness, Total	10	mg/l CaCO3
Arsenic 01-11-90	0.002<	mg/l	Iron 01-08-90	0.05	mg/l TOTAL
Anions, Total	14.48	meq/l	Lead 01-10-90	0.050	mg/l
Barium 01-10-90	0.03<	mg/l	Magnesium 01-08-90	0.96	mg/l
Boron 01-09-90	0.90	mg/l	Manganese 01-08-90	0.01<	mg/l
Cadmium 01-10-90	0.002<	mg/l	Mercury 01-11-90	0.002<	mg/l
Calcium 01-08-90	2.6	mg/l	Molybdenum 01-10-90	0.10<	mg/l
Cations, Total	14.35	meq/l	Nickel 01-10-90	0.02<	mg/l
Chloride 12-29-89	35.0	mg/l	Nitrogen, Ammonia 01-04-90	0.14	mg/l
Chromium 01-10-90	0.02<	mg/l	Nitrogen, Nitrate 01-09-90	0.14	mg/l

ANALYST: D. Tipon

DISS. & TOTAL FE

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

January 12, 1990

Job No.: 59 10234

Date Rec'd: January 3, 1990

Date Sampled: December 27, 1989

Sampled By: ANDALEX RESOURCES, INC.

Andalex Resources
P.O. Box 902
Price UT 84501

Sample ID: ANDALEX RESOURCES, INC.

CALICO SANDSTONE SEEP
SMOKEY HALLOW
Flow 1 gal/1.5 hrs.
No Temperature
Rec'd 0800 hr.
No Sampling Time
FEILD MEASUREMENTS
pH 8.9
Conductivity 1170

WATER ANALYSIS

Nitrogen, Nitrite 01-09-90	0.03	mg/l	Solids, Dissolved 01-03-90	854.0	mg/l
Oil and Grease 01-08-90	1.0<	mg/l	Solids, Settleable 12-19-90	1.0<	mg/l
Phosphorus, Total 01-04-90	0.01	mg/l	Solids, Suspended 01-03-90	2.0	mg/l
Potassium 01-08-90	1.80	mg/l	Sulfate 01-08-90	180.0	mg/l
Selenium 01-11-90	0.002<	mg/l	Sulfide 12-29-89	0.00	mg/l
Sodium 01-08-90	327.70	mg/l	Zinc 01-10-90	0.00<	mg/l

ACIDITY

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

August 1, 1990

Job No.: 59 10510

Date Rec'd: July 12, 1990

Date Sampled: ------

Sampled By: ANDALEX RESOURCES, INC.

Andalex Resources
P.O. Box 902
Price UT 84501

Sample ID: ANDALEX RESOURCES, INC.

WARM SPRINGS CALICO SANDSTONE SEEP
Temperature 25 degrees C.
FIELD MEASUREMENTS
pH 8.1
Conductivity 1460

1 GAL./1.5 HRS.

WATER ANALYSIS

Acidity 07-30-90	1<	mg/l CaCO3	Chloride 07-26-90	40.0	mg/l
Aluminum 07-24-90	0.01<	mg/l	Chromium 07-24-90	0.02<	mg/l
Alk., Bicarbonate 07-24-90	649	mg/l HCO3	Copper 07-24-90	0.010<	mg/l
Alk., Carbonate 07-24-90	1<	mg/l CaCO3	Fluoride 07-31-90	1.53	mg/l
Alk., Total 07-24-90	532	mg/l CaCO3	Hardness, Total	68	mg/l CaCO3
Arsenic 07-20-90	0.002<	mg/l	Iron 07-24-90	0.02<	mg/l
Anions, Total	16.74	meq/l	Iron, Dissolved 07-24-90	0.02<	mg/l
Barium 07-24-90	0.15	mg/l	Lead 07-24-90	0.050<	mg/l
Boron 07-19-90	0.84	mg/l	Magnesium 07-24-90	0.48	mg/l
Cadmium 07-24-90	0.002<	mg/l	Manganese 07-24-90	0.10	mg/l
Calcium 07-24-90	26.6	mg/l	Mercury 07-19-90	0.002<	mg/l
Cations, Total	16.44	meq/l	Molybdenum 07-24-90	0.10<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Connell by DT
Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

August 1, 1990

Job No.: 59 10510

Date Rec'd: July 12, 1990

Date Sampled: ------

Sampled By: ANDALEX RESOURCES, INC.

Sample ID: ANDALEX RESOURCES, INC.

WARM SPRINGS CALICO SANDSTONE SEEP
Temperature 25 degrees C.
FIELD MEASUREMENTS
pH 8.1
Conductivity 1460

Andalex Resources
P.O. Box 902
Price UT 84501

WATER ANALYSIS

Nickel 07-24-90	0.02<	mg/l	Selenium 07-20-90	0.002<	mg/l
Nitrogen, Ammonia 07-12-90	0.00	mg/l	Sodium 07-24-90	350.40	mg/l
Nitrogen, Nitrate 07-13-90	0.06	mg/l	Solids, Dissolved 07-27-90	820.0	mg/l
Nitrogen, Nitrite 07-13-90	0.01<	mg/l	Solids, Suspended 07-24-90	5.0	mg/l
Oil and Grease 07-27-90	1.0<	mg/l	Sulfate 07-30-90	250.0	mg/l
Phosphorus, Total 07-30-90	0.01<	mg/l	Sulfide 07-10-90	1.00	mg/l
Potassium 07-24-90	0.00<	mg/l	Zinc 07-24-90	0.00<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Council by DT
Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10630

Sample ID: SEEP S-2

Date Rec'd: October 2, 1990

S-2 RAW SURFACE WATER
Rec'd 14:30 hr.
Sampled 4:10 p.m hr.

Date Sampled: September 30, 1990

Sampled By: Andalex

Andalex Resources
P.O. Box 902
Price UT 84501

WATER ANALYSIS

Aluminum 10-25-90	0.01<	mg/l	Copper 10-25-90	0.010<	mg/l
Alk., Bicarbonate 10-09-90	300	mg/l HCO3	Fluoride 10-12-90	0.49	mg/l
Alk., Carbonate 10-09-90	1<	mg/l CaCO3	Hardness, Total	1311	mg/l CaCO3
Arsenic 10-08-90	0.002<	mg/l	Iron 10-09-90	0.02<	mg/l
Anions, Total	27.55	meq/l	Lead 10-25-90	0.050<	mg/l
Barium 10-25-90	0.03<	mg/l	Magnesium 10-09-90	157.00	mg/l
Boron 10-16-90	0.55	mg/l	Manganese 10-09-90	0.01<	mg/l
Cadmium 10-25-90	0.002<	mg/l	Mercury 10-23-90	0.002<	mg/l
Calcium 10-09-90	266.3	mg/l	Molybdenum 10-25-90	0.10<	mg/l
Cations, Total	27.24	meq/l	Nickel 10-25-90	0.02<	mg/l
Chloride 10-15-90	25.0	mg/l	Nitrogen, Ammonia 10-11-90	0.00	mg/l
Chromium 10-25-90	0.02<	mg/l	Nitrogen, Nitrate 10-15-90	0.01<	mg/l

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10630

Date Rec'd: October 2, 1990

Date Sampled: September 30, 1990

Sampled By: Andalex

Sample ID:

S-2 RAW SURFACE WATER
Rec'd 14:30 hr.
Sampled 4:10 p.m hr.

Andalex Resources
P.O. Box 902
Price UT 84501

WATER ANALYSIS

Nitrogen, Nitrite 10-15-90	0.01<	mg/l	Solids, Dissolved 10-24-90	911.0	mg/l
Oil and Grease 10-05-90	1.5	mg/l	Solids, Settleable 10-02-90	1.0<	mg/l
Phosphorus, Total 10-16-90	0.01<	mg/l	Solids, Suspended 10-24-90	3.0	mg/l
Potassium 10-09-90	1.13	mg/l	Sulfate 10-18-90	1050.0	mg/l
Selenium 10-08-90	0.003	mg/l	Sulfide 10-12-90	0.00	mg/l
Sodium 10-09-90	23.80	mg/l	Zinc 10-25-90	0.00<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10629

Sample ID: MONITORING WELL

Date Rec'd: October 2, 1990

M-W-1 GROUND
Rec'd 14:30 hr.
Sampled 5:08 p.m hr.

Date Sampled: September 30, 1990

Sampled By: Andalex

Andalex Resources
P.O. Box 902
Price UT 84501

WATER ANALYSIS

Aluminum 10-25-90	1.21	mg/l	Copper 10-25-90	0.010<	mg/l
Alk., Bicarbonate 10-09-90	672	mg/l HCO3	Fluoride 10-12-90	1.40	mg/l
Alk., Carbonate 10-09-90	1<	mg/l CaCO3	Hardness, Total	33	mg/l CaCO3
Arsenic 10-08-90	0.002<	mg/l	Iron 10-09-90	0.62	mg/l
Anions, Total	14.63	meq/l	Lead	0.050<	mg/l
Barium 10-25-90	0.03<	mg/l	Magnesium 10-09-90	0.57	mg/l
Boron 10-17-90	0.77	mg/l	Manganese 10-09-90	0.01<	mg/l
Cadmium 10-25-90	0.002<	mg/l	Mercury 10-23-90	0.002<	mg/l
Calcium 10-09-90	12.4	mg/l	Molybdenum 10-25-90	0.10<	mg/l
Cations, Total	14.30	meq/l	Nickel 10-25-90	0.02<	mg/l
Chloride 10-15-90	30.0	mg/l	Nitrogen, Ammonia 10-11-90	0.00	mg/l
Chromium 10-25-90	0.06	mg/l	Nitrogen, Nitrate 10-15-90	0.01<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10629

Date Rec'd: October 2, 1990

Date Sampled: September 30, 1990

Sampled By: Andalex

Sample ID:

M-W-1 GROUND
Rec'd 14:30 hr.
Sampled 5:08 p.m hr.

Andalex Resources
P.O. Box 902
Price UT 84501

WATER ANALYSIS

Nitrogen, Nitrite 10-15-90	0.01<	mg/l	Solids, Dissolved 10-24-90	707.0	mg/l
Phosphorus, Total 10-10-90	0.01<	mg/l	Sulfate 10-18-90	145.0	mg/l
Potassium 10-09-90	8.08	mg/l	Sulfide 10-12-90	0.00	mg/l
Selenium 10-08-90	0.003	mg/l	Zinc 10-25-90	0.01<	mg/l
Sodium 10-08-90	312.20	mg/l			

ANALYST: D. Lipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT: Andalex Resources
ID: Baseline GW
SITE: Calico SS
LAB NO: F5763

DATE REPORTED: 03/11/91
DATE RECEIVED: 02/14/91
DATE COLLECTED: 02/09/91

Trace metals by AA (total concentration), mg/l

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.0040	<0.0003
Cadmium (Cd).....	0.0007	<0.0002
Mercury (Hg).....	ND	<0.0002
Lead (Pb).....	ND	<0.004
Selenium (Se).....	ND	<0.0002

Trace metals by ICAP (total concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.78	<0.01
Barium (Ba).....	0.13	<0.05
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.13	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.01
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	3.45	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Mary Stepp
Lab Director

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT:	Andalex Resources	DATE REPORTED:	03/11/91
ID:	Baseline GW		
SITE:	Calico SS	DATE RECEIVED:	02/14/91
LAB NO:	F5763	DATE COLLECTED:	02/09/91

Lab pH (s.u.)	8.66
Lab conductivity, umhos/cm	1430
Lab resistivity, ohm-m	6.98
Total dissolved solids (180), mg/l	826
Total dissolved solids (calc), mg/l	863
Total suspended solids, mg/l	132
Settleable solids, ml/l	20
Total alkalinity as CaCO3, mg/l	445
Total hardness as CaCO3, mg/l	7.75
Sodium absorption ratio	51
Total ortho-phosphate, mg/l	0.16
Fluoride, mg/l	2.78
Sulfide as H2S, mg/l	<0.01
Total nitrate and nitrite, mg/l	0.06
Ammonia, mg/l	0.33
Oil and grease (gravimetric), mg/l	<5

	mg/l	meq/l
Bicarbonate as HCO3	459	7.52
Carbonate as CO3	41.1	1.37
Chloride	36.8	1.04
Sulfate	229	4.78
Calcium	1.55	0.08
Magnesium	0.94	0.08
Potassium	1.5	0.04
Sodium	326	14.2
Major cations		14.4
Major anions		14.7
Cation/anion difference		1.09 %

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT:	Andalex Resources	DATE REPORTED:	03/11/91
ID:	Baseline S.		
SITE:	MW-1	DATE RECEIVED:	02/14/91
LAB NO:	F5764	DATE COLLECTED:	02/09/91

Trace metals by AA (dissolved concentration), mg/l

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.0220	<0.0003
Cadmium (Cd).....	0.0003	<0.0002
Mercury (Hg).....	<0.001	<0.0002
Lead (Pb).....	<0.004	<0.004
Selenium (Se).....	0.0002	<0.0002

Trace metals by ICAP (dissolved concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	1.0	<0.1
Boron (B).....	0.57	<0.01
Barium (Ba).....	0.14	<0.05
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.16	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	0.01	<0.01
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	7.44	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp

Mary Stepp
Lab Director

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT:	Andalex Resources	DATE REPORTED:	03/11/91
ID:	Baseline S.		
SITE:	MW-1	DATE RECEIVED:	02/14/91
LAB NO:	F5764	DATE COLLECTED:	02/09/91

Lab pH (s.u.).....	11.47
Lab conductivity, umhos/cm.....	2490
Lab resistivity, ohm-m.....	4.02
Total dissolved solids (180), mg/l..	856
Total dissolved solids (calc), mg/l.	900
Total alkalinity as CaCO3, mg/l.....	650
Total hardness as CaCO3, mg/l.....	11.6
Sodium absorption ratio.....	41.3
Total ortho-phosphate, mg/l.....	0.16
Fluoride, mg/l.....	2.22
Sulfide as H2S, mg/l.....	0.08
Total nitrate and nitrite, mg/l.....	<0.04
Ammonia, mg/l.....	1.71
Oil and grease (gravimetric), mg/l..	<5

	mg/l	meq/l
Bicarbonate as HCO3.....	188	3.08
Carbonate as CO3.....	298	9.92
Hydroxide as OH.....	52.33	3.08
Chloride.....	30.6	0.86
Sulfate.....	105	2.19
Calcium.....	3.1	0.15
Magnesium.....	0.95	0.08
Potassium.....	46.3	1.18
Sodium.....	324	14.1
Major cations.....		15.5
Major anions.....		16.1
Cation/anion difference.....		1.73 %

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT: Andalex Resources
ID: Baseline GW
SITE: S-2 Pool
LAB NO: F5762

DATE REPORTED: 03/11/91
DATE RECEIVED: 02/14/91
DATE COLLECTED: 02/09/91

Trace metals by AA (total concentration), mg/l

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.0060	<0.0003
Cadmium (Cd).....	0.0027	<0.0002
Mercury (Hg).....	ND	<0.0002
Lead (Pb).....	ND	<0.004
Selenium (Se).....	ND	<0.0002

Trace metals by ICAP (total concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.3	<0.1
Boron (B).....	0.18	<0.01
Barium (Ba).....	0.10	<0.05
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	0.22	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.01
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	5.50	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Mary Stepp
Lab Director

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT:	Andalex Resources	DATE REPORTED:	03/11/91
ID:	Baseline GW		
SITE:	S-2 Pool	DATE RECEIVED:	02/14/91
LAB NO:	F5762	DATE COLLECTED:	02/09/91

Lab pH (s.u.)	7.64
Lab conductivity, umhos/cm	1720
Lab resistivity, ohm-m	5.82
Total dissolved solids (180), mg/l	1320
Total dissolved solids (calc), mg/l	1280
Total suspended solids, mg/l	17
Settleable solids, ml/l	<1
Total alkalinity as CaCO3, mg/l	260
Total hardness as CaCO3, mg/l	978
Sodium absorption ratio	0.357
Total ortho-phosphate, mg/l	0.25
Fluoride, mg/l	0.55
Sulfide as H2S, mg/l	<0.01
Total nitrate and nitrite, mg/l	<0.04
Ammonia, mg/l	0.70
Oil and grease (gravimetric), mg/l	<5

	mg/l	meq/l
Bicarbonate as HCO3	317	5.2
Carbonate as CO3	0	0
Chloride	15.3	0.43
Sulfate	758	15.8
Calcium	206	10.3
Magnesium	113	9.28
Potassium	5.39	0.14
Sodium	25.7	1.12
Major cations		20.8
Major anions		21.4
Cation/anion difference		1.41 %

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT: Andalex
ID: 1335
SITE: S-2
LAB NO: F6242

DATE REPORTED: 06/19/91
DATE RECEIVED: 05/21/91
DATE COLLECTED: 05/13/91

Trace metals by AA (total concentration), mg/l

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (total concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.2	<0.1
Boron (B).....	0.18	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.18	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Manager

Inter·Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT: Andalex
ID: 1335
SITE: S-2
LAB NO: F6242

DATE REPORTED: 06/19/91
DATE RECEIVED: 05/21/91
DATE COLLECTED: 05/13/91

Lab pH (s.u.)	7.93
Lab conductivity, umhos/cm	1690
Lab resistivity, ohm-m	5.91
Total dissolved solids (180), mg/l	3800
Total dissolved solids (calc), mg/l	1330
Total suspended solids, mg/l	23
Settleable solids, ml/l	<0.1
Total alkalinity as CaCO3, mg/l	275
Total hardness as CaCO3, mg/l	1020
Sodium absorption ratio	0.36
Total ortho-phosphate, mg/l	0.02
Fluoride, mg/l	0.40
Sulfide as H2S, mg/l	<0.1
Total nitrate and nitrite, mg/l	<0.04
Ammonia, mg/l	<0.04
Oil and grease (gravimetric), mg/l	<5.00

	mg/l	meq/l
Bicarbonate as HCO3	336	5.5
Carbonate as CO3	0	0
Chloride	12.3	0.35
Sulfate	782	16.3
Calcium	242	12.1
Magnesium	100	8.26
Potassium	5.5	0.14
Sodium	26.4	1.15
Major cations		21.6
Major anions		22.1
Cation/anion difference		1.16 %

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT: Andalex
ID: 1437
SITE: S-4
LAB NO: F6240

DATE REPORTED: 06/19/91
DATE RECEIVED: 05/21/91
DATE COLLECTED: 05/13/91

Trace metals by AA (dissolved concentration), mg/l

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (dissolved concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.07	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Manager

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT:	Andalex	DATE REPORTED:	06/19/91
ID:	1437		
SITE:	S-4	DATE RECEIVED:	05/21/91
LAB NO:	F6240	DATE COLLECTED:	05/13/91

Lab pH (s.u.).....	8.21
Lab conductivity, umhos/cm.....	301
Lab resistivity, ohm-m.....	33.2
Total dissolved solids (180), mg/l..	172
Total dissolved solids (calc), mg/l.	156
Total alkalinity as CaCO3, mg/l.....	107
Total hardness as CaCO3, mg/l.....	137
Sodium absorption ratio.....	0.149
Total ortho-phosphate, mg/l.....	0.03
Fluoride, mg/l.....	0.34
Sulfide as H2S, mg/l.....	<0.1
Total nitrate and nitrite, mg/l.....	0.76
Ammonia, mg/l.....	0.11
Oil and grease (gravimetric), mg/l..	<5.00

	mg/l	meq/l
Bicarbonate as HCO3.....	131	2.15
Carbonate as CO3.....	0	0
Chloride.....	4.46	0.13
Sulfate.....	31.5	0.66
Calcium.....	42.6	2.13
Magnesium.....	7.36	0.6
Potassium.....	1.74	0.04
Sodium.....	4	0.17
Major cations.....		2.95
Major anions.....		2.98
Cation/anion difference.....		0.58 %

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT: Andalex
ID: 1105
SITE: Calico SS
LAB NO: F6241

DATE REPORTED: 06/19/91
DATE RECEIVED: 05/21/91
DATE COLLECTED: 05/13/91

Trace metals by AA (total concentration), mg/l

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (total concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.1	<0.1
Boron (B).....	0.77	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.31	<0.05
Manganese (Mn).....	0.03	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.03	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Manager

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT:	Andalex	DATE REPORTED:	06/19/91
ID:	1105		
SITE:	Calico SS	DATE RECEIVED:	05/21/91
LAB NO:	F6241	DATE COLLECTED:	05/13/91

Lab pH (s.u.).....	8.60
Lab conductivity, umhos/cm.....	1420
Lab resistivity, ohm-m.....	7.04
Total dissolved solids (180), mg/l..	892
Total dissolved solids (calc), mg/l.	887
Total suspended solids, mg/l.....	36
Settleable solids, ml/l.....	<0.10
Total alkalinity as CaCO3, mg/l.....	460
Total hardness as CaCO3, mg/l.....	9.97
Sodium absorption ratio.....	46.3
Total ortho-phosphate, mg/l.....	0.08
Fluoride, mg/l.....	1.75
Sulfide as H2S, mg/l.....	<0.1
Total nitrate and nitrite, mg/l.....	<0.04
Ammonia, mg/l.....	0.04
Oil and grease (gravimetric), mg/l..	<5.00

	mg/l	meq/l
Bicarbonate as HCO3.....	561	9.19
Carbonate as CO3.....	0	0
Chloride.....	32.3	0.91
Sulfate.....	237	4.95
Calcium.....	2.98	0.15
Magnesium.....	0.62	0.05
Potassium.....	1.63	0.04
Sodium.....	336	14.6
Major cations.....		14.9
Major anions.....		15.1
Cation/anion difference.....		0.65 %

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT: Andalex
ID: 1200
SITE: MW-1
LAB NO: F6239

DATE REPORTED: 06/19/91
DATE RECEIVED: 05/21/91
DATE COLLECTED: 05/13/91

Trace metals by AA (dissolved concentration), mg/l

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (dissolved concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.3	<0.1
Boron (B).....	0.68	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.13	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Manager

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CLIENT:	Andalex	DATE REPORTED:	06/19/91
ID:	1200		
SITE:	MW-1	DATE RECEIVED:	05/21/91
LAB NO:	F6239	DATE COLLECTED:	05/13/91

Lab pH (s.u.)	10.18
Lab conductivity, umhos/cm	1590
Lab resistivity, ohm-m	6.28
Total dissolved solids (180), mg/l	876
Total dissolved solids (calc), mg/l	898
Total alkalinity as CaCO3, mg/l	541
Total hardness as CaCO3, mg/l	5.81
Sodium absorption ratio	63.3
Total ortho-phosphate, mg/l	0.03
Fluoride, mg/l	2.05
Sulfide as H2S, mg/l	0.31
Total nitrate and nitrite, mg/l	<0.04
Ammonia, mg/l	1.19
Oil and grease (gravimetric), mg/l	<5.00

	mg/l	meq/l
Bicarbonate as HCO3	659	10.8
Carbonate as CO3	0	0
Chloride	48.1	1.36
Sulfate	155	3.22
Calcium	1.43	0.07
Magnesium	0.54	0.04
Potassium	17.1	0.44
Sodium	351	15.3
Major cations		15.8
Major anions		15.4
Cation/anion difference		1.32 %

Inter·Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources	DATE REPORTED:	08/26/91
ID:	0957		
SITE:	MW-1	DATE RECEIVED:	08/02/91
LAB NO:	F6805	DATE COLLECTED:	07/25/91

Lab pH (s.u.).....	10.36
Lab conductivity, umhos/cm.....	1400
Lab resistivity, ohm-m.....	7.15
Total dissolved solids (180), mg/l..	874
Total dissolved solids (calc), mg/l.	917
Total alkalinity as CaC03, mg/l.....	562
Total hardness as CaC03, mg/l.....	16.5
Sodium absorption ratio.....	37.4
Total ortho-phosphate, mg/l.....	<0.02
Fluoride, mg/l.....	2.17
Sulfide as H2S, mg/l.....	<0.1
Total nitrate and nitrite, mg/l.....	<0.02
Ammonia, mg/l.....	1.64
Oil and grease (gravimetric), mg/l..	<5.0

	mg/l	meq/l
Bicarbonate as HC03.....	112	1.84
Carbonate as C03.....	282	9.39
Chloride.....	44.2	1.25
Sulfate.....	166	3.46
Calcium.....	1.84	0.09
Magnesium.....	2.89	0.24
Potassium.....	15.5	0.4
Sodium.....	350	15.2
Major cations.....		15.9
Major anions.....		15.9
Cation/anion difference.....		0.04 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: 0957
SITE: MW-1
LAB NO: F6805

DATE REPORTED: 08/26/91
DATE RECEIVED: 08/02/91
DATE COLLECTED: 07/25/91

Trace metals by AA (dissolved concentration), 0

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (dissolved concentration), mg/l

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.4	<0.1
Boron (B).....	0.65	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	0.22	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Manager

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: 1220
SITE: S-2
LAB NO: F7044

DATE REPORTED: 09/25/91
DATE RECEIVED: 08/29/91
DATE COLLECTED: 08/23/91

Trace metals by AA (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.12	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.05	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Manager

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/25/91
ID:	1220		
SITE:	S-2	DATE RECEIVED:	08/29/91
LAB NO:	F7044	DATE COLLECTED:	08/23/91

Lab pH (s.u.).....	7.40
Lab conductivity, umhos/cm.....	1690
Lab resistivity, ohm-m.....	5.93
Total dissolved solids (180), mg/L..	1390
Total dissolved solids (calc), mg/L.	1320
Total alkalinity as CaC03, mg/L.....	290
Total hardness as CaC03, mg/L.....	1030
Sodium absorption ratio.....	0.35
Total ortho-phosphate, mg/L.....	0.05
Fluoride, mg/L.....	0.41
Sulfide as H2S, mg/L.....	0.12
Total nitrate and nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.83
Oil and grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	354	5.8
Carbonate as C03.....	0	0
Chloride.....	13.8	0.39
Sulfate.....	769	16
Calcium.....	211	10.5
Magnesium.....	121	9.98
Potassium.....	5.9	0.15
Sodium.....	25.8	1.12
Major cations.....		21.8
Major anions.....		22.2
Cation/anion difference.....		0.96 %

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: 1110
SITE: S-4
LAB NO: F7043

DATE REPORTED: 09/25/91
DATE RECEIVED: 08/29/91
DATE COLLECTED: 08/23/91

Trace metals by AA (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.05	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.08	<0.05
Manganese (Mn).....	0.02	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Manager

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/25/91
ID:	1110		
SITE:	S-4	DATE RECEIVED:	08/29/91
LAB NO:	F7043	DATE COLLECTED:	08/23/91

Lab pH (s.u.).....	7.81
Lab conductivity, umhos/cm.....	271
Lab resistivity, ohm-m.....	36.9
Total dissolved solids (180), mg/L..	178
Total dissolved solids (calc), mg/L.	148
Total alkalinity as CaC03, mg/L.....	97.9
Total hardness as CaC03, mg/L.....	124
Sodium absorption ratio.....	0.142
Total ortho-phosphate, mg/L.....	0.03
Fluoride, mg/L.....	0.30
Sulfide as H2S, mg/L.....	<0.1
Total nitrate and nitrite, mg/L.....	0.02
Ammonia, mg/L.....	0.91
Oil and grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	120	1.96
Carbonate as C03.....	0	0
Chloride.....	4.39	0.12
Sulfate.....	34.2	0.71
Calcium.....	36.9	1.84
Magnesium.....	7.87	0.65
Potassium.....	2.5	0.06
Sodium.....	3.65	0.16
Major cations.....		2.71
Major anions.....		2.79
Cation/anion difference.....		1.53 %

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: 0842
SITE: Calico SS
LAB NO: F7045

DATE REPORTED: 09/25/91
DATE RECEIVED: 08/29/91
DATE COLLECTED: 08/23/91

Trace metals by AA (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.94	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	0.08	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Manager

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/25/91
ID:	0842		
SITE:	Calico SS	DATE RECEIVED:	08/29/91
LAB NO:	F7045	DATE COLLECTED:	08/23/91

Lab pH (s.u.).....	8.88
Lab conductivity, umhos/cm.....	1450
Lab resistivity, ohm-m.....	6.9
Total dissolved solids (180), mg/L..	930
Total dissolved solids (calc), mg/L.	861
Total alkalinity as CaC03, mg/L.....	467
Total hardness as CaC03, mg/L.....	8.85
Sodium absorption ratio.....	49
Total ortho-phosphate, mg/L.....	0.03
Fluoride, mg/L.....	1.90
Sulfide as H2S, mg/L.....	0.27
Total nitrate and nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.83
Oil and grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	487	7.99
Carbonate as C03.....	40.8	1.36
Chloride.....	33.1	0.93
Sulfate.....	229	4.77
Calcium.....	2.41	0.12
Magnesium.....	0.69	0.06
Potassium.....	2.03	0.05
Sodium.....	314	14.6
Major cations.....		14.8
Major anions.....		15
Cation/anion difference.....		0.8 %

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: 0945
SITE: MW-1
LAB NO: F7042

DATE REPORTED: 09/25/91
DATE RECEIVED: 08/29/91
DATE COLLECTED: 08/23/91

Trace metals by AA (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace metals by ICAP (dissolved concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.73	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	0.59	<0.05
Manganese (Mn).....	0.12	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.02	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Manager

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/25/91
ID:	0945		
SITE:	MW-1	DATE RECEIVED:	08/29/91
LAB NO:	F7042	DATE COLLECTED:	08/23/91

Lab pH (s.u.).....	10.41
Lab conductivity, umhos/cm.....	1700
Lab resistivity, ohm-m.....	5.88
Total dissolved solids (180), mg/L..	870
Total dissolved solids (calc), mg/L.	902
Total alkalinity as CaC03, mg/L.....	545
Total hardness as CaC03, mg/L.....	6.04
Sodium absorption ratio.....	62.2
Total ortho-phosphate, mg/L.....	0.03
Fluoride, mg/L.....	1.90
Sulfide as H2S, mg/L.....	0.1
Total nitrate and nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	1.88
Oil and grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	63.4	1.04
Carbonate as C03.....	296	9.86
Chloride.....	53.4	1.51
Sulfate.....	153	3.19
Calcium.....	0.48	0.02
Magnesium.....	1.17	0.1
Potassium.....	15.2	0.39
Sodium.....	352	15.3
Major cations.....		15.8
Major anions.....		15.6
Cation/anion difference.....		0.63 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1500		
SITE:	S-2	DATE RECEIVED:	12/23/91
LAB NO:	F7795	DATE COLLECTED:	12/17/91

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.002
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.1	<0.1
Boron (B).....	0.23	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.02	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Director

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1500		
SITE:	S-2	DATE RECEIVED:	12/23/91
LAB NO:	F7795	DATE COLLECTED:	12/17/91

Lab pH (s.u.).....	7.59
Lab Conductivity, umhos/cm @ 25C....	1610
Lab Resistivity, ohm-m.....	6.2
Total Dissolved Solids (180C), mg/L.	1360
Total Dissolved Solids (calc), mg/L.	1290
Total Suspended Solids, mg/L.....	52
Settleable Solids, ml/L.....	<0.1
Total Alkalinity as CaC03, mg/L.....	265
Total Hardness as CaC03, mg/L.....	992
Sodium Adsorption Ratio.....	0.35
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.33
Sulfide as H2S, mg/L.....	<0.10
Nitrate, mg/L.....	<0.02
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.05
Oil and Grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	323	5.3
Carbonate as C03.....	0	0
Chloride.....	12.9	0.37
Sulfate.....	763	15.9
Calcium.....	203	10.1
Magnesium.....	118	9.72
Potassium.....	5.12	0.13
Sodium.....	25.4	1.10
Major Cations.....		21.1
Major Anions.....		21.6
Cation/Anion Difference.....		1.15 %

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1335		
SITE:	S-4	DATE RECEIVED:	12/23/91
LAB NO:	F7796	DATE COLLECTED:	12/17/91

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.002
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.12	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.07	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Director

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1335		
SITE:	S-4	DATE RECEIVED:	12/23/91
LAB NO:	F7796	DATE COLLECTED:	12/17/91

Lab pH (s.u.).....	7.66
Lab Conductivity, umhos/cm @ 25C....	278
Lab Resistivity, ohm-m.....	36
Total Dissolved Solids (180C), mg/L.	176
Total Dissolved Solids (calc), mg/L.	144
Total Suspended Solids, mg/L.....	<1.0
Settleable Solids, ml/L.....	<0.1
Total Alkalinity as CaC03, mg/L.....	101
Total Hardness as CaC03, mg/L.....	124
Sodium Adsorption Ratio.....	0.13
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.25
Sulfide as H2S, mg/L.....	<0.10
Nitrate, mg/L.....	0.78
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.04
Oil and Grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	124	2.03
Carbonate as C03.....	0	0
Chloride.....	2.59	0.07
Sulfate.....	28.2	0.59
Calcium.....	43.5	2.17
Magnesium.....	3.77	0.31
Potassium.....	1.40	0.04
Sodium.....	3.30	0.14
Major Cations.....		2.66
Major Anions.....		2.74
Cation/Anion Difference.....		1.50 %

Inter·Mountain Laboratories, Inc.

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Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1230		
SITE:	MW -1	DATE RECEIVED:	12/23/91
LAB NO:	F7794	DATE COLLECTED:	12/17/91

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.002
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.5	<0.1
Boron (B).....	0.67	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.22	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.02	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Director

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1230		
SITE:	MW -1	DATE RECEIVED:	12/23/91
LAB NO:	F7794	DATE COLLECTED:	12/17/91

Lab pH (s.u.).....	10.76
Lab Conductivity, umhos/cm @ 25C....	1690
Lab Resistivity, ohm-m.....	5.91
Total Dissolved Solids (180C), mg/L.	870
Total Dissolved Solids (calc), mg/L.	875
Total Suspended Solids, mg/L.....	18
Settleable Solids, ml/L.....	<0.1
Total Alkalinity as CaC03, mg/L.....	536
Total Hardness as CaC03, mg/L.....	8.45
Sodium Adsorption Ratio.....	50.4
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	1.89
Sulfide as H2S, mg/L.....	<0.10
Nitrate, mg/L.....	<0.02
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	1.02
Oil and Grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	<0.10	<0.01
Carbonate as C03.....	327	10.9
Chloride.....	50.2	1.42
Sulfate.....	149	3.09
Calcium.....	2.74	0.14
Magnesium.....	0.39	0.03
Potassium.....	14.4	0.37
Sodium.....	337	14.7
Major Cations.....		15.2
Major Anions.....		15.2
Cation/Anion Difference.....		0.15 %

Inter·Mountain Laboratories, Inc.

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Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1057		
SITE:	Calico Sandstone	DATE RECEIVED:	12/23/91
LAB NO:	F7793	DATE COLLECTED:	12/17/91

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.002
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.2	<0.1
Boron (B).....	0.92	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.31	<0.05
Manganese (Mn).....	0.03	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.04	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Director

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	01/16/92
ID:	1057		
SITE:	Calico Sandstone	DATE RECEIVED:	12/23/91
LAB NO:	F7793	DATE COLLECTED:	12/17/91

Lab pH (s.u.).....	8.30
Lab Conductivity, umhos/cm @ 25C....	1310
Lab Resistivity, ohm-m.....	7.66
Total Dissolved Solids (180C), mg/L.	908
Total Dissolved Solids (calc), mg/L.	882
Total Suspended Solids, mg/L.....	190
Settleable Solids, ml/L.....	4
Total Alkalinity as CaC03, mg/L.....	453
Total Hardness as CaC03, mg/L.....	21.0
Sodium Adsorption Ratio.....	31.50
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	1.74
Sulfide as H2S, mg/L.....	<0.10
Nitrate, mg/L.....	<0.02
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.26
Oil and Grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	552	9.05
Carbonate as C03.....	0	0
Chloride.....	34.2	0.96
Sulfate.....	235	4.90
Calcium.....	6.12	0.31
Magnesium.....	1.40	0.11
Potassium.....	1.34	0.03
Sodium.....	332	14.4
Major Cations.....		14.9
Major Anions.....		14.9
Cation/Anion Difference.....		0.06 %

CHEMTECH

ANALYTICAL LABORATORY

6100 S. STRATLER
MURRAY, UTAH 84107
PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074123 - Andalex, Brett Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	976
Hardness as $CaCO_3$, mg/l	569
Bicarbonate as HCO_3, mg/l	442
Carbonate as CO3, mg/l	12.9
Chloride as Cl, mg/l	14.5
Fluoride as F, mg/l	0.506
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.044
Nitrite as NO_2-N, mg/l	0.005
Phosphate as PO_4-P, mg/l	0.033
Sulfate as SO_4, mg/l	434
Aluminum as Al, mg/l	0.18
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.032
Boron as B, mg/l	0.102
Calcium as Ca, mg/l	119
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.483

Rex Henderson

CHEMTECH

ANALYTICAL LABORATORY

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MURRAY, UTAH 84107
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DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074123 - Andalex, Brett Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	63.3
Manganese as Mn, mg/l	0.865
Mercury as Hg, mg/l	0.00074
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	11.1
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	103
Zinc as Zn, mg/l	0.015
Cation, meq/l	15.91
Anion, meq/l	17.12

Rex Henderson

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MURRAY, UTAH 84107
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FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074124 - Andalex, Calico Spring, 2-04-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	858
Hardness as $CaCO_3$, mg/l	5.3
Bicarbonate as HCO_3, mg/l	535
Carbonate as CO3, mg/l	36.1
Chloride as Cl, mg/l	32.5
Fluoride as F, mg/l	0.506
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.072
Nitrite as NO_2-N, mg/l	0.006
Phosphate as PO_4-P, mg/l	0.096
Sulfate as SO_4, mg/l	232
Aluminum as Al, mg/l	<.05
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	<.01
Boron as B, mg/l	0.275
Calcium as Ca, mg/l	2.05
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.200

Rex Henderson

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6100 S. STRATLER
MURRAY, UTAH 84107
PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074124 - Andalex, Calico Spring, 2-04-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	0.80
Manganese as Mn, mg/l	<.01
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	3.0
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	347
Zinc as Zn, mg/l	<.01
Cation, meq/l	15.27
Anion, meq/l	15.72

Rex Henderson

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DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074122 - Andalex, Clint Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	514
Hardness as $CaCO_3$, mg/l	289
Bicarbonate as HCO_3, mg/l	342
Carbonate as CO3, mg/l	7.7
Chloride as Cl, mg/l	4.2
Fluoride as F, mg/l	0.254
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.115
Nitrite as NO_2-N, mg/l	0.006
Phosphate as PO_4-P, mg/l	0.036
Sulfate as SO_4, mg/l	174
Aluminum as Al, mg/l	2.41
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.049
Boron as B, mg/l	0.081
Calcium as Ca, mg/l	72
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	1.72

Rex Henderson

CHEMTECH

ANALYTICAL LABORATORY

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DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074122 - Andalex, Clint Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	27.8
Manganese as Mn, mg/l	0.065
Mercury as Hg, mg/l	0.0050
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	7.0
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	67
Zinc as Zn, mg/l	0.013
Cation, meq/l	9.33
Anion, meq/l	9.60

Rex Henderson

CHEMTECH

ANALYTICAL LABORATORY

6100 S. STRATLER
MURRAY, UTAH 84107
PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074121 - Andalex, Drip Tank Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	805
Hardness as $CaCO_3$, mg/l	465
Bicarbonate as HCO_3, mg/l	384
Carbonate as CO3, mg/l	7.7
Chloride as Cl, mg/l	12.4
Fluoride as F, mg/l	0.500
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.068
Nitrite as NO_2-N, mg/l	<.005
Phosphate as PO_4-P, mg/l	0.020
Sulfate as SO_4, mg/l	339
Aluminum as Al, mg/l	2.22
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.048
Boron as B, mg/l	0.067
Calcium as Ca, mg/l	105
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	1.88

Rex Henderson

CHEMTECH

ANALYTICAL LABORATORY

6100 S. STRATLER
MURRAY, UTAH 84107
PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074121 - Andalex, Drip Tank Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	0.010
Magnesium as Mg, mg/l	50.8
Manganese as Mn, mg/l	0.107
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	8.6
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	88
Zinc as Zn, mg/l	0.011
Cation, meq/l	13.82
Anion, meq/l	13.96

Rex Henderson

CHEMTECH

ANALYTICAL LABORATORY

6100 S. STRATLER
MURRAY, UTAH 84107
PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074119 - Andalex, 14 So. Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	2,668
Hardness as $CaCO_3$, mg/l	136
Bicarbonate as HCO_3, mg/l	670
Carbonate as CO3, mg/l	19.3
Chloride as Cl, mg/l	151
Fluoride as F, mg/l	2.67
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.064
Nitrite as NO_2-N, mg/l	<.005
Phosphate as PO_4-P, mg/l	0.036
Sulfate as SO_4, mg/l	1,282
Aluminum as Al, mg/l	0.25
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.036
Boron as B, mg/l	0.667
Calcium as Ca, mg/l	20.4
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.125

Rex Henderson

CHEMTECH

ANALYTICAL LABORATORY

6100 S. STRATLER
MURRAY, UTAH 84107
PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074119 - Andalex, 14 So. Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	17.5
Manganese as Mn, mg/l	<.01
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	6.8
Selenium as Se, mg/l	0.007
Sodium as Na, mg/l	832
Zinc as Zn, mg/l	<.01
Cation, meq/l	38.82
Anion, meq/l	42.72

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PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074120 - Andalex, 14 No. Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	1,179
Hardness as $CaCO_3$, mg/l	57.1
Bicarbonate as HCO_3, mg/l	427
Carbonate as CO3, mg/l	48.9
Chloride as Cl, mg/l	60.6
Fluoride as F, mg/l	1.79
Ammonia as NH_3-N, mg/l	0.36
Nitrate as NO_3-N, mg/l	0.047
Nitrite as NO_2-N, mg/l	<.005
Phosphate as PO_4-P, mg/l	0.019
Sulfate as SO_4, mg/l	469
Aluminum as Al, mg/l	0.22
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.015
Boron as B, mg/l	0.599
Calcium as Ca, mg/l	11.6
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.273

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FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074120 - Andalex, 14 No. Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	7.22
Manganese as Mn, mg/l	<.01
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	4.9
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	428
Zinc as Zn, mg/l	<.01
Cation, meq/l	19.91
Anion, meq/l	20.20

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FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074127 - Andalex, John Henry Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	662
Hardness as $CaCO_3$, mg/l	397
Bicarbonate as HCO_3, mg/l	408
Carbonate as CO3, mg/l	5.2
Chloride as Cl, mg/l	11.8
Fluoride as F, mg/l	0.407
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.061
Nitrite as NO_2-N, mg/l	<.005
Phosphate as PO_4-P, mg/l	0.011
Sulfate as SO_4, mg/l	253
Aluminum as Al, mg/l	0.068
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.037
Boron as B, mg/l	0.090
Calcium as Ca, mg/l	89
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.385

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DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074127 - Andalex, John Henry Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	43.0
Manganese as Mn, mg/l	0.560
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	0.011
Potassium as K, mg/l	6.3
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	81.0
Zinc as Zn, mg/l	<.01
Cation, meq/l	11.66
Anion, meq/l	12.46

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FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074126 - Andalex, Tibbett Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	743
Hardness as $CaCO_3$, mg/l	348
Bicarbonate as HCO_3, mg/l	417
Carbonate as CO3, mg/l	7.7
Chloride as Cl, mg/l	10.0
Fluoride as F, mg/l	0.513
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.122
Nitrite as NO_2-N, mg/l	<.005
Phosphate as PO_4-P, mg/l	0.015
Sulfate as SO_4, mg/l	232
Aluminum as Al, mg/l	<.05
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.020
Boron as B, mg/l	0.108
Calcium as Ca, mg/l	74
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.110

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7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074126 - Andalex, Tibbett Spring, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	39.6
Manganese as Mn, mg/l	<.01
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	9.8
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	115
Zinc as Zn, mg/l	0.036
Cation, meq/l	12.20
Anion, meq/l	12.19

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DATE: 2-28-92

TO: EarthFax Engineering
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Midvale, Utah 84047

SAMPLE ID: Lab #U074125 - Andalex, S-2, 2-04-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	1,354
Hardness as $CaCO_3$, mg/l	997
Bicarbonate as HCO_3, mg/l	400
Carbonate as CO3, mg/l	6.4
Chloride as Cl, mg/l	12.7
Fluoride as F, mg/l	0.639
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.059
Nitrite as NO_2-N, mg/l	<.005
Phosphate as PO_4-P, mg/l	0.040
Sulfate as SO_4, mg/l	686
Aluminum as Al, mg/l	<.05
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.010
Boron as B, mg/l	0.086
Calcium as Ca, mg/l	199
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.060

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DATE: 2-28-92

TO: EarthFax Engineering
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Midvale, Utah 84047

SAMPLE ID: Lab #U074125 - Andalex, S-2, 2-04-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	115
Manganese as Mn, mg/l	<.01
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	6.2
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	22.7
Zinc as Zn, mg/l	0.013
Cation, meq/l	20.54
Anion, meq/l	21.41

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DATE: 2-28-92

TO: EarthFax Engineering
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Midvale, Utah 84047

SAMPLE ID: Lab #U074128 - Andalex, S-4, 2-04-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	158
Hardness as $CaCO_3$, mg/l	135
Bicarbonate as HCO_3, mg/l	123
Carbonate as CO3, mg/l	2.3
Chloride as Cl, mg/l	3.4
Fluoride as F, mg/l	0.327
Ammonia as NH_3-N, mg/l	<.2
Nitrate as NO_3-N, mg/l	0.882
Nitrite as NO_2-N, mg/l	<.005
Phosphate as PO_4-P, mg/l	<.01
Sulfate as SO_4, mg/l	27.1
Aluminum as Al, mg/l	<.05
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.147
Boron as B, mg/l	<.05
Calcium as Ca, mg/l	40.6
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.033

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DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074128 - Andalex, S-4, 2-04-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	7.98
Manganese as Mn, mg/l	<.01
Mercury as Hg, mg/l	<.0005
Molybdenum as Mo, mg/l	<.01
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	1.8
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	3.1
Zinc as Zn, mg/l	<.01
Cation, meq/l	2.86
Anion, meq/l	2.75

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PHONE: (801) 262-7299
FAX: (801) 262-7378

DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074118 - Andalex, MW-1, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
TDS, mg/l	868
Hardness as $CaCO_3$, mg/l	0
Bicarbonate as HCO_3, mg/l	0
Carbonate as CO3, mg/l	270
Chloride as Cl, mg/l	50.4
Fluoride as F, mg/l	2.09
Ammonia as NH_3-N, mg/l	1.84
Nitrate as NO_3-N, mg/l	0.016
Nitrite as NO_2-N, mg/l	0.010
Phosphate as PO_4-P, mg/l	0.110
Sulfate as SO_4, mg/l	152
Sulfide as S, mg/l	0.2
Aluminum as Al, mg/l	0.54
Arsenic as As, mg/l	<.05
Barium as Ba, mg/l	0.110
Boron as B, mg/l	0.101
Calcium as Ca, mg/l	6.37
Cadmium as Cd, mg/l	<.01
Chromium as Cr, mg/l	<.01
Copper as Cu, mg/l	<.01
Iron as Fe, mg/l	0.293

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DATE: 2-28-92

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U074118 - Andalex, MW-1, 2-05-92

DATE SUBMITTED: 2-10-92

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED
Lead as Pb, mg/l	<.01
Magnesium as Mg, mg/l	0.21
Manganese as Mn, mg/l	<.01
Mercury as Hg, mg/l	0.0023
Molybdenum as Mo, mg/l	0.011
Nickel as Ni, mg/l	<.01
Potassium as K, mg/l	21.2
Selenium as Se, mg/l	<.005
Sodium as Na, mg/l	304
Zinc as Zn, mg/l	0.015
Oil & Grease, mg/l	0.58
Cation, meq/l	14.21
Anion, meq/l	13.70

Rex Henderson

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	05/20/92
ID:	1618		
SITE:	MW-1	DATE RECEIVED:	04/13/92
LAB NO:	F8653	DATE COLLECTED:	04/07/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	2.0	<0.1
Boron (B).....	1.36	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.03	<0.01
Iron (Fe).....	1.97	<0.05
Manganese (Mn).....	0.08	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.01	<0.01
Zinc (Zn).....	0.09	<0.01

ND - Analyte "not detected" at the stated detection limit.

Mary Stepp
Lab Director

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	05/20/92
ID:	1618		
SITE:	MW-1	DATE RECEIVED:	04/13/92
LAB NO:	F8653	DATE COLLECTED:	04/07/92

Lab pH (s.u.).....	7.55
Lab Conductivity, umhos/cm @ 25C....	554
Lab Resistivity, ohm-m.....	18.1
Total Dissolved Solids (180C), mg/L.	1290
Total Dissolved Solids (calc), mg/L.	1240
Total Alkalinity as CaC03, mg/L.....	489
Total Hardness as CaC03, mg/L.....	9.65
Sodium Adsorption Ratio.....	64.3
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	3.29
Sulfide as H2S, mg/L.....	<0.10
Nitrate, mg/L.....	<0.02
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	1.09
Oil and Grease (gravimetric), mg/L..	<5.0

	mg/L	meq/L
Bicarbonate as HC03.....	597	9.78
Carbonate as C03.....	0	0
Chloride.....	153	4.30
Sulfate.....	324	6.76
Calcium.....	2.99	0.15
Magnesium.....	0.54	0.04
Potassium.....	2.63	0.07
Sodium.....	460	20.0
Major Cations.....		20.3
Major Anions.....		20.8
Cation/Anion Difference.....		1.41 %

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	Calico SS		
SITE:	0950	DATE RECEIVED:	06/05/92
LAB NO:	F8927	DATE COLLECTED:	05/30/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.2	<0.1
Boron (B).....	0.87	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.03	<0.01
Iron (Fe).....	0.67	<0.05
Manganese (Mn).....	0.04	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.01	<0.01
Zinc (Zn).....	0.04	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	Calico SS		
SITE:	0950	DATE RECEIVED:	06/05/92
LAB NO:	F8927	DATE COLLECTED:	05/30/92

Lab pH (s.u.).....	8.43
Lab Conductivity, umhos/cm @ 25C....	1400
Lab Resistivity, ohm-m.....	7.15
Total Dissolved Solids (180C), mg/L.	934
Total Dissolved Solids (calc), mg/L.	906
Total Alkalinity as CaC03, mg/L.....	461
Total Hardness as CaC03, mg/L.....	15.5
Sodium Adsorption Ratio.....	38.2
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	1.69
Sulfide as H2S, mg/L.....	<0.10
Nitrate, mg/L.....	0.09
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.04

	mg/L	meq/L
Bicarbonate as HC03.....	549	9.00
Carbonate as C03.....	6.90	0.23
Chloride.....	32.3	0.91
Sulfate.....	244	5.08
Calcium.....	4.63	0.23
Magnesium.....	0.98	0.08
Potassium.....	1.41	0.04
Sodium.....	347	15.1
Major Cations.....		15.4
Major Anions.....		15.2
Cation/Anion Difference.....		0.72 %

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	S-2		
SITE:	1400	DATE RECEIVED:	06/05/92
LAB NO:	F8930	DATE COLLECTED:	05/30/92

Lab pH (s.u.).....	7.53
Lab Conductivity, umhos/cm @ 25C....	1570
Lab Resistivity, ohm-m.....	6.36
Total Dissolved Solids (180C), mg/L.	1480
Total Dissolved Solids (calc), mg/L.	1280
Total Alkalinity as CaC03, mg/L.....	237
Total Hardness as CaC03, mg/L.....	945
Sodium Adsorption Ratio.....	0.44
Total Ortho-phosphate, mg/L.....	0.10
Fluoride, mg/L.....	0.37
Sulfide as H2S, mg/L.....	<0.10
Nitrate, mg/L.....	<0.02
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.23
Oil and Grease (IR), mg/L.....	0.59

	mg/L	meq/L
Bicarbonate as HC03.....	289	4.74
Carbonate as C03.....	0	0
Chloride.....	11.5	0.33
Sulfate.....	778	16.2
Calcium.....	186	9.30
Magnesium.....	117	9.60
Potassium.....	9.23	0.24
Sodium.....	31.3	1.36
Major Cations.....		20.5
Major Anions.....		21.3
Cation/Anion Difference.....		1.85 %

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	S-2		
SITE:	1400	DATE RECEIVED:	06/05/92
LAB NO:	F8930	DATE COLLECTED:	05/30/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.20	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.03	<0.01
Iron (Fe).....	0.17	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.02	<0.01
Zinc (Zn).....	0.02	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	S-4		
SITE:	1300	DATE RECEIVED:	06/05/92
LAB NO:	F8928	DATE COLLECTED:	05/30/92

Lab pH (s.u.).....	7.84
Lab Conductivity, umhos/cm @ 25C....	258
Lab Resistivity, ohm-m.....	38.8
Total Dissolved Solids (180C), mg/L.	188
Total Dissolved Solids (calc), mg/L.	142
Total Alkalinity as CaC03, mg/L.....	97.0
Total Hardness as CaC03, mg/L.....	117
Sodium Adsorption Ratio.....	0.23
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.28
Sulfide as H2S, mg/L.....	0.47
Nitrate, mg/L.....	0.12
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.05
Oil and Grease (IR), mg/L.....	<0.25

	mg/L	meq/L
Bicarbonate as HC03.....	118	1.94
Carbonate as C03.....	0	0
Chloride.....	3.55	0.10
Sulfate.....	30.9	0.64
Calcium.....	33.7	1.68
Magnesium.....	7.90	0.65
Potassium.....	1.84	0.05
Sodium.....	5.70	0.25
Major Cations.....		2.63
Major Anions.....		2.69
Cation/Anion Difference.....		1.16 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	S-4		
SITE:	1300	DATE RECEIVED:	06/05/92
LAB NO:	F8928	DATE COLLECTED:	05/30/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.07	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/16/92
ID:	MW-1		
SITE:	1231	DATE RECEIVED:	06/29/92
LAB NO:	F9082	DATE COLLECTED:	06/20/92

Lab pH (s.u.).....	9.26
Lab Conductivity, umhos/cm @ 25C....	1990
Lab Resistivity, ohm-m.....	5.02
Total Dissolved Solids (180C), mg/L.	1240
Total Dissolved Solids (calc), mg/L.	1190
Total Alkalinity as CaC03, mg/L.....	500
Total Hardness as CaC03, mg/L.....	11.5
Sodium Adsorption Ratio.....	56.4
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	3.09
Sulfide as H2S, mg/L.....	<0.1
Nitrate, mg/L.....	<0.02
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.99
Oil and Grease (IR), mg/L.....	4.7

	mg/L	meq/L
Bicarbonate as HC03.....	609	9.99
Carbonate as C03.....	0	0
Chloride.....	141	3.99
Sulfate.....	303	6.30
Calcium.....	3.74	0.19
Magnesium.....	0.55	0.04
Potassium.....	4.30	0.11
Sodium.....	441	19.2
Major Cations.....		19.5
Major Anions.....		20.3
Cation/Anion Difference.....		1.87 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: MW-1
SITE: 1231
LAB NO: F9082

DATE REPORTED: 07/16/92
DATE RECEIVED: 06/29/92
DATE COLLECTED: 06/20/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.2	<0.1
Boron (B).....	1.01	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	0.23	<0.05
Manganese (Mn).....	0.03	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.06	<0.01
Zinc (Zn).....	0.02	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/16/92
ID:	Calico SS		
SITE:	1321	DATE RECEIVED:	06/29/92
LAB NO:	F9083	DATE COLLECTED:	06/20/92

Oil and Grease (IR), mg/L..... <0.25

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Sample #9082-9083

	Date analyzed	Technician
TSS		
EC	07/06/92	W. ORSO
pH/Alk	07/03/92	S. GROSS
TH	06/29/92	G. ELLIOTT
Ca	06/29/92	G. ELLIOTT
K	06/29/92	G. ELLIOTT
Na	06/29/92	G. ELLIOTT
Cl	07/07/92	J. GOATS
SO4	07/02/92	J. GOATS
TDS	06/29/92	J. GOATS
F		
NO3/NO2		
NH3		
O & G	07/07/92	D. BOHEMIER
Metals		
As	07/07/92	G. BARTLETT
Cd	07/08/92	G. BARTLETT
Hg	07/14/92	G. BARTLETT
Pb	07/08/92	G. BARTLETT
Se	07/08/92	G. BARTLETT
Al	07/07/92	G. BARTLETT
B	07/07/92	G. BARTLETT
Ba	07/08/92	G. BARTLETT
Cr	07/08/92	G. BARTLETT
Cu	07/08/92	G. BARTLETT
Fe	07/06/92	G. BARTLETT
Mn	07/14/92	G. BARTLETT
Mo	07/08/92	G. BARTLETT
Ni	07/08/92	G. BARTLETT
Z	07/08/92	G. BARTLETT

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources	DATE REPORTED:	09/11/92
ID:	S-2		
SITE:	1615	DATE RECEIVED:	08/19/92
LAB NO:	9497	DATE COLLECTED:	08/15/92

Lab pH (s.u.).....	7.46
Lab Conductivity, umhos/cm @ 25C....	1600
Lab Resistivity, ohm-m.....	6.23
Total Dissolved Solids (180C), mg/L.	1450
Total Dissolved Solids (calc), mg/L.	1330
Total Suspended Solids, mg/L.....	39
Settleable Solids, ml/L.....	0.3
Total Alkalinity as CaC03, mg/L.....	265
Total Hardness as CaC03, mg/L.....	995
Sodium Adsorption Ratio.....	0.08
Total Ortho-Phosphate, mg/L.....	0.05
Fluoride, mg/L.....	0.32
Nitrate, mg/L.....	0.11
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.12
Oil & Grease (IR), mg/L.....	0.3

	mg/L	meq/L
Bicarbonate as HC03.....	324	5.31
Carbonate as C03.....	<0.10	<0.01
Chloride.....	14.4	0.41
Sulfate.....	775	16.1
Calcium.....	202	10.1
Magnesium.....	119	9.81
Potassium.....	50.4	1.29
Sodium.....	5.52	0.24
Major Cations.....		21.4
Major Anions.....		21.9
Cation/Anion Difference.....		0.99 %

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CLIENT: Andalex Resources
ID: S-2
SITE: 1615
LAB NO: 9497

DATE REPORTED: 09/11/92
DATE RECEIVED: 08/19/92
DATE COLLECTED: 08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.08	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.01
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.33	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.32	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex	DATE REPORTED:	08/31/92
ID:	S-4		
SITE:	1515	DATE RECEIVED:	08/19/92
LAB NO:	F9496	DATE COLLECTED:	08/15/92

Lab pH (s.u.)	7.81	
Lab Conductivity, umhos/cm @ 25C	325	
Lab Resistivity, ohm-m	30.8	
Total Dissolved Solids (180C), mg/L	208	*
Total Dissolved Solids (calc), mg/L	210	
Total Alkalinity as CaC03, mg/L	120	
Total Hardness as CaC03, mg/L	160	
Sodium Adsorption Ratio	0.17	
Total Ortho-Phosphate, mg/L	<0.02	
Fluoride, mg/L	0.31	
Sulfide as H2S, mg/L	1.60	
Nitrate, mg/L	6.38	
Nitrite, mg/L	<0.02	
Ammonia, mg/L	0.11	
Oil and Grease (IR), mg/L	<0.25	

	mg/L	meq/L
Bicarbonate as HC03	146	2.39
Carbonate as C03	<0.10	<0.01
Chloride	5.14	0.15
Sulfate	46.1	0.96
Calcium	39.4	1.97
Magnesium	15.0	1.23
Potassium	27.8	0.71
Sodium	4.83	0.21
Major Cations		4.12
Major Anions		3.96
Cation/Anion Difference		2.06 %

* Reanalyzed with no significant change.

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex	DATE REPORTED:	08/31/92
ID:	S-4		
SITE:	1515	DATE RECEIVED:	08/19/92
LAB NO:	F9496	DATE COLLECTED:	08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.13	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.13	<0.01
Iron (Fe).....	0.08	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.01	<0.01
Zinc (Zn).....	0.18	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/11/92
ID:	Calico SS		
SITE:	0940	DATE RECEIVED:	08/19/92
LAB NO:	9494	DATE COLLECTED:	08/15/92

Lab pH (s.u.)	8.29	
Lab Conductivity, umhos/cm @ 25C	1410	
Lab Resistivity, ohm-m	7.12	
Total Dissolved Solids (180C), mg/L	936	**
Total Dissolved Solids (calc), mg/L	1130	
Total Suspended Solids, mg/L	66	
Settleable Solids, ml/L	0.3	
Total Alkalinity as CaC03, mg/L	451	
Total Hardness as CaC03, mg/L	13.1	
Sodium Adsorption Ratio	0.25	
Total Ortho-Phosphate, mg/L	<0.02	
Fluoride, mg/L	1.69	
Nitrate, mg/L	0.12	
Nitrite, mg/L	<0.02	
Ammonia, mg/L	0.12	

	mg/L	meq/L
Bicarbonate as HC03	550	9.02
Carbonate as C03	<0.10	<0.01
Chloride	33.9	0.96
Sulfate	249	5.19
Calcium	3.83	0.19
Magnesium	0.87	0.07
Potassium	570	14.6
Sodium	2.07	0.09
Major Cations		14.9
Major Anions		15.2
Cation/Anion Difference		0.85 %

* Nutrients & Metals arrived unpreserved.
** Sample reanalyzed, no significant change.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Calico SS
SITE: 0940
LAB NO: 9494

DATE REPORTED: 09/11/92
DATE RECEIVED: 08/19/92
DATE COLLECTED: 08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.12	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.01
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.34	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.1	<0.1
Boron (B).....	0.97	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex	DATE REPORTED:	08/31/92
ID:	MW-1		
SITE:	1300	DATE RECEIVED:	08/19/92
LAB NO:	F9495	DATE COLLECTED:	08/15/92

Lab pH (s.u.)	9.83	
Lab Conductivity, umhos/cm @ 25C	2050	
Lab Resistivity, ohm-m	4.87	
Total Dissolved Solids (180C), mg/L	1290	*
Total Dissolved Solids (calc), mg/L	1570	
Total Alkalinity as CaC03, mg/L	505	
Total Hardness as CaC03, mg/L	10.7	
Sodium Adsorption Ratio	0.43	
Total Ortho-Phosphate, mg/L	<0.02	
Fluoride, mg/L	2.94	
Sulfide as H2S, mg/L	19.2	
Nitrate, mg/L	0.09	
Nitrite, mg/L	<0.02	
Ammonia, mg/L	1.24	
Oil and Grease (IR), mg/L	3.4	

	mg/L	meq/L
Bicarbonate as HC03	277	4.54
Carbonate as C03	167	5.55
Chloride	143	4.03
Sulfate	310	6.46
Calcium	2.49	0.12
Magnesium	1.09	0.09
Potassium	804	20.6
Sodium	3.22	0.14
Major Cations		20.9
Major Anions		20.6
Cation/Anion Difference		0.82 %

* Reanalyzed with no significant change.

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex	DATE REPORTED:	08/31/92
ID:	MW-1		
SITE:	1300	DATE RECEIVED:	08/19/92
LAB NO:	F9495	DATE COLLECTED:	08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.006	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	1.0	<0.1
Boron (B).....	0.78	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.06	<0.01
Iron (Fe).....	0.83	<0.05
Manganese (Mn).....	0.05	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.01	<0.01
Zinc (Zn).....	0.18	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	12/23/92
ID:	S-2		
SITE:	Smoky Mountain	DATE RECEIVED:	12/09/92
LAB NO:	F1437	DATE COLLECTED:	12/04/92

Lab pH (s.u.).....	8.15
Lab Conductivity, umhos/cm @ 25C....	1650
Lab Resistivity, ohm-m.....	6.07
Total Dissolved Solids (180C), mg/L.	1380
Total Dissolved Solids (calc), mg/L.	1280
Total Suspended Solids, mg/L.....	49
Settleable Solids, ml/L.....	0.1
Total Alkalinity as CaC03, mg/L.....	267
Total Hardness as CaC03, mg/L.....	978
Sodium Adsorption Ratio.....	0.35
Fluoride, mg/L.....	0.29
Sulfide as H2S, mg/L.....	<1.0
Nitrate, mg/L.....	<0.01
Nitrite, mg/L.....	<0.01
Ammonia, mg/L.....	0.11

	mg/L	meq/L
Bicarbonate as HC03.....	326	5.34
Carbonate as C03.....	<0.10	<0.01
Chloride.....	13.6	0.38
Sulfate.....	761	15.8
Calcium.....	201	10
Magnesium.....	116	9.53
Potassium.....	6.28	0.16
Sodium.....	25.4	1.1
Major Cations.....		20.8
Major Anions.....		21.6
Cation/Anion Difference.....		1.73 %

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources, Inc. DATE REPORTED: 12/23/92
ID: S-2
SITE: Smoky Mountain DATE RECEIVED: 12/09/92
LAB NO: F1437 DATE COLLECTED: 12/04/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Barium (Ba).....	ND	<0.5
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.25	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	0.2	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

TOTAL OIL and GREASE
EPA Method 413.2

Andalex Resources, Inc

Project ID:	Smoky Mtn Hydrologic Monitoring	Report Date:	12/21/92
Sample Matrix:	Water	Date Sampled:	12/04/92
Preservative:	Cool	Date Received:	12/07/92
Condition:	Intact	Date Extracted:	12/17/92
		Date Analyzed:	12/18/92

Sample ID	Lab ID	Concentration (mg/L)	Detection Limit (mg/L)
Calico SS	1435	ND	0.24
MW-1	1434	1.91	0.24
S-4	1436	ND	0.24

ND- Analyte not detected at the stated detection limit.

Reference: Method 3510 - Separatory Funnel Liquid - Liquid Extraction; Test Methods for Evaluating Solid Waste, SW-846, United States Environmental Protection Agency, September, 1986; Method 413.2, Oil and Grease, Total Recoverable; Chemical Analysis of Waste Water, United States Environmental Protection Agency, 1978

Comments:

Analyst

Review

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	12/23/92
ID:	S-4		
SITE:	Smoky Mountain	DATE RECEIVED:	12/09/92
LAB NO:	F1436	DATE COLLECTED:	12/04/92

Lab pH (s.u.).....	8.22
Lab Conductivity, umhos/cm @ 25C....	283
Lab Resistivity, ohm-m.....	35.3
Total Dissolved Solids (180C), mg/L.	168
Total Dissolved Solids (calc), mg/L.	154
Total Suspended Solids, mg/L.....	4
Settleable Solids, ml/L.....	<0.1
Total Alkalinity as CaC03, mg/L.....	109
Total Hardness as CaC03, mg/L.....	134
Sodium Adsorption Ratio.....	0.14
Fluoride, mg/L.....	0.25
Sulfide as H2S, mg/L.....	<1.0
Nitrate, mg/L.....	0.04
Nitrite, mg/L.....	<0.01
Ammonia, mg/L.....	<0.01
Oil and Grease (IR), mg/L.....	<0.24

	mg/L	meq/L
Bicarbonate as HC03.....	133	2.18
Carbonate as C03.....	<0.10	<0.01
Chloride.....	2.42	0.07
Sulfate.....	31.3	0.65
Calcium.....	43.5	2.17
Magnesium.....	6.32	0.52
Potassium.....	1.6	0.04
Sodium.....	3.8	0.17
Major Cations.....		2.89
Major Anions.....		2.91
Cation/Anion Difference.....		0.2 %

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	12/23/92
ID:	S-4		
SITE:	Smoky Mountain	DATE RECEIVED:	12/09/92
LAB NO:	F1436	DATE COLLECTED:	12/04/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Barium (Ba).....	ND	<0.5
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.16	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	12/23/92
ID:	Calico SS		
SITE:	Smoky Mountain	DATE RECEIVED:	12/09/92
LAB NO:	F1435	DATE COLLECTED:	12/04/92

Lab pH (s.u.).....	8.73
Lab Conductivity, umhos/cm @ 25C....	1390
Lab Resistivity, ohm-m.....	7.21
Total Dissolved Solids (180C), mg/L.	906
Total Dissolved Solids (calc), mg/L.	888
Total Suspended Solids, mg/L.....	80
Settleable Solids, ml/L.....	0.5
Total Alkalinity as CaC03, mg/L.....	453
Total Hardness as CaC03, mg/L.....	8.26
Sodium Adsorption Ratio.....	44.8
Fluoride, mg/L.....	1.61
Sulfide as H2S, mg/L.....	<1.0
Nitrate, mg/L.....	2.79
Nitrite, mg/L.....	<0.01
Ammonia, mg/L.....	0.13
Oil and Grease (IR), mg/L.....	<0.24

	mg/L	meq/L
Bicarbonate as HC03.....	519	8.5
Carbonate as C03.....	16.8	0.56
Chloride.....	32	0.9
Sulfate.....	235	4.89
Calcium.....	2.67	0.13
Magnesium.....	0.39	0.03
Potassium.....	1.56	0.04
Sodium.....	345	15
Major Cations.....		15.2
Major Anions.....		14.8
Cation/Anion Difference.....		1.18 %

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources, Inc.
ID: Calico SS
SITE: Smoky Mountain
LAB NO: F1435

DATE REPORTED: 12/23/92
DATE RECEIVED: 12/09/92
DATE COLLECTED: 12/04/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As)	ND	<0.005
Barium (Ba)	ND	<0.5
Cadmium (Cd)	ND	<0.002
Chromium (Cr)	ND	<0.02
Copper (Cu)	ND	<0.01
Iron (Fe)	ND	<0.05
Mercury (Hg)	ND	<0.001
Manganese (Mn)	0.02	<0.02
Molybdenum (Mo)	ND	<0.02
Nickel (Ni)	ND	<0.01
Lead (Pb)	ND	<0.02
Selenium (Se)	ND	<0.005
Zinc (Zn)	0.09	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al)	ND	<0.1
Boron (B)	0.91	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P)	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	12/23/92
ID:	MW-1		
SITE:	Smoky Mountain	DATE RECEIVED:	12/09/92
LAB NO:	F1434	DATE COLLECTED:	12/04/92

Lab pH (s.u.).....	8.96
Lab Conductivity, umhos/cm @ 25C....	2110
Lab Resistivity, ohm-m.....	4.74
Total Dissolved Solids (180C), mg/L.	1330
Total Dissolved Solids (calc), mg/L.	1300
Total Alkalinity as CaC03, mg/L.....	482
Total Hardness as CaC03, mg/L.....	10.8
Sodium Adsorption Ratio.....	48.7
Fluoride, mg/L.....	3.49
Sulfide as H2S, mg/L.....	<1.0
Nitrate, mg/L.....	2.30
Nitrite, mg/L.....	<0.01
Ammonia, mg/L.....	1.03
Oil and Grease (IR), mg/L.....	1.91

	mg/L	meq/L
Bicarbonate as HC03.....	514	8.42
Carbonate as C03.....	36.6	1.22
Chloride.....	153	4.33
Sulfate.....	361	7.51
Calcium.....	3.03	0.15
Magnesium.....	0.78	0.06
Potassium.....	2.42	0.06
Sodium.....	488	21.2
Major Cations.....		21.5
Major Anions.....		21.5
Cation/Anion Difference.....		0.06 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	12/23/92
ID:	MW-1		
SITE:	Smoky Mountain	DATE RECEIVED:	12/09/92
LAB NO:	F1434	DATE COLLECTED:	12/04/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Barium (Ba).....	ND	<0.5
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.97	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

APPENDIX VII-3

BASELINE SURFACE WATER SAMPLES

PEAK FLOW MEASUREMENTS FOR SINGLE STAGE SAMPLERS

SINGLE STAGE SAMPLERS
PEAK FLOW MEASUREMENTS

	SS-1		SS-2		SS-3		SS-4	
	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)
8/16/89	7	13.8	0	0	11	9.0	2	0.02
12/27/89	7	13.8	8	21.6	11	9.0	0	0
7/27/90	3	2.7	28.5	430.0	*	-	11	54.5
9/30/90	0	0	0	0	0	0	0	0
2/9/91	0	0	0	0	0	0	0	0
5/13/91	0	0	0	0	0	0	0	0
6/13/91	2	1.2	0	0	6	2.4	1	0
7/25/91	0	0	0	0	0	0	0	0
8/23/91	0	0	0	0	4	0.9	0	0
9/25/91	0	0	0	0	0	0	0	0
12/17/91	0	0	0	0	0	0	0	0
2/7/92	0	0	0	0	0	0	0	0
5/30/92	4	4.8	0	0	8	4.7	2	0.02
7/11/92	*	-	*	-	*	-	*	-
8/15/92	8.5	20.1	*	-	*	-	2	0.02
8/29/92	13	47.0	12	50.4	*	-	17	124.6
9/7/92	*	-	*	-	*	-	0	0
9/18/92	0	0	0	0	0	0	0	0
9/20/92	13	47.0	8	21.6	*	-	11	54.5
11/1/92	4.5	6.3	6	11.7	*	-	7	21.3

* Water depth measurement not available

SINGLE STAGE SAMPLERS
PEAK FLOW MEASUREMENTS

	SS-5		SS-6		SS-7		SS-8	
	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)
8/16/89								
12/27/89								
7/27/90								
9/30/90								
2/9/91								
5/13/91								
6/13/91								
7/25/91								
8/23/91								
9/25/91								
12/17/91								
2/7/92								
5/30/92	4	2.9	0	0	8	9.6	*	-
7/11/92	0	0	0	0	8	9.6	*	-
8/15/92	8	16.9	*	-	*	-	*	-
8/29/92	*	-	*	-	*	-	*	-
9/7/92	1	0.05	*	-	*	-	*	-
9/18/92	0	0	0	0	0	0	*	-
9/20/92	12	43.1	*	-	*	-	*	-
11/1/92	6	7.8	6	17.5	*	-	*	-

* Water depth measurement not available

SINGLE STAGE SAMPLERS
PEAK FLOW MEASUREMENTS

	SS-9							
	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)	DEPTH (in.)	FLOW (cfs)
8/16/89								
12/27/89								
7/27/90								
9/30/90								
2/9/91								
5/13/91								
6/13/91								
7/25/91								
8/23/91								
9/25/91								
12/17/91								
2/7/92								
5/30/92	*	-						
7/11/92	*	-						
8/15/92	*	-						
8/29/92	*	-						
9/7/92	*	-						
9/18/92	*	-						
9/20/92	*	-						
11/1/92	*	-						

* Water depth measurement not available

SURFACE WATER - STREAM SAMPLERS

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLERS

Parameters	Units	Sample Date - 8/16/89				
		SS-1 (A)	SS-2	SS-3 (A)	SS-4	
Water Level		7"	0"	11"	2"	
Flow	ft^3/s	13.8	0	9.0	0.02	
pH (Lab)	S.U.	7.5		7.3	e	
pH (Field)	S.U.	a		a	e	
Conduct. (Field)	umhos/cm @ 25c	810		680	e	
Conduct. (Lab)	umhos/cm @ 25c	a		a	e	
Total Dissolved Solids	mg/l	650		652 (d)	e	
Total Settleable Solids	mg/l	>40		>40	e	
Total Suspended Solids	mg/l	75,380		>90,000	e	
Total Hardness as CaCO3	mg/l	581		487	e	
Total, Ortho-phosphate	mg/l	a		a	e	
Fluoride	mg/l	a		a	e	
Sulfide as H2S	mg/l	a		a	e	
Nitrate	mg/l	a		a	e	
Nitrite	mg/l	a		a	e	
Total, Nitrate/Nitrite	mg/l	a		a	e	
Ammonia	mg/l	a		a	e	
Oil and Grease	mg/l	a		a	e	
Bicarbonate as HCO3	mg/l	693		542	e	
Carbonate as CO3	mg/l	<1.0		<1.0	e	
Chloride	mg/l	25.0		40.0	e	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLERS
1989

Parameters	Units	Sample Date - 8/16/89				
		SS-1 (A)	SS-2	SS-3 (A)	SS-4	
Sulfate	mg/l	70		80	e	
Calcium	mg/l	167.9		135.3	e	
Magnesium	mg/l	39.3		36.2	e	
Potassium	mg/l	16.9		13.4	e	
Sodium	mg/l	10.1		17.3	e	
Major Cations	meq/l	12.49		10.83	e	
Major Anions	meq/l	12.83		10.63	e	
Arsenic	mg/l	a		a	e	
Cadmium	mg/l	<0.002		<0.002	e	
Mercury	mg/l	a		a	e	
Lead	mg/l	<0.05		<0.05	e	
Selenium	mg/l	a		a	e	
Aluminum	mg/l	2.9		0.5	e	
Boron	mg/l	0.29		0.5	e	
Barium	mg/l	0.23		0.1	e	
Chromium	mg/l	<0.02		<0.02	e	
Copper	mg/l	0.06		0.02	e	
Iron	mg/l	10.6		0.58	e	
Manganese	mg/l	5.3		2.9	e	
Molybdenum	mg/l	a		a	e	
Nickel	mg/l	0.04		0.04	e	
Zinc	mg/l	0.21		0.17	e	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLERS
1989

Parameters	Units	Sample Date - 12/27/89				
		SS-1	SS-2	SS-3	SS-4	
Water Level		7"	8"	11"	g	
Flow	ft^3/s	13.8	21.6	9.0	-	
pH (Lab)	S.U.	e	e	e	e	
pH (Field)	S.U.	e	e	e	e	
Conduct. (Field)	umhos/cm @ 25c	e	e	e	e	
Conduct. (Lab)	umhos/cm @ 25c	e	e	e	e	
Total Dissolved Solids	mg/l	e	e	e	e	
Total Settleable Solids	mg/l	e	e	e	e	
Total Suspended Solids	mg/l	e	e	e	e	
Total Hardness as CaCO3	mg/l	e	e	e	e	
Total, Ortho-phosphate	mg/l	e	e	e	e	
Fluoride	mg/l	e	e	e	e	
Sulfide as H2S	mg/l	e	e	e	e	
Nitrate	mg/l	e	e	e	e	
Nitrite	mg/l	e	e	e	e	
Total, Nitrate/Nitrite	mg/l	e	e	e	e	
Ammonia	mg/l	e	e	e	e	
Oil and Grease	mg/l	e	e	e	e	
Bicarbonate as HCO3	mg/l	e	e	e	e	
Carbonate as CO3	mg/l	e	e	e	e	
Chloride	mg/l	e	e	e	e	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLERS
1989

Parameters	Units	Sample Date - 12/27/89				
		SS-1	SS-2	SS-3	SS-4	
Sulfate	mg/l	e	e	e	e	
Calcium	mg/l	e	e	e	e	
Magnesium	mg/l	e	e	e	e	
Potassium	mg/l	e	e	e	e	
Sodium	mg/l	e	e	e	e	
Major Cations	meq/l	e	e	e	e	
Major Anions	meq/l	e	e	e	e	
Arsenic	mg/l	e	e	e	e	
Cadmium	mg/l	e	e	e	e	
Mercury	mg/l	e	e	e	e	
Lead	mg/l	e	e	e	e	
Selenium	mg/l	e	e	e	e	
Aluminum	mg/l	e	e	e	e	
Boron	mg/l	e	e	e	e	
Barium	mg/l	e	e	e	e	
Chromium	mg/l	e	e	e	e	
Copper	mg/l	e	e	e	e	
Iron	mg/l	e	e	e	e	
Manganese	mg/l	e	e	e	e	
Molybdenum	mg/l	e	e	e	e	
Nickel	mg/l	e	e	e	e	
Zinc	mg/l	e	e	e	e	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLERS
1990

Parameters	Units	Sample Date - 7/27/90				
		SS-1 (A)	SS-2	SS-3	SS-4 (A)	
Water Level		3"	2' 4 1/2"	g	11"	
Flow	ft^3/s	2.7	430	-	54.5	
pH (Lab)	S.U.	a	e	e	a	
pH (Field)	S.U.	a	e	e	a	
Conduct. (Field)	umhos/cm @ 25c	a	e	e	a	
Conduct. (Lab)	umhos/cm @ 25c	a	e	e	a	
Total Dissolved Solids	mg/l	579 (d)	e	e	a	
Total Settleable Solids	mg/l	a	e	e	a	
Total Suspended Solids	mg/l	a	e	e	a	
Total Hardness as CaCO3	mg/l	427	e	e	1356	
Total, Ortho-phosphate	mg/l	a	e	e	a	
Fluoride	mg/l	a	e	e	a	
Sulfide as H2S	mg/l	a	e	e	a	
Nitrate	mg/l	a	e	e	a	
Nitrite	mg/l	a	e	e	a	
Total, Nitrate/Nitrite	mg/l	a	e	e	a	
Ammonia	mg/l	a	e	e	a	
Oil and Grease	mg/l	a	e	e	a	
Bicarbonate as HCO3	mg/l	383	e	e	216	
Carbonate as CO3	mg/l	<1	e	e	<1	
Chloride	mg/l	15	e	e	a	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLERS
1990

Parameters	Units	Sample Date - 7/27/90				
		SS-1 (A)	SS-2	SS-3	SS-4 (A)	
Sulfate	mg/l	145.0	e	e	290.0	
Calcium	mg/l	135.6	e	e	402.5	
Magnesium	mg/l	21.5	e	e	85.2	
Potassium	mg/l	8.67	e	e	24.96	
Sodium	mg/l	17.6	e	e	43.9	
Major Cations	meq/l	9.53	e	e	29.65	
Major Anions	meq/l	a	e	e	a	
Arsenic	mg/l	a	e	e	a	
Cadmium	mg/l	a	e	e	a	
Mercury	mg/l	a	e	e	a	
Lead	mg/l	a	e	e	a	
Selenium	mg/l	a	e	e	a	
Aluminum	mg/l	a	e	e	a	
Boron	mg/l	a	e	e	a	
Barium	mg/l	a	e	e	a	
Chromium	mg/l	a	e	e	a	
Copper	mg/l	a	e	e	a	
Iron	mg/l	3.08	e	e	a	
Manganese	mg/l	<0.01	e	e	0.52	
Molybdenum	mg/l	a	e	e	a	
Nickel	mg/l	a	e	e	a	
Zinc	mg/l	a	e	e	a	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLERS
1991

Parameters	Units	Sample Date - 6/13/91				
		SS-1	SS-2	SS-3	SS-4	
Water Level		2"	0"	6"	1"	
Flow	ft^3/s	1.2	0	2.4	0	
pH (Lab)	S.U.	e		e	e	
pH (Field)	S.U.	e		e	e	
Conduct. (Field)	umhos/cm @ 25c	e		e	e	
Conduct. (Lab)	umhos/cm @ 25c	e		e	e	
Total Dissolved Solids	mg/l	e		e	e	
Total Settleable Solids	mg/l	e		e	e	
Total Suspended Solids	mg/l	e		e	e	
Total Hardness as CaCO3	mg/l	e		e	e	
Total, Ortho-phosphate	mg/l	e		e	e	
Fluoride	mg/l	e		e	e	
Sulfide as H2S	mg/l	e		e	e	
Nitrate	mg/l	e		e	e	
Nitrite	mg/l	e		e	e	
Total, Nitrate/Nitrite	mg/l	e		e	e	
Ammonia	mg/l	e		e	e	
Oil and Grease	mg/l	e		e	e	
Bicarbonate as HCO3	mg/l	e		e	e	
Carbonate as CO3	mg/l	e		e	e	
Chloride	mg/l	e		e	e	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLERS
1991

Parameters	Units	Sample Date - 6/13/91				
		SS-1	SS-2	SS-3	SS-4	
Sulfate	mg/l	e		e	e	
Calcium	mg/l	e		e	e	
Magnesium	mg/l	e		e	e	
Potassium	mg/l	e		e	e	
Sodium	mg/l	e		e	e	
Major Cations	meq/l	e		e	e	
Major Anions	meq/l	e		e	e	
Arsenic	mg/l	e		e	e	
Cadmium	mg/l	e		e	e	
Mercury	mg/l	e		e	e	
Lead	mg/l	e		e	e	
Selenium	mg/l	e		e	e	
Aluminum	mg/l	e		e	e	
Boron	mg/l	e		e	e	
Barium	mg/l	e		e	e	
Chromium	mg/l	e		e	e	
Copper	mg/l	e		e	e	
Iron	mg/l	e		e	e	
Manganese	mg/l	e		e	e	
Molybdenum	mg/l	e		e	e	
Nickel	mg/l	e		e	e	
Zinc	mg/l	e		e	e	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLERS
1992

Parameters	Units	Sample Date - 5/30/92				
		SS-1	SS-2	SS-3	SS-4	SS-5 (B)(f)
Water Level		4"	no flow	8"	2"	4"
Flow	ft^3/s	4.8	0	4.7	0.02	2.9
pH (Lab)	S.U.	e	e	e	e	7.59
pH (Field)	S.U.	e	e	e	e	8.5
Conduct. (Field)	umhos/cm @ 25c	e	e	e	e	548
Conduct. (Lab)	umhos/cm @ 25c	e	e	e	e	890
Total Dissolved Solids	mg/l	e	e	e	e	808
Total Settleable Solids	mg/l	e	e	e	e	e
Total Suspended Solids	mg/l	e	e	e	e	e
Total Hardness as CaCO3	mg/l	e	e	e	e	449
Total, Ortho-phosphate	mg/l	e	e	e	e	<0.02
Fluoride	mg/l	e	e	e	e	0.32
Sulfide as H2S	mg/l	e	e	e	e	e
Nitrate	mg/l	e	e	e	e	e
Nitrite	mg/l	e	e	e	e	e
Total, Nitrate/Nitrite	mg/l	e	e	e	e	e
Ammonia	mg/l	e	e	e	e	e
Oil and Grease	mg/l	e	e	e	e	e
Bicarbonate as HCO3	mg/l	e	e	e	e	211
Carbonate as CO3	mg/l	e	e	e	e	0
Chloride	mg/l	e	e	e	e	20.4

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLERS
1992

Parameters	Units	Sample Date - 5/30/92				
		SS-1	SS-2	SS-3	SS-4	SS-5 (B)(f)
Sulfate	mg/l	e	e	e	e	367
Calcium	mg/l	e	e	e	e	132
Magnesium	mg/l	e	e	e	e	29.3
Potassium	mg/l	e	e	e	e	12.9
Sodium	mg/l	e	e	e	e	35.7
Major Cations	meq/l	e	e	e	e	10.9
Major Anions	meq/l	e	e	e	e	11.7
Arsenic	mg/l	e	e	e	e	<0.005
Cadmium	mg/l	e	e	e	e	<0.002
Mercury	mg/l	e	e	e	e	<0.001
Lead	mg/l	e	e	e	e	<0.02
Selenium	mg/l	e	e	e	e	<0.005
Aluminum	mg/l	e	e	e	e	<0.1
Boron	mg/l	e	e	e	e	0.26
Barium	mg/l	e	e	e	e	<0.5
Chromium	mg/l	e	e	e	e	<0.02
Copper	mg/l	e	e	e	e	0.01
Iron	mg/l	e	e	e	e	<0.05
Manganese	mg/l	e	e	e	e	<0.02
Molybdenum	mg/l	e	e	e	e	<0.02
Nickel	mg/l	e	e	e	e	<0.01
Zinc	mg/l	e	e	e	e	0.04

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLERS
1992

Parameters	Units	Sample Date - 5/30/92				
		SS-6	SS-7	SS-8	SS-9	
Water Level		0"	8"	g	g	
Flow	ft^3/s	0	9.6	-	-	
pH (Lab)	S.U.		e			
pH (Field)	S.U.		e			
Conduct. (Field)	umhos/cm @ 25c		e			
Conduct. (Lab)	umhos/cm @ 25c		e			
Total Dissolved Solids	mg/l		e			
Total Settleable Solids	mg/l		e			
Total Suspended Solids	mg/l		e			
Total Hardness as CaCO3	mg/l		e			
Total, Ortho-phosphate	mg/l		e			
Fluoride	mg/l		e			
Sulfide as H2S	mg/l		e			
Nitrate	mg/l		e			
Nitrite	mg/l		e			
Total, Nitrate/Nitrite	mg/l		e			
Ammonia	mg/l		e			
Oil and Grease	mg/l		e			
Bicarbonate as HCO3	mg/l		e			
Carbonate as CO3	mg/l		e			
Chloride	mg/l		e			

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLERS
1992

Parameters	Units	Sample Date - 5/30/92				
		SS-6	SS-7	SS-8	SS-9	
Sulfate	mg/l		e			
Calcium	mg/l		e			
Magnesium	mg/l		e			
Potassium	mg/l		e			
Sodium	mg/l		e			
Major Cations	meq/l		e			
Major Anions	meq/l		e			
Arsenic	mg/l		e			
Cadmium	mg/l		e			
Mercury	mg/l		e			
Lead	mg/l		e			
Selenium	mg/l		e			
Aluminum	mg/l		e			
Boron	mg/l		e			
Barium	mg/l		e			
Chromium	mg/l		e			
Copper	mg/l		e			
Iron	mg/l		e			
Manganese	mg/l		e			
Molybdenum	mg/l		e			
Nickel	mg/l		e			
Zinc	mg/l		e			

Codes:

Laboratory	
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments	
(a)	Not analyzed.
(b)	Field instruments malfunctioned
(c)	Temperature may not be accurate due to sample collection technique.
(d)	Calculated value.
(e)	Not enough water could be collected to run laboratory analysis.
(f)	Metals analyzed in dissolved form. Metals analyzed in total form unless otherwise specified.
(g)	Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLERS
1992

Parameters	Units	Sample Date - 7/11/92				
		101 (B)	102 (B)	103 (B)	SS-8 (B)	SS-9 (B)
Water Level		g	g	g	g	g
Flow	ft^3/s	-	-	-	-	-
pH (Lab)	S.U.	7.13	6.65	7.35	7.68	7.54
pH (Field)	S.U.	8.2	7.9	8.1	7.6	8.1
Conduct. (Field)	umhos/cm @ 25c	867	562	585	955	809
Conduct. (Lab)	umhos/cm @ 25c	1090	549	655	1050	946
Total Dissolved Solids	mg/l	826	426	490	832	684
Total Settleable Solids	ml/l	500	.2	660	71	500
Total Suspended Solids	mg/l	49,200	252	41,700	13,100	38,000
Total Hardness as CaCO3	mg/l	201	210	139	311	162
Total, Ortho-phosphate	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Fluoride	mg/l	0.47	0.47	0.47	0.47	0.53
Sulfide as H2S	mg/l	a	a	a	a	a
Nitrate	mg/l	.77	3.78	0.93	1.52	0.87
Nitrite	mg/l	.09	0.15	0.11	<0.02	0.10
Total, Nitrate/Nitrite	mg/l	a	a	a	a	a
Ammonia	mg/l	0.03	0.24	0.67	0.01	1.41
Oil and Grease	mg/l	a	a	a	a	a
Bicarbonate as HCO3	mg/l	237	75	178	176	243
Carbonate as CO3	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride	mg/l	17.1	17.5	10.3	39.1	14.9

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLERS
1992

Parameters	Units	Sample Date - 7/11/92				
		101 (B)	102 (B)	103 (B)	SS-8 (B)	SS-9 (B)
Sulfate	mg/l	360	186	172	382	283
Calcium	mg/l	57	60.9	41.4	94.7	46.5
Magnesium	mg/l	14.3	14.1	8.6	18.0	11.1
Potassium	mg/l	6.65	11.3	6.65	10.6	5.87
Sodium	mg/l	178	35.2	89.2	117	154
Major Cations	meq/l	11.9	6.02	6.82	11.6	10.1
Major Anions	meq/l	11.9	5.87	6.86	12	10.4
Arsenic	mg/l	0.027	<0.005	<0.005	0.009	0.009
Cadmium	mg/l	0.004	<0.002	0.004	0.003	<0.002
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/l	<0.02	<0.02	0.04	0.07	0.04
Selenium	mg/l	0.005	<0.005	0.009	<0.005	<0.005
Aluminum	mg/l	22.2	1.6	52.7	6.9	4.2
Boron	mg/l	0.44	0.26	0.35	0.41	0.39
Barium	mg/l	1.9	<0.5	2.4	0.7	0.9
Chromium	mg/l	<0.02	0.14	<0.02	0.15	0.03
Copper	mg/l	0.07	0.02	0.06	0.84	0.02
Iron	mg/l	19.2	14.3	38.5	3.94	3.56
Manganese	mg/l	3.58	0.34	4.55	1.10	1.15
Molybdenum	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/l	0.14	0.04	0.14	0.09	0.06
Zinc	mg/l	0.09	<0.01	0.10	0.03	<0.01

Codes:

Laboratory	
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments

(a)	Not analyzed.
(b)	Field instruments malfunctioned
(c)	Temperature may not be accurate due to sample collection technique.
(d)	Calculated value.
(e)	Not enough water could be collected to run laboratory analysis.
(f)	Metals analyzed in dissolved form. Metals analyzed in total form unless otherwise specified.
(g)	Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date - 7/11/92				
		SS-1	SS-2	SS-3	SS-4	SS-5
Water Level		*	*	*	*	0"
Flow	ft^3/s	-	-	-	-	-
pH (Lab)	S.U.	e		e	e	
pH (Field)	S.U.	e		e	e	
Conduct. (Field)	umhos/cm @ 25c	e		e	e	
Conduct. (Lab)	umhos/cm @ 25c	e		e	e	
Total Dissolved Solids	mg/l	e		e	e	
Total Settleable Solids	mg/l	e		e	e	
Total Suspended Solids	mg/l	e		e	e	
Total Hardness as CaCO3	mg/l	e		e	e	
Total, Ortho-phosphate	mg/l	e		e	e	
Fluoride	mg/l	e		e	e	
Sulfide as H2S	mg/l	e		e	e	
Nitrate	mg/l	e		e	e	
Nitrite	mg/l	e		e	e	
Total, Nitrate/Nitrite	mg/l	e		e	e	
Ammonia	mg/l	e		e	e	
Oil and Grease	mg/l	e		e	e	
Bicarbonate as HCO3	mg/l	e		e	e	
Carbonate as CO3	mg/l	e		e	e	
Chloride	mg/l	e		e	e	

Codes:

	Laboratory
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments

(a)	Not analyzed.
(b)	Field instruments malfunctioned
(c)	Temperature may not be accurate due to sample collection technique.
(d)	Calculated value.
(e)	Not enough water could be collected to run laboratory analysis.
(f)	Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date - 7/11/92				
		SS-1	SS-2	SS-3	SS-4	SS-5
Sulfate	mg/l	e		e	e	
Calcium	mg/l	e		e	e	
Magnesium	mg/l	e		e	e	
Potassium	mg/l	e		e	e	
Sodium	mg/l	e		e	e	
Major Cations	meq/l	e		e	e	
Major Anions	meq/l	e		e	e	
Arsenic	mg/l	e		e	e	
Cadmium	mg/l	e		e	e	
Mercury	mg/l	e		e	e	
Lead	mg/l	e		e	e	
Selenium	mg/l	e		e	e	
Aluminum	mg/l	e		e	e	
Boron	mg/l	e		e	e	
Barium	mg/l	e		e	e	
Chromium	mg/l	e		e	e	
Copper	mg/l	e		e	e	
Iron	mg/l	e		e	e	
Manganese	mg/l	e		e	e	
Molybdenum	mg/l	e		e	e	
Nickel	mg/l	e		e	e	
Zinc	mg/l	e		e	e	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date - 7/11/92				
		SS-6	SS-7			
Water Level		0"	8"			
Flow	ft^3/s	-	9.6			
pH (Lab)	S.U.		e			
pH (Field)	S.U.		e			
Conduct. (Field)	umhos/cm @ 25c		e			
Conduct. (Lab)	umhos/cm @ 25c		e			
Total Dissolved Solids	mg/l		e			
Total Settleable Solids	mg/l		e			
Total Suspended Solids	mg/l		e			
Total Hardness as CaCO3	mg/l		e			
Total, Ortho-phosphate	mg/l		e			
Fluoride	mg/l		e			
Sulfide as H2S	mg/l		e			
Nitrate	mg/l		e			
Nitrite	mg/l		e			
Total, Nitrate/Nitrite	mg/l		e			
Ammonia	mg/l		e			
Oil and Grease	mg/l		e			
Bicarbonate as HCO3	mg/l		e			
Carbonate as CO3	mg/l		e			
Chloride	mg/l		e			

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date - 7/11/92				
		SS-6	SS-7			
Sulfate	mg/l		e			
Calcium	mg/l		e			
Magnesium	mg/l		e			
Potassium	mg/l		e			
Sodium	mg/l		e			
Major Cations	meq/l		e			
Major Anions	meq/l		e			
Arsenic	mg/l		e			
Cadmium	mg/l		e			
Mercury	mg/l		e			
Lead	mg/l		e			
Selenium	mg/l		e			
Aluminum	mg/l		e			
Boron	mg/l		e			
Barium	mg/l		e			
Chromium	mg/l		e			
Copper	mg/l		e			
Iron	mg/l		e			
Manganese	mg/l		e			
Molybdenum	mg/l		e			
Nickel	mg/l		e			
Zinc	mg/l		e			

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.

Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date - 8/15/92				
		SS-1 (B)	SS-2 (B)	SS-6 (B)	104 (B)	105 (B)
Water Level		8.5"	g	g	g	g
Flow	ft^3/s	20.1	-	-	-	-
pH (Lab)	S.U.	7.53	7.8	7.67	7.5	7.29
pH (Field)	S.U.	a	a	a	a	a
Conduct. (Field)	umhos/cm @ 25c	a	a	a	a	a
Conduct. (Lab)	umhos/cm @ 25c	510	1,340	1,420	1,120	1,740
Total Dissolved Solids	mg/l	358	1,420	1,240	976	1,560
Total Settleable Solids	mg/l	16	208	53	270	<0.10
Total Suspended Solids	mg/l	2,960	90,000	9,750	22,800	24
Total Hardness as CaCO3	mg/l	243	797	604	374	738
Total, Ortho-phosphate	mg/l	0.07	e	<0.02	<0.02	<0.02
Fluoride	mg/l	0.31	0.47	0.51	0.56	0.79
Sulfide as H2S	mg/l	a	a	a	a	a
Nitrate	mg/l	2.64	2.11	0.16	12.47	28.05
Nitrite	mg/l	<0.02	<0.02	0.76	0.24	0.10
Total, Nitrate/Nitrite	mg/l	a	a	a	a	a
Ammonia	mg/l	6.33	0.35	1.17	0.42	0.23
Oil and Grease	mg/l	e	e	e	e	e
Bicarbonate as HCO3	mg/l	267	231	115	171	67.7
Carbonate as CO3	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride	mg/l	11.9	20	29.3	26.7	26.2

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date - 8/15/92				
		SS-1 (B)	SS-2 (B)	SS-6 (B)	104 (B)	105 (B)
Sulfate	mg/l	42.8	687	722	488	848
Calcium	mg/l	71.9	214	157	112	228
Magnesium	mg/l	15.5	63.9	51.8	22.7	41.4
Potassium	mg/l	7.98	120	182	13.3	229
Sodium	mg/l	17.9	13.3	11.7	124	11.5
Major Cations	meq/l	5.84	19.6	17.2	13.2	21.1
Major Anions	meq/l	5.79	18.8	17.8	13.7	21.5
Arsenic	mg/l	<0.005	0.006	<0.005	0.006	<0.005
Cadmium	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/l	<0.02	<0.01	0.02	<0.01	<0.01
Selenium	mg/l	<0.005	<0.005	<0.005	0.013	0.053
Aluminum	mg/l	0.2	6.1	0.9	6.4	0.1
Boron	mg/l	0.25	0.23	0.40	0.32	0.33
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/l	0.10	0.06	0.02	0.04	0.02
Iron	mg/l	0.16	5.36	0.88	3.88	0.11
Manganese	mg/l	<0.02	0.14	0.02	0.40	<0.02
Molybdenum	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/l	<0.01	0.01	0.01	0.01	<0.01
Zinc	mg/l	0.08	0.15	0.36	0.31	0.30

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 08/29/92				
		106 (B)(f)	107 (B)(f)			
Water Level		g	g			
Flow	ft^3/s	-	-			
pH (Lab)	S.U.	8.11	7.64			
pH (Field)	S.U.	a	a			
Conduct. (Field)	umhos/cm @ 25c	a	a			
Conduct. (Lab)	umhos/cm @ 25c	1660	1470			
Total Dissolved Solids	mg/l	1320	1260			
Total Settleable Solids	mg/l	<0.1	0.2			
Total Suspended Solids	mg/l	6	20			
Total Hardness as CaCO3	mg/l	397	349			
Total, Phosphorus	mg/l	<0.1	<0.1			
Fluoride	mg/l	0.63	0.70			
Sulfide as H2S	mg/l	a	a			
Nitrate	mg/l	1.4	2.07			
Nitrite	mg/l	<0.02	0.02			
Total, Nitrate/Nitrite	mg/l	a	a			
Ammonia	mg/l	0.10	0.66			
Oil and Grease	mg/l	e	e			
Bicarbonate as HCO3	mg/l	197	287			
Carbonate as CO3	mg/l	<0.10	<0.10			
Chloride	mg/l	55.3	51			

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 08/29/92				
		106 (B)(f)	107 (B)(f)			
Sulfate	mg/l	662	616			
Calcium	mg/l	111	89			
Magnesium	mg/l	29.4	31			
Potassium	mg/l	10.1	9.53			
Sodium	mg/l	251	275			
Major Cations	meq/l	19.1	19.2			
Major Anions	meq/l	18.7	19			
Arsenic	mg/l	<0.005	<0.005			
Cadmium	mg/l	<0.002	<0.002			
Mercury	mg/l	<0.001	<0.001			
Lead	mg/l	<0.02	<0.02			
Selenium	mg/l	<0.005	<0.005			
Aluminum	mg/l	<0.1	<0.1			
Boron	mg/l	0.40	0.40			
Barium	mg/l	<0.5	<0.5			
Chromium	mg/l	<0.02	<0.02			
Copper	mg/l	<0.01	0.02			
Iron	mg/l	<0.05	<0.05			
Manganese	mg/l	<0.02	<0.02			
Molybdenum	mg/l	<0.02	<0.02			
Nickel	mg/l	<0.01	<0.01			
Zinc	mg/l	<0.01	<0.01			

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 08/29/92				
		SS-1 (B)(f)	SS-2 (B)(f)	SS-4 (B)(f)	SS-5 (B)(f)	
Water Level		13"	12"	17"	g	
Flow	ft^3/s	47.0	50.4	124.6	-	
pH (Lab)	S.U.	7.25	7.53	7.56	7.1	
pH (Field)	S.U.	a	a	a	a	
Conduct. (Field)	umhos/cm @ 25c	a	a	a	a	
Conduct. (Lab)	umhos/cm @ 25c	575	897	787	552	
Total Dissolved Solids	mg/l	512	200	640	462	
Total Settleable Solids	mg/l	100	213	630	360	
Total Suspended Solids	mg/l	22,600	148,000	180,000	65,000	
Total Hardness as CaCO3	mg/l	322	322	402	305	
Total, Phosphorus	mg/l	<0.1	<0.1	<0.1	<0.1	
Fluoride	mg/l	0.39	0.44	0.58	0.33	
Sulfide as H2S	mg/l	a	a	a	a	
Nitrate	mg/l	2.08	13.55	3.4	0.2	
Nitrite	mg/l	0.05	0.56	0.16	0.04	
Total, Nitrate/Nitrite	mg/l	a	a	a	a	
Ammonia	mg/l	0.20	0.20	0.38	0.60	
Oil and Grease	mg/l	e	e	e	e	
Bicarbonate as HCO3	mg/l	204	163	167	223	
Carbonate as CO3	mg/l	<0.10	<0.10	<0.10	<0.10	
Chloride	mg/l	17.3	16.4	23.1	9.25	

Codes:

Laboratory	
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments	
(a)	Not analyzed.
(b)	Field instruments malfunctioned
(c)	Temperature may not be accurate due to sample collection technique.
(d)	Calculated value.
(e)	Not enough water could be collected to run laboratory analysis.
(f)	Metals analyzed in dissolved form. Metals analyzed in total form unless otherwise specified.
(g)	Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 08/29/92				
		SS-1 (B)(f)	SS-2 (B)(f)	SS-4 (B)(f)	SS-5 (B)(f)	
Sulfate	mg/l	166	350	310	131	
Calcium	mg/l	92.4	72.6	117	92.8	
Magnesium	mg/l	22.2	34.4	26.7	18	
Potassium	mg/l	9.18	32.4	15.6	7.31	
Sodium	mg/l	25.5	74.4	44	15.9	
Major Cations	meq/l	7.78	10.5	10.3	6.99	
Major Anions	meq/l	7.3	10.4	9.86	6.64	
Arsenic	mg/l	0.024	<0.005	<0.005	<0.005	
Cadmium	mg/l	<0.002	<0.002	<0.002	<0.002	
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	
Lead	mg/l	<0.02	<0.02	<0.02	<0.02	
Selenium	mg/l	<0.005	0.012	0.012	0.006	
Aluminum	mg/l	<0.1	<0.1	<0.1	<0.1	
Boron	mg/l	0.24	0.27	0.28	0.22	
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	
Copper	mg/l	0.03	0.04	0.02	<0.01	
Iron	mg/l	0.10	0.06	<0.05	0.05	
Manganese	mg/l	0.14	0.03	<0.02	0.86	
Molybdenum	mg/l	<0.02	<0.02	<0.02	<0.02	
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	
Zinc	mg/l	<0.01	<0.01	<0.01	<0.01	

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 09/07/92				
		SS-3 (B)(f)	SS-5 (B)(f)	SS-9 (B)(f)	SS-8 (B)(f)	108 (B)(f)
Water Level		g	1"	g	g	g
Flow	ft^3/s	-	0.05	-	-	-
pH (Lab)	S.U.	7.46	7.3	7.6	7.36	7.77
pH (Field)	S.U.	a	a	a	a	a
Conduct. (Field)	umhos/cm @ 25c	a	a	a	a	a
Conduct. (Lab)	umhos/cm @ 25c	485	510	723	738	3,630
Total Dissolved Solids	mg/l	332	300	410	512	2900
Total Settleable Solids	mg/l	1.4	56	<0.10	<0.10	2.9 ml/l
Total Suspended Solids	mg/l	3,970	11,500	50,800	268	528
Total Hardness as CaCO3	mg/l	191	194	162	232	848
Total, Phosphorus	mg/l	0.3	0.7	1.2	<0.1	<0.1
Fluoride	mg/l	0.66	e	0.5	0.48	0.45
Nitrate	mg/l	2.13	3.58	0.93	3.14	0.14
Nitrite	mg/l	0.11	0.03	0.02	0.12	<0.02
Ammonia	mg/l	0.09	0.88	0.11	0.05	0.82
Oil and Grease	mg/l	e	e	e	e	e
Bicarbonate as HCO3	mg/l	131	132	257	115	329
Carbonate as CO3	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride	mg/l	10.9	19.5	77.1	12.9	155

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 09/07/92				
		SS-3 (B)(f)	SS-5 (B)(f)	SS-9 (B)(f)	SS-8 (B)(f)	108 (B)(f)
Sulfate	mg/l	100	115	123	238	1,550
Calcium	mg/l	57.7	54.3	45.9	69.3	221
Magnesium	mg/l	11.5	14.2	11.6	14.3	72.1
Potassium	mg/l	6.87	14.3	20.3	6.73	17.8
Sodium	mg/l	18.8	34	111	58	549
Major Cations	meq/l	4.82	5.73	8.58	7.33	41.3
Major Anions	meq/l	4.71	5.63	9.03	7.2	42.1
Arsenic	mg/l	0.006	0.008	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.002	<0.002	0.002	<0.002	0.002
Mercury	mg/l	<0.001	<0.001	0.001	<0.001	<0.001
Lead	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	mg/l	0.010	0.006	0.006	0.009	0.007
Aluminum	mg/l	<0.1	0.1	0.6	<0.1	<0.1
Boron	mg/l	0.22	0.19	0.21	0.22	0.66
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/l	<0.01	0.09	<0.01	<0.01	<0.01
Iron	mg/l	<0.05	0.13	0.59	<0.05	<0.05
Manganese	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Molybdenum	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	mg/l	<0.01	0.03	0.08	0.04	<0.01

Codes: Laboratory

(A) Commercial Testing & Engineering
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(C) Chemtech

Comments

(a) Not analyzed.
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(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 09/18/92				
		SS-9 (B)(f)	109 (B)(f)	110 (B)(f)		
Water Level		g	g	g		
Flow	ft^3/s	-	-	-		
pH (Lab)	S.U.	7.77	7.87	7.71		
pH (Field)	S.U.	a	a	a		
Conduct. (Field)	umhos/cm @ 25c	a	a	a		
Conduct. (Lab)	umhos/cm @ 25c	669	1,250	1,480		
Total Dissolved Solids	mg/l	442	928	1,130		
Total Settleable Solids	mg/l	500	<0.10	<0.10		
Total Suspended Solids	mg/l	26,700	8	67		
Total Hardness as CaCO3	mg/l	146	240	230		
Total, Phosphorus	mg/l	<0.5	<0.5	<0.5		
Fluoride	mg/l	0.38	0.58	0.70		
Nitrate	mg/l	0.66	1.26	3.58		
Nitrite	mg/l	0.07	<0.02	0.09		
Ammonia	mg/l	1.07	0.11	0.24		
Oil and Grease	mg/l	e	e	e		
Bicarbonate as HCO3	mg/l	153	194	93.3		
Carbonate as CO3	mg/l	<0.10	<0.10	<0.10		
Chloride	mg/l	15.7	42.6	58.3		

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

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(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 09/18/92				
		SS-9 (B)(f)	109 (B)(f)	110 (B)(f)		
Sulfate	mg/l	184	459	629		
Calcium	mg/l	45	65.4	65.2		
Magnesium	mg/l	8.2	18.6	16.4		
Potassium	mg/l	5.99	6.38	8.21		
Sodium	mg/l	93.7	213	270		
Major Cations	meq/l	7.15	14.2	16.6		
Major Anions	meq/l	6.84	14	16.5		
Arsenic	mg/l	<0.005	<0.005	0.009		
Cadmium	mg/l	<0.002	0.002	<0.002		
Mercury	mg/l	<0.001	0.005	<0.001		
Lead	mg/l	<0.02	<0.02	<0.02		
Selenium	mg/l	0.005	0.005	0.010		
Aluminum	mg/l	<0.1	<0.1	<0.1		
Boron	mg/l	0.21	0.31	0.31		
Barium	mg/l	<0.5	<0.5	<0.5		
Chromium	mg/l	0.04	0.04	0.04		
Copper	mg/l	<0.01	<0.01	0.01		
Iron	mg/l	<0.05	<0.05	<0.05		
Manganese	mg/l	<0.02	<0.02	<0.02		
Molybdenum	mg/l	<0.02	<0.02	<0.02		
Nickel	mg/l	<0.01	<0.01	<0.01		
Zinc	mg/l	<0.01	<0.01	<0.01		

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 09/20/92				
		SS-1 (B)(f)	SS-2 (B)(f)	SS-5 (B)(f)	SS-8 (B)(f)	111 (B)(f)
Water Level		13"	8"	12"	g	g
Flow	ft^3/s	47.0	21.6	43.1	-	-
pH (Lab)	S.U.	7.61	7.63	7.6	7.68	8.09
pH (Field)	S.U.	7.3	7.1	7.4	7.4	7.8
Conduct. (Field)	umhos/cm @ 25c	a	a	a	a	a
Conduct. (Lab)	umhos/cm @ 25c	397	403	396	480	2,500
Total Dissolved Solids	mg/l	282	286	290	326	2,140
Total Settleable Solids	mg/l	480	30	400	800	<0.10
Total Suspended Solids	mg/l	51,700	15,900	17,800	206,000	10
Total Hardness as CaCO3	mg/l	189	157	158	145	675
Total, Phosphorus	mg/l	<0.5	<0.5	<0.5	0.5	<0.5
Fluoride	mg/l	0.26	0.24	0.29	0.21	0.42
Nitrate	mg/l	1.71	1.89	2.82	0.70	0.10
Nitrite	mg/l	0.11	0.18	0.10	0.09	<0.02
Ammonia	mg/l	0.71	1.08	0.87	0.76	0.01
Oil and Grease	mg/l	e	e	e	e	e
Bicarbonate as HCO3	mg/l	95.2	94.6	89.7	149	362
Carbonate as CO3	mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride	mg/l	9.23	15.7	10.9	4.2	103

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 09/20/92				
		SS-1 (B)(f)	SS-2 (B)(f)	SS-5 (B)(f)	SS-8 (B)(f)	111 (B)(f)
Sulfate	mg/l	114	111	116	113	1,150
Calcium	mg/l	57.4	48.3	47.4	42.6	171
Magnesium	mg/l	11.2	8.95	9.73	9.43	60.7
Potassium	mg/l	6.38	7.69	7.04	8.28	13.2
Sodium	mg/l	13.1	23	24.9	36.6	435
Major Cations	meq/l	4.52	4.35	4.43	4.7	32.8
Major Anions	meq/l	4.32	4.45	4.41	4.97	32.7
Arsenic	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.002	0.003	<0.002	<0.002	<0.002
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	mg/l	0.005	0.005	0.005	<0.005	<0.005
Aluminum	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	mg/l	0.19	0.15	0.17	0.17	0.55
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/l	0.04	0.04	0.05	0.05	0.06
Copper	mg/l	0.01	0.01	0.02	<0.01	<0.01
Iron	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese	mg/l	<0.02	<0.02	<0.02	0.05	0.03
Molybdenum	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01

Codes:

Laboratory	
(A)	Commercial Testing & Engineering
(B)	Inter-Mountain Laboratories
(C)	Chemtech

Comments

(a)	Not analyzed.
(b)	Field instruments malfunctioned
(c)	Temperature may not be accurate due to sample collection technique.
(d)	Calculated value.
(e)	Not enough water could be collected to run laboratory analysis.
(f)	Metals analyzed in dissolved form. Metals analyzed in total form unless otherwise specified.
(g)	Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 11/01/92				
		SS-1 (B)(f)	SS-2 (B)(f)	SS-9 (B)(f)	SS-8 (B)(f)	112 (B)(f)
Water Level		4.5"	6.0"	g	g	g
Flow	ft^3/s	6.3	11.7	-	-	-
pH (Lab)	S.U.	7.54	7.70	7.91	8.15	8.34
pH (Field)	S.U.	7.4	a	8.3	8.1	8.4
Conduct. (Field)	umhos/cm @ 25c	420	a	432	706	829
Conduct. (Lab)	umhos/cm @ 25c	729	984	572	1,070	2,460
Total Dissolved Solids	mg/l	294	374	488	756	1,850
Total Settleable Solids	mg/l	20	38	<0.10	<0.10	<0.10
Total Suspended Solids	mg/l	294	8,760	33	27	8
Total Hardness as CaCO3	mg/l	181	394	92.2	160	471
Total, Phosphorus	mg/l	3.3	4.2	<0.1	<0.1	<0.1
Fluoride	mg/l	.21	0.36	0.37	0.58	0.52
Nitrate	mg/l	.75	11.95	0.89	0.87	0.82
Nitrite	mg/l	.20	0.31	0.03	0.03	0.02
Ammonia	mg/l	.84	0.69	0.04	<0.01	<0.01
Oil and Grease	mg/l	e	e	<0.25	<0.25	<0.25
Bicarbonate as HCO3	mg/l	146	89.1	127	186	355
Carbonate as CO3	mg/l	<0.10	<0.10	<0.10	<0.10	2.7
Chloride	mg/l	14.5	31.2	10.9	18.7	90.8

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

SURFACE WATER MONITORING DATA (continued)
LOCATION: STREAM SAMPLER

Parameters	Units	Sample Date: 11/01/92				
		SS-1 (B)(f)	SS-2 (B)(f)	SS-9 (B)(f)	SS-8 (B)(f)	112 (B)(f)
Sulfate	mg/l	86.8	361	141	396	980
Calcium	mg/l	60.7	111	30.7	50.9	131
Magnesium	mg/l	7.14	28.2	3.77	8.04	34.9
Potassium	mg/l	8.69	7.78	3.3	2.33	9.2
Sodium	mg/l	18.6	53	80.7	193	441
Major Cations	meq/l	4.65	10.4	5.44	11.6	28.8
Major Anions	meq/l	4.66	10.7	5.32	11.8	28.9
Arsenic	mg/l	0.005	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	mg/l	<0.005	0.007	<0.005	<0.005	<0.005
Aluminum	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	mg/l	0.03	0.12	0.04	0.12	0.43
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/l	0.05	0.10	0.01	0.01	0.01
Iron	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese	mg/l	0.42	<0.02	<0.02	<0.02	0.02
Molybdenum	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	mg/l	0.02	0.01	0.01	0.01	0.01

Codes: Laboratory

(A) Commercial Testing & Engineering
(B) Inter-Mountain Laboratories
(C) Chemtech

Comments

(a) Not analyzed.
(b) Field instruments malfunctioned
(c) Temperature may not be accurate due to sample collection technique.
(d) Calculated value.
(e) Not enough water could be collected to run laboratory analysis.
(f) Metals analyzed in dissolved form.
Metals analyzed in total form unless otherwise specified.
(g) Flow depth could not be measured accurately.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex
ID: SS-8
SITE: 1100
LAB NO: F9291

DATE REPORTED: 08/05/92
DATE RECEIVED: 07/21/92
DATE COLLECTED: 07/11/92

Lab pH (s.u.)	7.68
Lab Conductivity, umhos/cm @ 25C	1050
Lab Resistivity, ohm-m	9.57
Total Dissolved Solids (180C), mg/L	832
Total Dissolved Solids (calc), mg/L	748
Total Suspended Solids, mg/L	13100
Settleable Solids, ml/L	71
Total Alkalinity as CaC03, mg/L	144
Total Hardness as CaC03, mg/L	311
Sodium Adsorption Ratio	2.89
Total Ortho-phosphate, mg/L	<0.02
Fluoride, mg/L	0.47
Nitrate, mg/L	1.52
Nitrite, mg/L	<0.02
Ammonia, mg/L	0.01

	mg/L	meq/L
Bicarbonate as HC03	176	2.89
Carbonate as C03	<0.10	<0.01
Chloride	39.1	1.10
Sulfate	382	7.95
Calcium	94.7	4.73
Magnesium	18.0	1.48
Potassium	10.6	0.27
Sodium	117	5.10
Major Cations		11.6
Major Anions		12
Cation/Anion Difference		1.97 %

* Samples arrived at lab 10 days after sampling.
* Nutrient and Metal samples unpreserved.

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex
ID: SS-8
SITE: 1100
LAB NO: F9291

DATE REPORTED: 08/05/92
DATE RECEIVED: 07/21/92
DATE COLLECTED: 07/11/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.009	<0.005
Cadmium (Cd).....	0.003	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	0.07	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	6.9	<0.1
Boron (B).....	0.41	<0.01
Barium (Ba).....	0.7	<0.5
Chromium (Cr).....	0.15	<0.02
Copper (Cu).....	0.84	<0.01
Iron (Fe).....	3.94	<0.05
Manganese (Mn).....	1.10	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.09	<0.01
Zinc (Zn).....	0.03	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex
ID: SS-9
SITE: 1010
LAB NO: F9292

DATE REPORTED: 08/05/92
DATE RECEIVED: 07/21/92
DATE COLLECTED: 07/11/92

Lab pH (s.u.)	7.54
Lab Conductivity, umhos/cm @ 25C	946
Lab Resistivity, ohm-m	10.6
Total Dissolved Solids (180C), mg/L	684
Total Dissolved Solids (calc), mg/L	635
Total Suspended Solids, mg/L	38000
Settleable Solids, ml/L	500
Total Alkalinity as CaC03, mg/L	199
Total Hardness as CaC03, mg/L	162
Sodium Adsorption Ratio	5.25
Total Ortho-phosphate, mg/L	<0.02
Fluoride, mg/L	0.53
Nitrate, mg/L	0.87
Nitrite, mg/L	0.10
Ammonia, mg/L	1.41

	mg/L	meq/L
Bicarbonate as HC03	243	3.98
Carbonate as C03	<0.10	<0.01
Chloride	14.9	0.42
Sulfate	283	5.90
Calcium	46.5	2.32
Magnesium	11.1	0.91
Potassium	5.87	0.15
Sodium	154	6.68
Major Cations		10.1
Major Anions		10.4
Cation/Anion Difference		1.5 %

* Samples arrived at lab 10 days after sampling.
* Nutrient and Metal samples unpreserved.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex
ID: SS-9
SITE: 1010
LAB NO: F9292

DATE REPORTED: 08/05/92
DATE RECEIVED: 07/21/92
DATE COLLECTED: 07/11/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As)	0.009	<0.005
Cadmium (Cd)	ND	<0.002
Mercury (Hg)	ND	<0.001
Lead (Pb)	0.04	<0.02
Selenium (Se)	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al)	4.2	<0.1
Boron (B)	0.39	<0.01
Barium (Ba)	0.9	<0.5
Chromium (Cr)	0.03	<0.02
Copper (Cu)	0.02	<0.01
Iron (Fe)	3.56	<0.05
Manganese (Mn)	1.15	<0.02
Molybdenum (Mo)	ND	<0.02
Nickel (Ni)	0.06	<0.01
Zinc (Zn)	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Sample # 9288-9292

	Date analyzed	Technician
TSS	07/23/92	J. GOATS
H2S		
EC	07/27/92	W. ORSO
pH/Alk	07/22/92	J. GOATS
TH	07/27/92	J. GOATS
Ca	07/27/92	G. BARTLETT
K	07/22/92	G. BARTLETT
Na	07/22/92	G. BARTLETT
Cl	07/23/92	J. GOATS
SO4	07/29/92	W. ORSO
TDS	07/31/92	W. ORSO
F	07/28/92	J. GOATS
NO3/NO2	07/28/92	N. COSCO
NH4	07/28/92	N. COSCO
O & G		
Metals		
As	07/27/92	G. BARTLETT
Cd	07/23/92	G. BARTLETT
Hg	07/24/92	G. BARTLETT
Pb	07/23/92	G. BARTLETT
Se	07/27/92	G. BARTLETT
Al	07/28/92	S. ROGERS
B	07/28/92	S. ROGERS
Ba	07/28/92	S. ROGERS
Cr	07/23/92	G. BARTLETT
Cu	07/23/92	G. BARTLETT
Fe	07/28/92	G. BARTLETT
Mn	07/23/92	G. BARTLETT
Mo	07/28/92	S. ROGERS
Ni	07/23/92	G. BARTLETT
P	07/29/92	J. GOATS
Zn	07/23/92	G. BARTLETT

Lab Number

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/11/92
ID:	Stream Station #1		
SITE:	1443	DATE RECEIVED:	08/19/92
LAB NO:	9489	DATE COLLECTED:	08/15/92

Lab pH (s.u.).....	7.53
Lab Conductivity, umhos/cm @ 25C....	510
Lab Resistivity, ohm-m.....	19.6
Total Dissolved Solids (180C), mg/L.	358
Total Dissolved Solids (calc), mg/L.	299
Total Suspended Solids, mg/L.....	2960
Settleable Solids, ml/L.....	16
Total Alkalinity as CaC03, mg/L.....	219
Total Hardness as CaC03, mg/L.....	243
Sodium Adsorption Ratio.....	0.50
Total Ortho-Phosphate, mg/L.....	0.07
Fluoride, mg/L.....	0.31
Nitrate, mg/L.....	2.64
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	6.33

	mg/L	meq/L
Bicarbonate as HC03.....	267	4.37
Carbonate as C03.....	<0.10	<0.01
Chloride.....	11.9	0.34
Sulfate.....	42.8	0.89
Calcium.....	71.9	3.59
Magnesium.....	15.5	1.27
Potassium.....	7.98	0.20
Sodium.....	17.9	0.78
Major Cations.....		5.84
Major Anions.....		5.79
Cation/Anion Difference.....		0.46 %

* Nutrients & Metals arrived unpreserved.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station #1
SITE: 1443
LAB NO: 9489

DATE REPORTED: 09/11/92
DATE RECEIVED: 08/19/92
DATE COLLECTED: 08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.10	<0.01
Iron (Fe).....	0.16	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.08	<0.01

Trace Metals by ICAP (Total Concentration, mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.2	<0.1
Boron (B).....	0.25	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/11/92
ID:	Stream Station #2		
SITE:	1407	DATE RECEIVED:	08/19/92
LAB NO:	9490	DATE COLLECTED:	08/15/92

Lab pH (s.u.).....	7.80
Lab Conductivity, umhos/cm @ 25C....	1340
Lab Resistivity, ohm-m.....	7.47
Total Dissolved Solids (180C), mg/L.	1420
Total Dissolved Solids (calc), mg/L.	1230
Total Suspended Solids, mg/L.....	90000
Settleable Solids, ml/L.....	208
Total Alkalinity as CaC03, mg/L.....	190
Total Hardness as CaC03, mg/L.....	797
Sodium Adsorption Ratio.....	0.21
Total Ortho-Phosphate, mg/L.....	**
Fluoride, mg/L.....	0.47
Nitrate, mg/L.....	2.11
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.35

	mg/L	meq/L
Bicarbonate as HC03.....	231	3.79
Carbonate as C03.....	<0.10	<0.01
Chloride.....	20	0.57
Sulfate.....	687	14.3
Calcium.....	214	10.7
Magnesium.....	63.9	5.25
Potassium.....	120	3.06
Sodium.....	13.3	0.58
Major Cations.....		19.6
Major Anions.....		18.8
Cation/Anion Difference.....		1.95 %

*Nutrients & Metals arrived unpreserved.
**Insufficient sample for analysis.

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station #2
SITE: 1407
LAB NO: 9490

DATE REPORTED: 09/11/92
DATE RECEIVED: 08/19/92
DATE COLLECTED: 08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.006	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.06	<0.01
Iron (Fe).....	5.36	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.14	<0.02
Lead (Pb).....	ND	<0.01
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.15	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	6.1	<0.1
Boron (B).....	0.23	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/11/92
ID:	Stream Station #6		
SITE:	1423	DATE RECEIVED:	08/19/92
LAB NO:	9491	DATE COLLECTED:	08/15/92

Lab pH (s.u.).....	7.67
Lab Conductivity, umhos/cm @ 25C....	1420
Lab Resistivity, ohm-m.....	7.03
Total Dissolved Solids (180C), mg/L.	1240
Total Dissolved Solids (calc), mg/L.	1210
Total Suspended Solids, mg/L.....	9750
Settleable Solids, ml/L.....	53
Total Alkalinity as CaC03, mg/L.....	94.4
Total Hardness as CaC03, mg/L.....	604
Sodium Adsorption Ratio.....	0.21
Total Ortho-Phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.51
Nitrate, mg/L.....	0.16
Nitrite, mg/L.....	0.76
Ammonia, mg/L.....	1.17

	mg/L	meq/L
Bicarbonate as HC03.....	115	1.89
Carbonate as C03.....	<0.10	<0.01
Chloride.....	29.3	0.83
Sulfate.....	722	15
Calcium.....	157	7.82
Magnesium.....	51.8	4.26
Potassium.....	182	4.66
Sodium.....	11.7	0.51
Major Cations.....		17.2
Major Anions.....		17.8
Cation/Anion Difference.....		1.45 %

* Nutrients & Metals arrived unpreserved.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station #6
SITE: 1423
LAB NO: 9491

DATE REPORTED: 09/11/92
DATE RECEIVED: 08/19/92
DATE COLLECTED: 08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	0.88	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.02	<0.02
Lead (Pb).....	0.02	<0.01
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.36	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.9	<0.1
Boron (B).....	0.40	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/11/92
ID:	No. 104		
SITE:	1225	DATE RECEIVED:	08/19/92
LAB NO:	9492	DATE COLLECTED:	08/15/92

Lab pH (s.u.).....	7.50
Lab Conductivity, umhos/cm @ 25C....	1120
Lab Resistivity, ohm-m.....	8.94
Total Dissolved Solids (180C), mg/L.	976
Total Dissolved Solids (calc), mg/L.	871
Total Suspended Solids, mg/L.....	22800
Settleable Solids, ml/L.....	270
Total Alkalinity as CaC03, mg/L.....	141
Total Hardness as CaC03, mg/L.....	374
Sodium Adsorption Ratio.....	2.79
Total Ortho-Phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.56
Nitrate, mg/L.....	12.47
Nitrite, mg/L.....	0.24
Ammonia, mg/L.....	0.42

	mg/L	meq/L
Bicarbonate as HC03.....	171	2.81
Carbonate as C03.....	<0.10	<0.01
Chloride.....	26.7	0.75
Sulfate.....	488	10.2
Calcium.....	112	5.61
Magnesium.....	22.7	1.86
Potassium.....	13.3	0.34
Sodium.....	124	5.39
Major Cations.....		13.2
Major Anions.....		13.7
Cation/Anion Difference.....		1.94 %

* Nutrients & Metals arrived unpreserved.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: No. 104
SITE: 1225
LAB NO: 9492

DATE REPORTED: 09/11/92
DATE RECEIVED: 08/19/92
DATE COLLECTED: 08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.006	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.04	<0.01
Iron (Fe).....	3.88	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.40	<0.02
Lead (Pb).....	ND	<0.01
Selenium (Se).....	0.013	<0.005
Zinc (Zn).....	0.31	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	6.4	<0.1
Boron (B).....	0.32	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.01	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	09/11/92
ID:	No. 105		
SITE:	1016	DATE RECEIVED:	08/19/92
LAB NO:	9493	DATE COLLECTED:	08/15/92

Lab pH (s.u.).....	7.29
Lab Conductivity, umhos/cm @ 25C....	1740
Lab Resistivity, ohm-m.....	5.76
Total Dissolved Solids (180C), mg/L.	1560
Total Dissolved Solids (calc), mg/L.	1420
Total Suspended Solids, mg/L.....	24
Settleable Solids, ml/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	55.5
Total Hardness as CaC03, mg/L.....	738
Sodium Adsorption Ratio.....	0.18
Total Ortho-Phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.79
Nitrate, mg/L.....	28.05
Nitrite, mg/L.....	0.10
Ammonia, mg/L.....	0.23

	mg/L	meq/L
Bicarbonate as HC03.....	67.7	1.11
Carbonate as C03.....	<0.10	<0.01
Chloride.....	26.2	0.74
Sulfate.....	848	17.7
Calcium.....	228	11.4
Magnesium.....	41.4	3.4
Potassium.....	229	5.85
Sodium.....	11.5	0.5
Major Cations.....		21.1
Major Anions.....		21.5
Cation/Anion Difference.....		0.98 %

* Nutrients & Metals arrived unpreserved.

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: No. 105
SITE: 1016
LAB NO: 9493

DATE REPORTED: 09/11/92
DATE RECEIVED: 08/19/92
DATE COLLECTED: 08/15/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	0.11	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.01
Selenium (Se).....	0.053	<0.005
Zinc (Zn).....	0.30	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.1	<0.1
Boron (B).....	0.33	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/09/92
ID:	Stream Station 1		
SITE:	1514	DATE RECEIVED:	09/02/92
LAB NO:	9614	DATE COLLECTED:	08/29/92

Lab pH (s.u.).....	7.25
Lab Conductivity, umhos/cm @ 25C....	575
Lab Resistivity, ohm-m.....	17.4
Total Dissolved Solids (180C), mg/L.	512
Total Dissolved Solids (calc), mg/L.	433
Total Suspended Solids, mg/L.....	22600
Settleable Solids, ml/L.....	100
Total Alkalinity as CaC03, mg/L.....	167
Total Hardness as CaC03, mg/L.....	322
Sodium Adsorption Ratio.....	0.62
Fluoride, mg/L.....	0.39
Nitrate, mg/L.....	2.08
Nitrite, mg/L.....	0.05
Ammonia, mg/L.....	0.20

	mg/L	meq/L
Bicarbonate as HC03.....	204	3.34
Carbonate as C03.....	<0.10	<0.01
Chloride.....	17.3	0.49
Sulfate.....	166	3.47
Calcium.....	92.4	4.61
Magnesium.....	22.2	1.83
Potassium.....	9.18	0.23
Sodium.....	25.5	1.11
Major Cations.....		7.78
Major Anions.....		7.3
Cation/Anion Difference.....		3.19 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station 1
SITE: 1514
LAB NO: 9614

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/02/92
DATE COLLECTED: 08/29/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.024	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.03	<0.01
Iron (Fe).....	0.10	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.14	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.24	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/09/92
ID:	Stream Station 2		
SITE:	1336	DATE RECEIVED:	09/02/92
LAB NO:	9615	DATE COLLECTED:	08/29/92

Lab pH (s.u.)	7.53	
Lab Conductivity, umhos/cm @ 25C	897	
Lab Resistivity, ohm-m	11.1	
Total Dissolved Solids (180C), mg/L	200	*
Total Dissolved Solids (calc), mg/L	660	
Total Suspended Solids, mg/L	148000	
Settleable Solids, ml/L	213	
Total Alkalinity as CaC03, mg/L	134	
Total Hardness as CaC03, mg/L	322	
Sodium Adsorption Ratio	1.80	
Fluoride, mg/L	0.44	
Nitrate, mg/L	13.55	
Nitrite, mg/L	0.56	
Ammonia, mg/L	0.20	

	mg/L	meq/L
Bicarbonate as HC03	163	2.68
Carbonate as C03	<0.10	<0.01
Chloride	16.4	0.46
Sulfate	350	7.29
Calcium	72.6	3.62
Magnesium	34.4	2.83
Potassium	32.4	0.83
Sodium	74.4	3.24
Major Cations		10.5
Major Anions		10.4
Cation/Anion Difference		0.38 %

* Insufficient sample for reanalysis.

Inter-Mountain Laboratories, Inc.

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Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station 2
SITE: 1336
LAB NO: 9615

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/02/92
DATE COLLECTED: 08/29/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.04	<0.01
Iron (Fe).....	0.06	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.03	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.012	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.27	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/09/92
ID:	Stream Station 4		
SITE:	1203	DATE RECEIVED:	09/02/92
LAB NO:	9616	DATE COLLECTED:	08/29/92

Lab pH (s.u.)	7.56
Lab Conductivity, umhos/cm @ 25C	787
Lab Resistivity, ohm-m	12.7
Total Dissolved Solids (180C), mg/L	640
Total Dissolved Solids (calc), mg/L	619
Total Suspended Solids, mg/L	180000
Settleable Solids, ml/L	630
Total Alkalinity as CaC03, mg/L	137
Total Hardness as CaC03, mg/L	402
Sodium Adsorption Ratio	0.96
Fluoride, mg/L	0.58
Nitrate, mg/L	3.40
Nitrite, mg/L	0.16
Ammonia, mg/L	0.38

	mg/L	meq/L
Bicarbonate as HC03	167	2.74
Carbonate as C03	<0.10	<0.01
Chloride	23.1	0.65
Sulfate	310	6.47
Calcium	117	5.83
Magnesium	26.7	2.2
Potassium	15.6	0.4
Sodium	44	1.91
Major Cations		10.3
Major Anions		9.86
Cation/Anion Difference		2.41 %

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Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/09/92
ID:	Stream Station 4		
SITE:	1203	DATE RECEIVED:	09/02/92
LAB NO:	9616	DATE COLLECTED:	08/29/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.012	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.28	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/09/92
ID:	Stream Station 5		
SITE:	1427	DATE RECEIVED:	09/02/92
LAB NO:	9617	DATE COLLECTED:	08/29/92

Lab pH (s.u.).....	7.10
Lab Conductivity, umhos/cm @ 25C....	552
Lab Resistivity, ohm-m.....	18.1
Total Dissolved Solids (180C), mg/L.	462
Total Dissolved Solids (calc), mg/L.	384
Total Suspended Solids, mg/L.....	65000
Settleable Solids, ml/L.....	360
Total Alkalinity as CaC03, mg/L.....	183
Total Hardness as CaC03, mg/L.....	305
Sodium Adsorption Ratio.....	0.40
Fluoride, mg/L.....	0.33
Nitrate, mg/L.....	0.20
Nitrite, mg/L.....	0.04
Ammonia, mg/L.....	0.60

	mg/L	meq/L
Bicarbonate as HC03.....	223	3.66
Carbonate as C03.....	<0.10	<0.01
Chloride.....	9.25	0.26
Sulfate.....	131	2.73
Calcium.....	92.8	4.63
Magnesium.....	18	1.48
Potassium.....	7.31	0.19
Sodium.....	15.9	0.69
Major Cations.....		6.99
Major Anions.....		6.64
Cation/Anion Difference.....		2.52 %

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Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station 5
SITE: 1427
LAB NO: 9617

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/02/92
DATE COLLECTED: 08/29/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.05	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.86	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.006	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.22	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/09/92
ID:	No. 106		
SITE:	1000	DATE RECEIVED:	09/02/92
LAB NO:	9612	DATE COLLECTED:	08/29/92

Lab pH (s.u.).....	8.11
Lab Conductivity, umhos/cm @ 25C....	1660
Lab Resistivity, ohm-m.....	6.02
Total Dissolved Solids (180C), mg/L.	1320
Total Dissolved Solids (calc), mg/L.	1210
Total Suspended Solids, mg/L.....	6
Settleable Solids, ml/L.....	<0.1
Total Alkalinity as CaC03, mg/L.....	161
Total Hardness as CaC03, mg/L.....	397
Sodium Adsorption Ratio.....	5.48
Fluoride, mg/L.....	0.63
Nitrate, mg/L.....	1.40
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.10

	mg/L	meq/L
Bicarbonate as HC03.....	197	3.23
Carbonate as C03.....	<0.10	<0.01
Chloride.....	55.3	1.56
Sulfate.....	662	13.8
Calcium.....	111	5.52
Magnesium.....	29.4	2.42
Potassium.....	10.1	0.26
Sodium.....	251	10.9
Major Cations.....		19.1
Major Anions.....		18.7
Cation/Anion Difference.....		1.14 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: No. 106
SITE: 1000
LAB NO: 9612

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/02/92
DATE COLLECTED: 08/29/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.40	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/09/92
ID:	No. 107		
SITE:	1126	DATE RECEIVED:	09/02/92
LAB NO:	9613	DATE COLLECTED:	08/29/92

Lab pH (s.u.).....	7.64
Lab Conductivity, umhos/cm @ 25C....	1470
Lab Resistivity, ohm-m.....	6.81
Total Dissolved Solids (180C), mg/L.	1260
Total Dissolved Solids (calc), mg/L.	1210
Total Suspended Solids, mg/L.....	20
Settleable Solids, ml/L.....	0.2
Total Alkalinity as CaC03, mg/L.....	235
Total Hardness as CaC03, mg/L.....	349
Sodium Adsorption Ratio.....	6.41
Fluoride, mg/L.....	0.70
Nitrate, mg/L.....	2.07
Nitrite, mg/L.....	0.02
Ammonia, mg/L.....	0.66

	mg/L	meq/L
Bicarbonate as HC03.....	287	4.7
Carbonate as C03.....	<0.10	<0.01
Chloride.....	51	1.44
Sulfate.....	616	12.8
Calcium.....	89	4.44
Magnesium.....	31	2.55
Potassium.....	9.53	0.24
Sodium.....	275	12
Major Cations.....		19.2
Major Anions.....		19
Cation/Anion Difference.....		0.65 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: No. 107
SITE: 1126
LAB NO: 9613

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/02/92
DATE COLLECTED: 08/29/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.40	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 1, 1989

Job No.: 59 9945

Date Rec'd: August 16, 1989

Date Sampled: ------

Sampled By: ANDALEX RESOURCES, INC.

Andalex Resources
P.O. Box 902
Price UT 84501

Sample ID: ANDALEX RESOURCES, INC.

SAMPLE #2
Rec'd 0800 hr.
no sampling time
Above Minesite

SAMPLER #1 ABOVE MINESITE
STICK 7"
PH 7.5
CONDUCTIVITY 810
TEMP N/A

WATER ANALYSIS

Aluminum	2.90	mg/l	Hardness, Total	581	mg/l CaCO3
Alk., Bicarbonate	693	mg/l HCO3	Iron	10.60	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Lead	0.050<	mg/l
Anions, Total	12.83	meq/l	Magnesium	39.30	mg/l
Barium	0.23	mg/l	Manganese	5.30	mg/l
Boron	0.29	mg/l	Nickel	0.04	mg/l
Cadmium	0.002<	mg/l	Potassium	16.90	mg/l
Calcium	167.9	mg/l	Silver	0.010<	mg/l
Cations, Total	12.49	meq/l	Sodium	10.10	mg/l
Chloride	25.0	mg/l	Solids, Dissolved	650.0	mg/l
Chromium	0.02<	mg/l	Solids, Settleable	40.0 >	mg/l
Copper	0.060	mg/l	Solids, Suspended	75380.0	mg/l

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 1, 1989

Job No.: 59 9945

Date Rec'd: August 16, 1989

Date Sampled: ------

Sampled By: ANDALEX RESOURCES, INC.

Sample ID: ANDALEX RESOURCES, INC.

SAMPLE #2
Rec'd 0800 hr.
no sampling time

Andalex Resources
P.O. Box 902
Price UT 84501

WATER ANALYSIS

Sulfate	70.0	mg/l	Zinc	0.21	mg/l

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 1, 1989

Job No.: 59 9944

Date Rec'd: August 16, 1989

Date Sampled: ------

Sampled By: ANDALEX RESOURCES, INC.

Andalex Resources
P.O. Box 902
Price UT 84501

Sample ID: ANDALEX RESOURCES, INC.

SAMPLE #1
Rec'd 0800 hr.
no sampling time
Below Minesite

SAMPLER #3 BELOW MINESITE
STICK 11"
pH 7.3
CONDUCTIVITY 680
TEMP N/A

WATER ANALYSIS

Aluminum	0.50	mg/l	Hardness, Total	487	mg/l CaCO3
Alk., Bicarbonate	542	mg/l HCO3	Iron	0.58	mg/l
Alk., Carbonate	1<	mg/l CaCO3	Lead	0.050<	mg/l
Anions, Total	10.63	meq/l	Magnesium	36.20	mg/l
Barium	0.10	mg/l	Manganese	2.90	mg/l
Boron	0.50	mg/l	Nickel	0.04	mg/l
Cadmium	0.002<	mg/l	Potassium	13.40	mg/l
Calcium	135.3	mg/l	Silver	0.010<	mg/l
Cations, Total	10.83	meq/l	Sodium	17.30	mg/l
Chloride	40.0	mg/l	Solids, Dissolved	1010.0	mg/l
Chromium	0.02<	mg/l	Solids, Settleable	40.0>	mg/l
Copper	0.020	mg/l	Solids, Suspended	90000.0>	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 1, 1989

Job No.: 59 9944

Sample ID: ANDALEX RESOURCES, INC.

Date Rec'd: August 16, 1989

SAMPLE #1
Rec'd 0800 hr.
no sampling time

Date Sampled: ------

Sampled By: ANDALEX RESOURCES, INC.

Andalex Resources
P.O. Box 902
Price UT 84501

WATER ANALYSIS

Sulfate	80.0	mg/l	Zinc	0.17	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10575

Date Rec'd: August 29, 1990

Date Sampled: July 27, 1990

Sampled By: Andalex

Andalex Resources
P.O. Box 902
Price UT 84501

Sample ID:

SAMPLE #1 (ABOVE OLD MINE)
SITE NEAR DRILL
HOLE 402
(Sample was received in a one quart glass bottle)

WATER ANALYSIS

Alk., Bicarbonate 10-09-90	383	mg/l HCO3	Magnesium 10-09-90	21.50	mg/l
Alk., Carbonate 10-09-90	1<	mg/l CaCO3	Manganese 10-09-90	0.01<	mg/l
Calcium 10-09-90	135.6	mg/l	Potassium 10-09-90	8.67	mg/l
Cations, Total	9.53	meq/l	Sodium 10-09-90	17.60	mg/l
Chloride 10-15-90	15.0	mg/l	Solids, Dissolved 10-24-90	2849.0	mg/l
Hardness, Total	427	mg/l CaCO3	Sulfate 10-18-90	145.0	mg/l
Iron 10-09-90	3.08	mg/l			

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10576

Date Rec'd: August 29, 1990

Date Sampled: July 27, 1990

Sampled By: Andalex

Andalex Resources
P.O. Box 902
Price UT 84501

Sample ID:

SAMPLE #4 (SAMPLED STATION)
2ND SITE DOWN FROM MINE

(Sampled was received in a one quart glass bottle)

WATER ANALYSIS

Alk., Bicarbonate 10-15-90	216	mg/l HCO3	Magnesium 10-09-90	85.20	mg/l
Alk., Carbonate 10-15-90	1<	mg/l CaCO3	Manganese 10-09-90	0.52	mg/l
Calcium 10-09-90	402.5	mg/l	Potassium 10-09-90	24.96	mg/l
Cations, Total	29.65	meq/l	Sodium 10-09-90	43.90	mg/l
Hardness, Total	1356	mg/l CaCO3	Solids, Dissolved 10-24-90	2313.0	mg/l
			Sulfate 10-18-90	290.0	mg/l

ANALYST: E. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	Station #5		
SITE:	1230	DATE RECEIVED:	06/05/92
LAB NO:	F8929	DATE COLLECTED:	05/30/92

Lab pH (s.u.).....	7.59
Lab Conductivity, umhos/cm @ 25C....	890
Lab Resistivity, ohm-m.....	11.2
Total Dissolved Solids (180C), mg/L.	808
Total Dissolved Solids (calc), mg/L.	669
Total Alkalinity as CaC03, mg/L.....	173
Total Hardness as CaC03, mg/L.....	449
Sodium Adsorption Ratio.....	0.73
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.32
Sulfide as H2S, mg/L.....	*
Nitrate, mg/L.....	*
Nitrite, mg/L.....	*
Ammonia, mg/L.....	*

	mg/L	meq/L
Bicarbonate as HC03.....	211	3.46
Carbonate as C03.....	0	0
Chloride.....	20.4	0.58
Sulfate.....	367	7.65
Calcium.....	132	6.57
Magnesium.....	29.3	2.41
Potassium.....	12.9	0.33
Sodium.....	35.7	1.55
Major Cations.....		10.9
Major Anions.....		11.7
Cation/Anion Difference.....		3.63 %

* Insufficient sample.

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CLIENT:	Andalex Resources	DATE REPORTED:	07/08/92
ID:	Station #5		
SITE:	1230	DATE RECEIVED:	06/05/92
LAB NO:	F8929	DATE COLLECTED:	05/30/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.26	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	ND	<0.05
Manganese (Mn).....	ND	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.04	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

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CLIENT:	Andalex	DATE REPORTED:	08/05/92
ID:	101		
SITE:	0940	DATE RECEIVED:	07/21/92
LAB NO:	F9288	DATE COLLECTED:	07/11/92

Lab pH (s.u.).....	7.13
Lab Conductivity, umhos/cm @ 25C....	1090
Lab Resistivity, ohm-m.....	9.19
Total Dissolved Solids (180C), mg/L.	826
Total Dissolved Solids (calc), mg/L.	749
Total Suspended Solids, mg/L.....	49200
Settleable Solids, ml/L.....	500
Total Alkalinity as CaC03, mg/L.....	194
Total Hardness as CaC03, mg/L.....	201
Sodium Adsorption Ratio.....	5.47
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.47
Nitrate, mg/L.....	0.77
Nitrite, mg/L.....	0.09
Ammonia, mg/L.....	0.03

	mg/L	meq/L
Bicarbonate as HC03.....	237	3.88
Carbonate as C03.....	<0.10	<0.01
Chloride.....	17.1	0.48
Sulfate.....	360	7.49
Calcium.....	57.0	2.84
Magnesium.....	14.3	1.18
Potassium.....	6.65	0.17
Sodium.....	178	7.75
Major Cations.....		11.9
Major Anions.....		11.9
Cation/Anion Difference.....		0.13 %

* Samples arrived at lab 10 days after sampling.
* Nutrient and Metal samples unpreserved.

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CLIENT:	Andalex	DATE REPORTED:	08/05/92
ID:	101		
SITE:	0940	DATE RECEIVED:	07/21/92
LAB NO:	F9288	DATE COLLECTED:	07/11/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.027	<0.005
Cadmium (Cd).....	0.004	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	0.10	<0.02
Selenium (Se).....	0.005	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	22.2	<0.1
Boron (B).....	0.44	<0.01
Barium (Ba).....	1.9	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.07	<0.01
Iron (Fe).....	19.2	<0.05
Manganese (Mn).....	3.58	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.14	<0.01
Zinc (Zn).....	0.09	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

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CLIENT:	Andalex	DATE REPORTED:	08/05/92
ID:	102		
SITE:	1200	DATE RECEIVED:	07/21/92
LAB NO:	F9289	DATE COLLECTED:	07/11/92

Lab pH (s.u.).....	6.65
Lab Conductivity, umhos/cm @ 25C....	549
Lab Resistivity, ohm-m.....	18.2
Total Dissolved Solids (180C), mg/L.	426
Total Dissolved Solids (calc), mg/L.	362
Total Suspended Solids, mg/L.....	252
Settleable Solids, ml/L.....	0.2
Total Alkalinity as CaC03, mg/L.....	61.6
Total Hardness as CaC03, mg/L.....	210
Sodium Adsorption Ratio.....	1.06
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.47
Nitrate, mg/L.....	3.78
Nitrite, mg/L.....	0.15
Ammonia, mg/L.....	0.24

	mg/L	meq/L
Bicarbonate as HC03.....	75	1.23
Carbonate as C03.....	<0.10	<0.01
Chloride.....	17.5	0.49
Sulfate.....	186	3.88
Calcium.....	60.9	3.04
Magnesium.....	14.1	1.16
Potassium.....	11.3	0.29
Sodium.....	35.2	1.53
Major Cations.....		6.02
Major Anions.....		5.87
Cation/Anion Difference.....		1.27 %

* Samples arrived at lab 10 days after sampling.
* Nutrient and Metal samples unpreserved.

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CLIENT:	Andalex	DATE REPORTED:	08/05/92
ID:	102		
SITE:	1200	DATE RECEIVED:	07/21/92
LAB NO:	F9289	DATE COLLECTED:	07/11/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	1.6	<0.1
Boron (B).....	0.26	<0.01
Barium (Ba).....	ND	<0.5
Chromium (Cr).....	0.14	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	14.3	<0.05
Manganese (Mn).....	0.34	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.04	<0.01
Zinc (Zn).....	ND	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex	DATE REPORTED:	08/05/92
ID:	103		
SITE:	1256	DATE RECEIVED:	07/21/92
LAB NO:	F9290	DATE COLLECTED:	07/11/92

Lab pH (s.u.).....	7.35
Lab Conductivity, umhos/cm @ 25C....	655
Lab Resistivity, ohm-m.....	15.3
Total Dissolved Solids (180C), mg/L.	490
Total Dissolved Solids (calc), mg/L.	416
Total Suspended Solids, mg/L.....	41700
Settleable Solids, ml/L.....	660
Total Alkalinity as CaC03, mg/L.....	146
Total Hardness as CaC03, mg/L.....	139
Sodium Adsorption Ratio.....	3.29
Total Ortho-phosphate, mg/L.....	<0.02
Fluoride, mg/L.....	0.47
Nitrate, mg/L.....	0.93
Nitrite, mg/L.....	0.11
Ammonia, mg/L.....	0.67

	mg/L	meq/L
Bicarbonate as HC03.....	178	2.92
Carbonate as C03.....	<0.10	<0.01
Chloride.....	10.3	0.29
Sulfate.....	172	3.58
Calcium.....	41.4	2.07
Magnesium.....	8.60	0.71
Potassium.....	6.65	0.17
Sodium.....	89.2	3.88
Major Cations.....		6.82
Major Anions.....		6.86
Cation/Anion Difference.....		0.26 %

* Samples arrived at lab 10 days after sampling.
* Nutrient and Metal samples unpreserved.

Inter·Mountain Laboratories, Inc.

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CLIENT:	Andalex	DATE REPORTED:	08/05/92
ID:	103		
SITE:	1256	DATE RECEIVED:	07/21/92
LAB NO:	F9290	DATE COLLECTED:	07/11/92

Trace Metals by AA (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	0.004	<0.002
Mercury (Hg).....	ND	<0.001
Lead (Pb).....	0.04	<0.02
Selenium (Se).....	0.009	<0.005

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	52.7	<0.1
Boron (B).....	0.35	<0.01
Barium (Ba).....	2.4	<0.5
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.06	<0.01
Iron (Fe).....	38.5	<0.05
Manganese (Mn).....	4.55	<0.02
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	0.14	<0.01
Zinc (Zn).....	0.10	<0.01

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources Inc.	DATE REPORTED:	10/09/92
ID:	Stream Station #3		
SITE:	1019	DATE RECEIVED:	09/10/92
LAB NO:	9654	DATE COLLECTED:	09/07/92

Lab pH (s.u.).....	7.46
Lab Conductivity, umhos/cm @ 25C....	485
Lab Resistivity, ohm-m.....	20.6
Total Dissolved Solids (180C), mg/L.	332
Total Dissolved Solids (calc), mg/L.	271
Total Suspended Solids, mg/L.....	3970
Settleable Solids, ml/L.....	1.4
Total Alkalinity as CaC03, mg/L.....	107
Total Hardness as CaC03, mg/L.....	191
Sodium Adsorption Ratio.....	0.59
Fluoride, mg/L.....	0.66
Nitrate, mg/L.....	2.13
Nitrite, mg/L.....	0.11
Ammonia, mg/L.....	0.09

	mg/L	meq/L
Bicarbonate as HC03.....	131	2.14
Carbonate as C03.....	<0.10	<0.01
Chloride.....	10.9	0.31
Sulfate.....	100	2.09
Calcium.....	57.7	2.88
Magnesium.....	11.5	0.95
Potassium.....	6.87	0.18
Sodium.....	18.8	0.82
Major Cations.....		4.82
Major Anions.....		4.71
Cation/Anion Difference.....		1.19 %

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CLIENT: Andalex Resources Inc.
ID: Stream Station #3
SITE: 1019
LAB NO: 9654

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/10/92
DATE COLLECTED: 09/07/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.006	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.010	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.22	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	0.3	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources Inc.	DATE REPORTED:	10/09/92
ID:	Stream Station #5		
SITE:	1059	DATE RECEIVED:	09/10/92
LAB NO:	9655	DATE COLLECTED:	09/07/92

Lab pH (s.u.)	7.30	
Lab Conductivity, umhos/cm @ 25C	510	
Lab Resistivity, ohm-m	19.6	
Total Dissolved Solids (180C), mg/L	300	
Total Dissolved Solids (calc), mg/L	317	
Total Suspended Solids, mg/L	11500	
Settleable Solids, ml/L	56	
Total Alkalinity as CaC03, mg/L	108	
Total Hardness as CaC03, mg/L	194	
Sodium Adsorption Ratio	1.06	
Fluoride, mg/L		*
Nitrate, mg/L	3.58	
Nitrite, mg/L	0.03	
Ammonia, mg/L	0.88	

	mg/L	meq/L
Bicarbonate as HC03	132	2.16
Carbonate as C03	<0.10	<0.01
Chloride	19.5	0.55
Sulfate	115	2.4
Calcium	54.3	2.71
Magnesium	14.2	1.17
Potassium	14.3	0.37
Sodium	34	1.48
Major Cations		5.73
Major Anions		5.63
Cation/Anion Difference		0.88 %

* Insufficient sample for analysis.

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CLIENT: Andalex Resources Inc.
ID: Stream Station #5
SITE: 1059
LAB NO: 9655

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/10/92
DATE COLLECTED: 09/07/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.008	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.09	<0.01
Iron (Fe).....	0.13	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.006	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.1	<0.1
Boron (B).....	0.19	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.03	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	0.7	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
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CLIENT:	Andalex Resources Inc.	DATE REPORTED:	10/09/92
ID:	Stream Station # 9		
SITE:	1145	DATE RECEIVED:	09/10/92
LAB NO:	9656	DATE COLLECTED:	09/07/92

Lab pH (s.u.).....	7.60
Lab Conductivity, umhos/cm @ 25C....	723
Lab Resistivity, ohm-m.....	13.8
Total Dissolved Solids (180C), mg/L.	410
Total Dissolved Solids (calc), mg/L.	516
Total Suspended Solids, mg/L.....	50800
Settleable Solids, ml/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	211
Total Hardness as CaC03, mg/L.....	162
Sodium Adsorption Ratio.....	3.77
Fluoride, mg/L.....	0.50
Nitrate, mg/L.....	0.93
Nitrite, mg/L.....	0.02
Ammonia, mg/L.....	0.11

	mg/L	meq/L
Bicarbonate as HC03.....	257	4.22
Carbonate as C03.....	<0.10	<0.01
Chloride.....	77.1	2.18
Sulfate.....	123	2.57
Calcium.....	45.9	2.29
Magnesium.....	11.6	0.96
Potassium.....	20.3	0.52
Sodium.....	111	4.81
Major Cations.....		8.58
Major Anions.....		9.03
Cation/Anion Difference.....		2.58 % *

*Insufficient sample to reanalyze for cation/anion balance.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
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CLIENT: Andalex Resources Inc.
ID: Stream Station # 9
SITE: 1145
LAB NO: 9656

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/10/92
DATE COLLECTED: 09/07/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	0.002	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	0.59	<0.05
Mercury (Hg).....	0.001	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.006	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	0.6	<0.1
Boron (B).....	0.21	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.08	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	1.2	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources Inc.	DATE REPORTED:	10/09/92
ID:	Stream Station #0		
SITE:	1200	DATE RECEIVED:	09/10/92
LAB NO:	9657	DATE COLLECTED:	09/07/92

Lab pH (s.u.)	7.36
Lab Conductivity, umhos/cm @ 25C	738
Lab Resistivity, ohm-m	13.6
Total Dissolved Solids (180C), mg/L	512
Total Dissolved Solids (calc), mg/L	455
Total Suspended Solids, mg/L	268
Settleable Solids, ml/L	<0.10
Total Alkalinity as CaC03, mg/L	94.4
Total Hardness as CaC03, mg/L	232
Sodium Adsorption Ratio	1.66
Fluoride, mg/L	0.48
Nitrate, mg/L	3.14
Nitrite, mg/L	0.12
Ammonia, mg/L	0.05

	mg/L	meq/L
Bicarbonate as HC03	115	1.89
Carbonate as C03	<0.10	<0.01
Chloride	12.9	0.36
Sulfate	238	4.95
Calcium	69.3	3.46
Magnesium	14.3	1.17
Potassium	6.73	0.17
Sodium	58	2.52
Major Cations		7.33
Major Anions		7.2
Cation/Anion Difference		0.85 %

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CLIENT: Andalex Resources Inc.
ID: Stream Station #8
SITE: 1200
LAB NO: 9657

DATE REPORTED: 10/09/92
DATE RECEIVED: 09/10/92
DATE COLLECTED: 09/07/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.009	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.22	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	0.04	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources Inc.	DATE REPORTED:	10/09/92
ID:	No. 108		
SITE:	0928	DATE RECEIVED:	09/10/92
LAB NO:	9653	DATE COLLECTED:	09/07/92

Lab pH (s.u.).....	7.77
Lab Conductivity, umhos/cm @ 25C....	3630
Lab Resistivity, ohm-m.....	2.76
Total Dissolved Solids (180C), mg/L.	2900
Total Dissolved Solids (calc), mg/L.	2730
Total Suspended Solids, mg/L.....	528
Settleable Solids, ml/L.....	2.9
Total Alkalinity as CaC03, mg/L.....	270
Total Hardness as CaC03, mg/L.....	848
Sodium Adsorption Ratio.....	8.20
Fluoride, mg/L.....	0.45
Nitrate, mg/L.....	0.14
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.82

	mg/L	meq/L
Bicarbonate as HC03.....	329	5.4
Carbonate as C03.....	<0.10	<0.01
Chloride.....	155	4.36
Sulfate.....	1550	32.3
Calcium.....	221	11.0
Magnesium.....	72.1	5.93
Potassium.....	17.8	0.46
Sodium.....	549	23.9
Major Cations.....		41.3
Major Anions.....		42.1
Cation/Anion Difference.....		0.95 %

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Farmington, New Mexico 87401

CLIENT: Andalex Resources Inc. DATE REPORTED: 10/09/92
ID: No. 108
SITE: 0928 DATE RECEIVED: 09/10/92
LAB NO: 9653 DATE COLLECTED: 09/07/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	0.002	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.007	<0.005

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.66	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	Stream Station # 9		
SITE:	0940	DATE RECEIVED:	09/23/92
LAB NO:	9704	DATE COLLECTED:	09/18/92

Lab pH (s.u.).....	7.77
Lab Conductivity, umhos/cm @ 25C....	669
Lab Resistivity, ohm-m.....	14.9
Total Dissolved Solids (180C), mg/L.	442
Total Dissolved Solids (calc), mg/L.	428
Total Suspended Solids, mg/L.....	26700
Settleable Solids, mg/L.....	500
Total Alkalinity as CaC03, mg/L.....	125
Total Hardness as CaC03, mg/L.....	146
Sodium Adsorption Ratio.....	3.37
Fluoride, mg/L.....	0.38
Nitrate, mg/L.....	0.66
Nitrite, mg/L.....	0.07
Ammonia, mg/L.....	1.07

	mg/L	meq/L
Bicarbonate as HC03.....	153	2.5
Carbonate as C03.....	<0.10	<0.01
Chloride.....	15.7	0.44
Sulfate.....	184	3.84
Calcium.....	45	2.24
Magnesium.....	8.2	0.67
Potassium.....	5.99	0.15
Sodium.....	93.7	4.08
Major Cations.....		7.15
Major Anions.....		6.84
Cation/Anion Difference.....		2.2 % *

* Insufficient sample for balance.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station # 9
SITE: 0940
LAB NO: 9704

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/18/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	0.04	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.005	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.21	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	No. 109		
SITE:	0915	DATE RECEIVED:	09/23/92
LAB NO:	9702	DATE COLLECTED:	09/18/92

Lab pH (s.u.).....	7.87
Lab Conductivity, umhos/cm @ 25C....	1250
Lab Resistivity, ohm-m.....	7.99
Total Dissolved Solids (180C), mg/L.	928
Total Dissolved Solids (calc), mg/L.	900
Total Suspended Solids, mg/L.....	8
Settleable Solids, mg/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	159
Total Hardness as CaC03, mg/L.....	240
Sodium Adsorption Ratio.....	5.98
Fluoride, mg/L.....	0.58
Nitrate, mg/L.....	1.26
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.11

	mg/L	meq/L
Bicarbonate as HC03.....	194	3.18
Carbonate as C03.....	<0.10	<0.01
Chloride.....	42.6	1.2
Sulfate.....	459	9.55
Calcium.....	65.4	3.27
Magnesium.....	18.6	1.53
Potassium.....	6.38	0.16
Sodium.....	213	9.25
Major Cations.....		14.2
Major Anions.....		14
Cation/Anion Difference.....		0.64 %

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2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: No. 109
SITE: 0915
LAB NO: 9702

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/18/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	0.002	<0.002
Chromium (Cr).....	0.04	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	0.005	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.005	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.31	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	No. 110		
SITE:	1000	DATE RECEIVED:	09/23/92
LAB NO:	9703	DATE COLLECTED:	09/18/92

Lab pH (s.u.).....	7.71
Lab Conductivity, umhos/cm @ 25C....	1480
Lab Resistivity, ohm-m.....	6.78
Total Dissolved Solids (180C), mg/L.	1130
Total Dissolved Solids (calc), mg/L.	1090
Total Suspended Solids, mg/L.....	67
Settleable Solids, mg/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	76.6
Total Hardness as CaC03, mg/L.....	230
Sodium Adsorption Ratio.....	7.74
Fluoride, mg/L.....	0.70
Nitrate, mg/L.....	3.58
Nitrite, mg/L.....	0.09
Ammonia, mg/L.....	0.24

	mg/L	meq/L
Bicarbonate as HC03.....	93.3	1.53
Carbonate as C03.....	<0.10	<0.01
Chloride.....	58.3	1.65
Sulfate.....	629	13.1
Calcium.....	65.2	3.25
Magnesium.....	16.4	1.35
Potassium.....	8.21	0.21
Sodium.....	270	11.7
Major Cations.....		16.6
Major Anions.....		16.5
Cation/Anion Difference.....		0.08 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: No. 110
SITE: 1000
LAB NO: 9703

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/18/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	0.009	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	0.04	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.010	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.31	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	Stream Station #1		
SITE:	1400	DATE RECEIVED:	09/23/92
LAB NO:	9709	DATE COLLECTED:	09/20/92

Lab pH (s.u.).....	7.61
Lab Conductivity, umhos/cm @ 25C....	397
Lab Resistivity, ohm-m.....	25.2
Total Dissolved Solids (180C), mg/L.	282
Total Dissolved Solids (calc), mg/L.	258
Total Suspended Solids, mg/L.....	51700
Settleable Solids, ml/L.....	480
Total Alkalinity as CaC03, mg/L.....	78.1
Total Hardness as CaC03, mg/L.....	189
Sodium Adsorption Ratio.....	0.41
Fluoride, mg/L.....	0.26
Nitrate, mg/L.....	1.71
Nitrite, mg/L.....	0.11
Ammonia, mg/L.....	0.71

	mg/L	meq/L
Bicarbonate as HC03.....	95.2	1.56
Carbonate as C03.....	<0.10	<0.01
Chloride.....	9.23	0.26
Sulfate.....	114	2.37
Calcium.....	57.4	2.87
Magnesium.....	11.2	0.92
Potassium.....	6.38	0.16
Sodium.....	13.1	0.57
Major Cations.....		4.52
Major Anions.....		4.32
Cation/Anion Difference.....		2.27 % *

* Insufficient sample for balance.

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station #1
SITE: 1400
LAB NO: 9709

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/20/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	0.04	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.005	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.19	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	Stream Station #2		
SITE:	1243	DATE RECEIVED:	09/23/92
LAB NO:	9707	DATE COLLECTED:	09/20/92

Lab pH (s.u.).....	7.63
Lab Conductivity, umhos/cm @ 25C....	403
Lab Resistivity, ohm-m.....	24.8
Total Dissolved Solids (180C), mg/L.	286
Total Dissolved Solids (calc), mg/L.	261
Total Suspended Solids, mg/L.....	15900
Settleable Solids, ml/L.....	30
Total Alkalinity as CaC03, mg/L.....	77.7
Total Hardness as CaC03, mg/L.....	157
Sodium Adsorption Ratio.....	0.80
Fluoride, mg/L.....	0.24
Nitrate, mg/L.....	1.89
Nitrite, mg/L.....	0.18
Ammonia, mg/L.....	1.08

	mg/L	meq/L
Bicarbonate as HC03.....	94.6	1.55
Carbonate as C03.....	<0.10	<0.01
Chloride.....	15.7	0.44
Sulfate.....	111	2.31
Calcium.....	48.3	2.41
Magnesium.....	8.95	0.74
Potassium.....	7.69	0.2
Sodium.....	23	1
Major Cations.....		4.35
Major Anions.....		4.45
Cation/Anion Difference.....		1.21 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station #2
SITE: 1243
LAB NO: 9707

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/20/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	0.003	<0.002
Chromium (Cr).....	0.04	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.005	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.15	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	Stream Station #5		
SITE:	1340	DATE RECEIVED:	09/23/92
LAB NO:	9708	DATE COLLECTED:	09/20/92

Lab pH (s.u.).....	7.60
Lab Conductivity, umhos/cm @ 25C....	396
Lab Resistivity, ohm-m.....	25.3
Total Dissolved Solids (180C), mg/L.	290
Total Dissolved Solids (calc), mg/L.	260
Total Suspended Solids, mg/L.....	17800
Settleable Solids, ml/L.....	400
Total Alkalinity as CaC03, mg/L.....	73.6
Total Hardness as CaC03, mg/L.....	158
Sodium Adsorption Ratio.....	0.86
Fluoride, mg/L.....	0.29
Nitrate, mg/L.....	2.82
Nitrite, mg/L.....	0.10
Ammonia, mg/L.....	0.87

	mg/L	meq/L
Bicarbonate as HC03.....	89.7	1.47
Carbonate as C03.....	<0.10	<0.01
Chloride.....	10.9	0.31
Sulfate.....	116	2.42
Calcium.....	47.4	2.36
Magnesium.....	9.73	0.8
Potassium.....	7.04	0.18
Sodium.....	24.9	1.08
Major Cations.....		4.43
Major Anions.....		4.41
Cation/Anion Difference.....		0.23 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: Stream Station #5
SITE: 1340
LAB NO: 9708

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/20/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	0.05	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.005	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.17	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/29/92
ID:	Stream Station #5		
SITE:	1340	DATE RECEIVED:	09/23/92
LAB NO:	9708	DATE COLLECTED:	09/20/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	0.05	<0.02
Copper (Cu).....	0.02	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.005	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.17	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	Stream Station #8		
SITE:	1054	DATE RECEIVED:	09/23/92
LAB NO:	9706	DATE COLLECTED:	09/20/92

Lab pH (s.u.).....	7.68
Lab Conductivity, umhos/cm @ 25C....	480
Lab Resistivity, ohm-m.....	20.8
Total Dissolved Solids (180C), mg/L.	326
Total Dissolved Solids (calc), mg/L.	288
Total Suspended Solids, mg/L.....	206000
Settleable Solids, ml/L.....	800
Total Alkalinity as CaC03, mg/L.....	122
Total Hardness as CaC03, mg/L.....	145
Sodium Adsorption Ratio.....	1.32
Fluoride, mg/L.....	0.21
Nitrate, mg/L.....	0.70
Nitrite, mg/L.....	0.09
Ammonia, mg/L.....	0.76

	mg/L	meq/L
Bicarbonate as HC03.....	149	2.44
Carbonate as C03.....	<0.10	<0.01
Chloride.....	4.2	0.12
Sulfate.....	113	2.36
Calcium.....	42.6	2.12
Magnesium.....	9.43	0.78
Potassium.....	8.28	0.21
Sodium.....	36.6	1.59
Major Cations.....		4.7
Major Anions.....		4.97
Cation/Anion Difference.....		2.81 % *

* Insufficient sample for balance.

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
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CLIENT: Andalex Resources
ID: Stream Station #8
SITE: 1054
LAB NO: 9706

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/20/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	0.05	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.05	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.17	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	0.5	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources	DATE REPORTED:	10/19/92
ID:	No. 111		
SITE:	1006	DATE RECEIVED:	09/23/92
LAB NO:	9705	DATE COLLECTED:	09/20/92

Lab pH (s.u.).....	8.09
Lab Conductivity, umhos/cm @ 25C....	2500
Lab Resistivity, ohm-m.....	4
Total Dissolved Solids (180C), mg/L.	2140
Total Dissolved Solids (calc), mg/L.	2110
Total Suspended Solids, mg/L.....	10
Settleable Solids, mg/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	297
Total Hardness as CaC03, mg/L.....	675
Sodium Adsorption Ratio.....	7.28
Fluoride, mg/L.....	0.42
Nitrate, mg/L.....	0.10
Nitrite, mg/L.....	<0.02
Ammonia, mg/L.....	0.01

	mg/L	meq/L
Bicarbonate as HC03.....	362	5.93
Carbonate as C03.....	<0.10	<0.01
Chloride.....	103	2.92
Sulfate.....	1150	23.9
Calcium.....	171	8.51
Magnesium.....	60.7	4.99
Potassium.....	13.2	0.34
Sodium.....	435	18.9
Major Cations.....		32.8
Major Anions.....		32.7
Cation/Anion Difference.....		0.03 %

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT: Andalex Resources
ID: No. 111
SITE: 1006
LAB NO: 9705

DATE REPORTED: 10/19/92
DATE RECEIVED: 09/23/92
DATE COLLECTED: 09/20/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	0.06	<0.02
Copper (Cu).....	ND	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.03	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	ND	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Boron (B).....	0.55	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.5

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	11/24/92
ID:	Stream Station #1		
SITE:	Smoky Mountain	DATE RECEIVED:	11/05/92
LAB NO:	F1270	DATE COLLECTED:	11/01/92

Lab pH (s.u.).....	7.54
Lab Conductivity, umhos/cm @ 25C....	729
Lab Resistivity, ohm-m.....	13.7
Total Dissolved Solids (180C), mg/L.	294
Total Dissolved Solids (calc), mg/L.	268
Total Suspended Solids, mg/L.....	294
Settleable Solids, ml/L.....	20
Total Alkalinity as CaC03, mg/L.....	119
Total Hardness as CaC03, mg/L.....	181
Sodium Adsorption Ratio.....	0.60
Total Ortho-Phosphate, mg/L.....	0.04
Fluoride, mg/L.....	0.21
Nitrate, mg/L.....	0.75
Nitrite, mg/L.....	0.20
Ammonia, mg/L.....	0.84

	mg/L	meq/L
Bicarbonate as HC03.....	146	2.39
Carbonate as C03.....	<0.10	<0.01
Chloride.....	14.5	0.41
Sulfate.....	86.8	1.81
Calcium.....	60.7	3.03
Magnesium.....	7.14	0.59
Potassium.....	8.69	0.22
Sodium.....	18.6	0.81
Major Cations.....		4.65
Major Anions.....		4.66
Cation/Anion Difference.....		0.11 %

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CLIENT: Andalex Resources, Inc. DATE REPORTED: 11/24/92
ID: Stream Station #1
SITE: Smoky Mountain DATE RECEIVED: 11/05/92
LAB NO: F1270 DATE COLLECTED: 11/01/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Arsenic (As).....	0.005	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.05	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.42	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.02	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Boron (B).....	0.03	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	3.3	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	11/24/92
ID:	Stream Station #2		
SITE:	Smoky Mountain	DATE RECEIVED:	11/05/92
LAB NO:	F1269	DATE COLLECTED:	11/01/92

Lab pH (s.u.).....	7.70
Lab Conductivity, umhos/cm @ 25C....	984
Lab Resistivity, ohm-m.....	10.2
Total Dissolved Solids (180C), mg/L.	374
Total Dissolved Solids (calc), mg/L.	636
Total Suspended Solids, mg/L.....	8760
Settleable Solids, ml/L.....	38
Total Alkalinity as CaC03, mg/L.....	72.9
Total Hardness as CaC03, mg/L.....	394
Sodium Adsorption Ratio.....	1.16
Total Ortho-Phosphate, mg/L.....	0.03
Fluoride, mg/L.....	0.36
Nitrate, mg/L.....	11.95
Nitrite, mg/L.....	0.31
Ammonia, mg/L.....	0.69

	mg/L	meq/L
Bicarbonate as HC03.....	89.1	1.46
Carbonate as C03.....	<0.10	<0.01
Chloride.....	31.2	0.88
Sulfate.....	361	7.51
Calcium.....	111	5.55
Magnesium.....	28.2	2.32
Potassium.....	7.78	0.2
Sodium.....	53	2.31
Major Cations.....		10.4
Major Anions.....		10.7
Cation/Anion Difference.....		1.55 %

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CLIENT: Andalex Resources, Inc. DATE REPORTED: 11/24/92
ID: Stream Station #2
SITE: Smoky Mountain DATE RECEIVED: 11/05/92
LAB NO: F1269 DATE COLLECTED: 11/01/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.10	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	0.007	<0.005
Zinc (Zn).....	0.01	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Boron (B).....	0.12	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	4.2	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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Farmington, New Mexico 87401

CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	11/24/92
ID:	Stream Station # 9		
SITE:	Smoky Mountain	DATE RECEIVED:	11/05/95
LAB NO:	F1267	DATE COLLECTED:	11/01/92

Lab pH (s.u.).....	7.91
Lab Conductivity, umhos/cm @ 25C....	572
Lab Resistivity, ohm-m.....	17.5
Total Dissolved Solids (180C), mg/L.	488
Total Dissolved Solids (calc), mg/L.	333
Total Suspended Solids, mg/L.....	33
Settleable Solids, ml/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	104
Total Hardness as CaC03, mg/L.....	92.2
Sodium Adsorption Ratio.....	3.66
Total Ortho-Phosphate, mg/L.....	0.03
Fluoride, mg/L.....	0.37
Nitrate, mg/L.....	0.89
Nitrite, mg/L.....	0.03
Ammonia, mg/L.....	0.04
Oil & Grease (IR), mg/L.....	<0.25

	mg/L	meq/L
Bicarbonate as HC03.....	127	2.08
Carbonate as C03.....	<0.10	<0.01
Chloride.....	10.9	0.31
Sulfate.....	141	2.94
Calcium.....	30.7	1.53
Magnesium.....	3.77	0.31
Potassium.....	3.3	0.08
Sodium.....	80.7	3.51
Major Cations.....		5.44
Major Anions.....		5.32
Cation/Anion Difference.....		1.06 %

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CLIENT: Andalex Resources, Inc. DATE REPORTED: 11/24/92
ID: Stream Station # 9
SITE: Smoky Mountain DATE RECEIVED: 11/05/95
LAB NO: F1267 DATE COLLECTED: 11/01/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.01	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Boron (B).....	0.04	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter·Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	11/24/92
ID:	Stream Station #8		
SITE:	1240	DATE RECEIVED:	11/05/92
LAB NO:	F1268	DATE COLLECTED:	11/01/92

Lab pH (s.u.).....	8.15
Lab Conductivity, umhos/cm @ 25C....	1070
Lab Resistivity, ohm-m.....	9.34
Total Dissolved Solids (180C), mg/L.	756
Total Dissolved Solids (calc), mg/L.	760
Total Suspended Solids, mg/L.....	27
Settleable Solids, ml/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	152
Total Hardness as CaC03, mg/L.....	160
Sodium Adsorption Ratio.....	6.62
Total Ortho-Phosphate, mg/L.....	0.01
Fluoride, mg/L.....	0.58
Nitrate, mg/L.....	0.87
Nitrite, mg/L.....	0.03
Ammonia, mg/L.....	<0.01
Oil & Grease (IR), mg/L.....	<0.25

	mg/L	meq/L
Bicarbonate as HC03.....	186	3.05
Carbonate as C03.....	<0.10	<0.01
Chloride.....	18.7	0.53
Sulfate.....	396	8.26
Calcium.....	50.9	2.54
Magnesium.....	8.04	0.66
Potassium.....	2.33	0.06
Sodium.....	193	8.38
Major Cations.....		11.6
Major Anions.....		11.8
Cation/Anion Difference.....		0.82 %

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CLIENT: Andalex Resources, Inc. DATE REPORTED: 11/24/92
ID: Stream Station #8
SITE: 1240 DATE RECEIVED: 11/05/92
LAB NO: F1268 DATE COLLECTED: 11/01/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	ND	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.01	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Boron (B).....	0.12	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

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CLIENT:	Andalex Resources, Inc.	DATE REPORTED:	11/24/92
ID:	112		
SITE:	Smoky Mountain	DATE RECEIVED:	11/05/92
LAB NO:	F1266	DATE COLLECTED:	11/01/92

Lab pH (s.u.).....	8.34
Lab Conductivity, umhos/cm @ 25C....	2460
Lab Resistivity, ohm-m.....	4.06
Total Dissolved Solids (180C), mg/L.	1850
Total Dissolved Solids (calc), mg/L.	1860
Total Suspended Solids, mg/L.....	8
Settleable Solids, ml/L.....	<0.10
Total Alkalinity as CaC03, mg/L.....	295
Total Hardness as CaC03, mg/L.....	471
Sodium Adsorption Ratio.....	8.84
Total Ortho-Phosphate, mg/L.....	0.01
Fluoride, mg/L.....	0.52
Nitrate, mg/L.....	0.82
Nitrite, mg/L.....	0.02
Ammonia, mg/L.....	<0.01
Oil & Grease (IR), mg/L	<0.25

	mg/L	meq/L
Bicarbonate as HC03.....	355	5.82
Carbonate as C03.....	2.7	0.09
Chloride.....	90.8	2.56
Sulfate.....	980	20.4
Calcium.....	131	6.55
Magnesium.....	34.9	2.87
Potassium.....	9.2	0.24
Sodium.....	441	19.2
Major Cations.....		28.8
Major Anions.....		28.9
Cation/Anion Difference.....		0.16 %

Inter-Mountain Laboratories, Inc.

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Farmington, New Mexico 87401

CLIENT: Andalex Resources, Inc. DATE REPORTED: 11/24/92
ID: 112
SITE: Smoky Mountain DATE RECEIVED: 11/05/92
LAB NO: F1266 DATE COLLECTED: 11/01/92

Trace Metals by AA (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Aluminum (Al).....	ND	<0.1
Arsenic (As).....	ND	<0.005
Cadmium (Cd).....	ND	<0.002
Chromium (Cr).....	ND	<0.02
Copper (Cu).....	0.01	<0.01
Iron (Fe).....	ND	<0.05
Mercury (Hg).....	ND	<0.001
Manganese (Mn).....	0.02	<0.02
Lead (Pb).....	ND	<0.02
Selenium (Se).....	ND	<0.005
Zinc (Zn).....	0.01	<0.01

Trace Metals by ICAP (Dissolved Concentration), mg/L

	Analytical Result:	Detection Limit:
Boron (B).....	0.43	<0.01
Barium (Ba).....	ND	<0.5
Molybdenum (Mo).....	ND	<0.02
Nickel (Ni).....	ND	<0.01

Trace Metals by ICAP (Total Concentration), mg/L

	Analytical Result:	Detection Limit:
Phosphorus (P).....	ND	<0.1

ND - Analyte "not detected" at the stated detection limit.

Wanda Orso
Water Lab Supervisor

APPENDIX VII-4

SLUG TEST PROCEDURES AND RESULTS

SLUG TEST METHODS

Slug Test Methods

The hydraulic conductivity of the Calico bed was determined by conducting a slug test in monitoring well MW-1. Slug tests are considered to provide adequate information about hydraulic conditions in areas in which studies are not aimed at designing an aquifer exploitation program (Freeze and Cherry, 1979). A slug test consists of rapidly raising or lowering the water level in a well and monitoring the recovery of the water level through time. This was accomplished by rapidly introducing a solid section of stainless steel rod. When the slug is rapidly lowered into the water column, the water rises abruptly.

Prior to testing, the static water level in the well was measured with an electric water-level indicator. A pressure transducer (Instrumentation Northwest, Inc. model PS-7000) with a maximum operating pressure rating of 10 pounds per square inch (23.1 feet of water) was used to measure water levels during the slug test. Pressure data transmitted by the transducer were recorded by a model 21X Micrologger manufactured by Campbell Scientific. The micrologger was programmed to record water level changes to within 0.001 foot at one second intervals.

After pretest measurements and programming of the micrologger, the pressure transducer was lowered into the water to a depth below the lowest point to which the slug would be lowered. The slug was then rapidly lowered into the water column in the monitoring well. As data were collected, water levels displayed by the micrologger were examined to monitor trends and the progress of the test. All data were stored in the final memory of the micrologger and were transferred to diskette storage in the office.

Slug test data collected in the data logger storage module in the field were transferred to diskette by means of a model SC532 interface and associated software manufactured by Campbell Scientific. The data set is stored as a comma-delineated ASCII data file. The contents of the data file was subsequently transferred to computer software (AQTESOLV™, Duffield and Rumbaugh, 1989) designed to aid in the analysis of hydraulic test data. The AQTESOLV™ software greatly reduces analysis time when evaluating slug test data.

The analytical method of Bouwer and Rice (1976) is available in the AQTESOLV™ software for the evaluation of the slug test data obtained from wells penetrating unconfined aquifers. This analytical method was used to estimate the hydraulic conductivity of the screened interval in the monitoring well.

Values of time and actual water-level displacement due to the injection of the slug are displayed on a semi-logarithmic plot; i.e., water-level displacement is represented on a logarithmic y-axis and time is represented on a normal (arithmetic) x-axis. The hydraulic conductivity is estimated from the equation:

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L} \frac{1}{t} \ln \frac{y_o}{y_t} \qquad \text{(Eq. 1)}$$

where:

K =hydraulic conductivity (ft/sec).

r_c =radius of well casing (ft).

r_w =radius of well, including gravel pack (ft).

L =length of well screen (ft).

t =time since test began (sec).

y_o =maximum drawdown during test or drawdown immediately following slug injection (ft).

y_t =drawdown in well at time t (ft).

The function ln (R_e/r_w) is defined according to Bouwer and Rice (1976) by the equation:

$$\ln (R_e/r_w) = \left(\frac{1.1}{\ln (H/r_w)} + \frac{C}{L/r_w}\right)^{-1} \qquad \text{(Eq. 2)}$$

where:

C = dimensionless parameter which is a function of L/r_w; (see Bouwer and Rice, 1976, Figure 3).

H =distance from the water surface to the bottom of the screen (ft).

According to Bouwer and Rice (1976), Equation 1 allows the hydraulic conductivity to be calculated from the water-level change in the well. Because the hydraulic conductivity, casing radius, well radius, the radius over which head loss occurs, and the screen length are constants, (1/t) ln y_o/y_t must also be a constant. Thus, the time drawdown data should approximate a straight line if plotted as ln y_o verses t. The term (1/t) ln y_o/y_t in Equation 1 is obtained from the first straight line segment drawn through the field data.

The AQTESOLV™ software program prompts the user to supply values of well casing radius, drill hole radius, aquifer saturated thickness, well screen length, and static height of water in the well. Time and water level data are read into the software program in the form of ASCII data files, which are down-loaded from the field data logger.

Once the field data and constants are entered, the AQTESOLV™ software generates semi-log plots of the data and automatically fits a straight line to the data according to user-defined weighing. If the entire range of field data do not approximate a straight line, only those early data which form a valid straight-line segment are weighted by the user such that the software package produces the desired straight line approximation through the valid part of the data set.

The straight-line fit produced by AQTESOLV™ automatically determines the value of y_o (y-intercept), an arbitrary value of y_t at time t to solve Equation 1. Based on user-defined values of screen length and drill hole radius, the software determines the value of C to evaluate R_e in Equation 2.

The software generates the straight line approximation by means of a nonlinear weighted least-squares parameter estimation technique, i.e., the Gauss-Newton linearization method (see Duffield and Rumbaugh, 1989, Appendix B). The estimation technique minimizes the difference between observed and estimated values through iterative solution of the system of linearized equations until convergence is achieved.

REFERENCES

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Duffield, G.M. and J.O. Rumbaugh, III. 1989. AQTESOLV™: Aquifer Test Design and Analysis Computer Software. Geraghty and Miller, Inc Environmental Services Modeling Group. Reston, Virginia.

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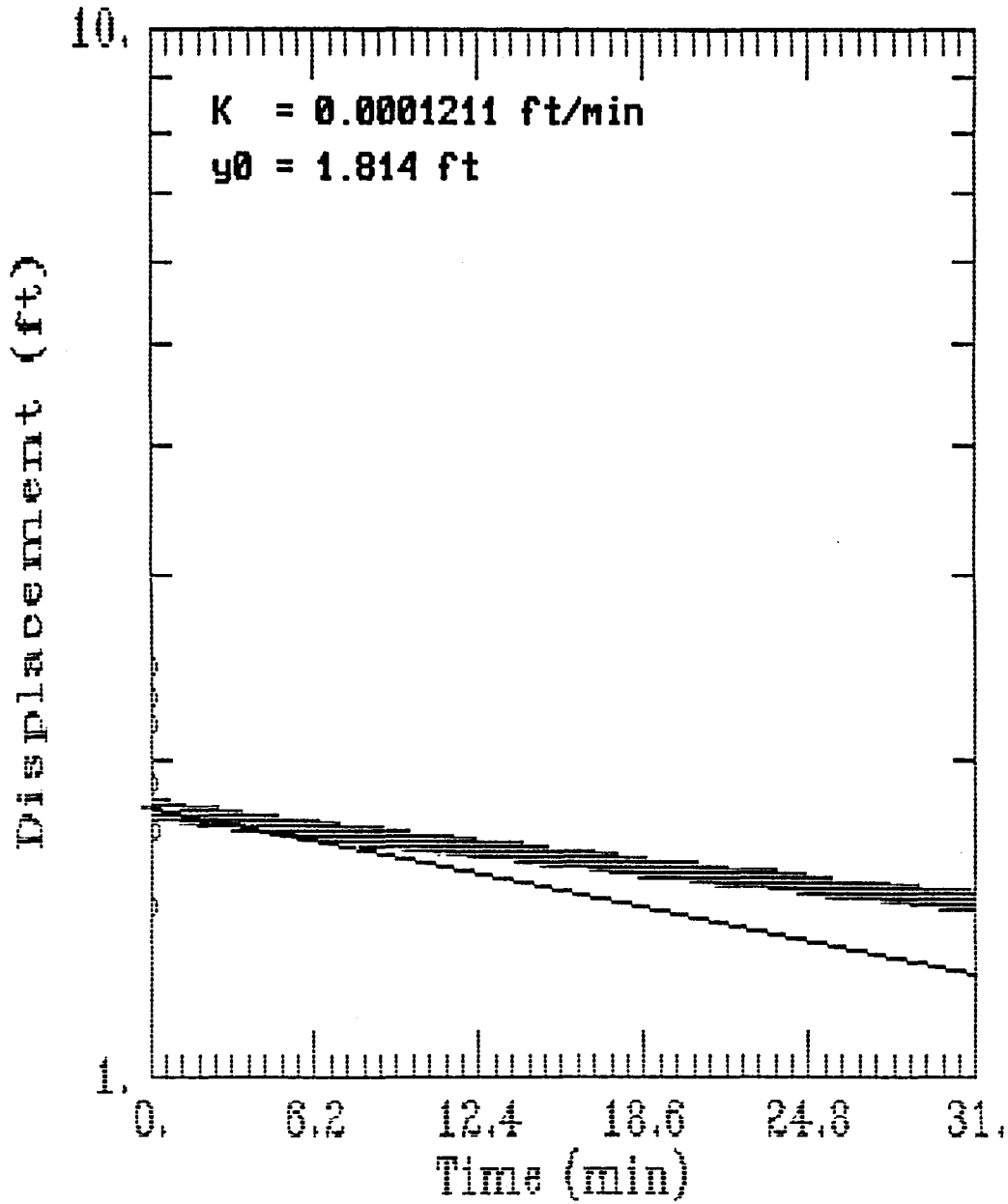
SMOKY HOLLOW MINE MW-1 SLUG TEST



APPENDIX VII-5

SMOKY HOLLOW MINE
SEDIMENTATION AND DRAINAGE CONTROL PLAN

PREPARED BY: DAN W. GUY, P.E.
BLACKHAWK ENGINEERING COMPANY
P.O. BOX 146-H5
HELPER, UTAH 84526

REVISED MARCH 30, 1993

REGISTERED PROFESSIONAL ENGINEER
No 4548
DAN W.
GUY
3/30/93
STATE OF UTAH

SEDIMENTATION AND DRAINAGE CONTROL PLAN
SMOKY HOLLOW MINE
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SEDIMENTATION AND DRAINAGE CONTROL PLAN
SMOKY HOLLOW MINE

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SEDIMENTATION AND DRAINAGE CONTROL PLAN
SMOKY HOLLOW MINE

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SEDIMENTATION AND DRAINAGE CONTROL PLAN
SMOKY HOLLOW MINE

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SMOKY HOLLOW MINE
SEDIMENTATION AND DRAINAGE CONTROL PLAN

1. Introduction

The Sedimentation and Drainage Control Plan for the Smoky Hollow Mine has been designed according to the State of Utah R645 - Coal Mining Rules, September 11, 1992. All design criteria and construction will be certified by a Utah Registered Professional Engineer.

This plan has been divided into the following three sections:

1) Design of Drainage Control Structures for the Proposed Construction
2) Design of Sediment Control Structures
3) Design of Drainage Control Structures for Reclamation

The general surface water control plan for this project will consist of the following:

(a) Undisturbed drainage from the main canyon - Smoky Hollow - above the minesite will be diverted beneath the site via a properly sized culvert, and be discharged below the disturbed area;

(b) Major side drainages into the mine area will also be diverted beneath the disturbed area via properly sized culverts. The upper culverts will tie into the main Smoky Hollow culvert and undisturbed runoff will discharge below the disturbed area as described previously;

(c) The entire disturbed area, and portions of the undisturbed area not diverted, will be drained to the lower end of the property via properly sized ditches and culverts, where runoff will be captured in a sedimentation pond.

DESIGN OF DRAINAGE CONTROL STRUCTURES FOR PROPOSED CONSTRUCTION

Design Parameters

2.1 Precipitation
2.2 Flow
2.3 Velocity
2.4 Drainage Area
2.5 Slope Lengths
2.6 Runoff
2.7 Runoff Curve Numbers
2.8 Culvert Sizing
2.9 Culverts
2.10 Ditches

Table 1 Undisturbed Drainage Area - Runoff Curve Number Summary
2 Surface Water Hydrologic Summary
3 Undisturbed Drainage Summary
4 Undisturbed Culvert Design Parameters
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Design Parameters

2.1 Precipitation

The precipitation-frequency values for the area were taken from "NOAA, Precipitation-Frequency Atlas of the Western U.S., Volume 6", and "Estimated Return Periods for Short Duration Precipitation in Utah", U.S.U page 27. The chart used for selection was Estimated Return Periods for Short Duration Precipitation, Glen Canyon City.

Frequency - Duration	Precipitation
10 year-6 hour	1.52 "
10 year-24 hour	1.93 "
25 year-6 hour	1.80 "
25 year-24 hour	2.32 "
100 year-6 hour	2.23 "
100 year-24 hour	2.94 "

Disturbed ditch and culvert designs for runoff control are based on the 10 year-6 hour event of 1.52" and the 25 year-6 hour event of 1.80", where required. Undisturbed culvert designs are based on the 100 year - 6 hour event of 2.23". The sedimentation pond is designed to contain the runoff from a 10 year-24 hour event of 1.93" as required by the Division. Reclamation designs will be based on the 100 year-6 hour event of 2.23", where applicable for permanent structures. The 6 hour event has been used for most hydrologic design at this site, since it is much more representative of the typical, short-duration, high-intensity storms for the area than is the 24 hour event.

700 #2
742.110 #1

2.2 Flow

Peak flows, flow depths, areas and velocities were calculated using the computer program "Office of Surface Mining Watershed Model", Storm Version 6.20 by Gary E. McIntosh. (Trapezoidal Channel Flow). All flow is based on the SCS - TR55 Method for Type II storms.

Time of concentration of storm events was calculated for each drainage area using the following formula:

$$t_L = \frac{L^{0.8}\,(S+1)^{0.7}}{1900\,Y^{0.5}}$$

where:
- t_c = Time of Concentration (hrs.)
- t_L = Lag Time (hrs.) = 0.6 t_c
- L = Hydraulic Length of Watershed (ft.)
- Y = Average Land Slope (%)
- S = $\frac{1000}{CN}$ -10

2.3 Velocity

Flow velocities for each ditch structure were calculated using the Storm computer program with Manning's Formula:

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

Where:
V = Velocity (fps)
R = Hydraulic Radius (ft.)
S = Slope (ft. per ft.)
n = Manning's n; Table 3.1, p.159,

"Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner & Haan, 1983.

Note: The following Manning's n were used in the calculations:

Structure	Manning's n
Culverts (cmp)	0.025
Natural Drainage Channels	0.040
Unlined Disturbed Area Ditches	0.025
Concrete Lined Disturbed Area Ditches	0.015

742.300
#3

2.4 Drainage Areas

All drainage areas were planimetered directly from Exhibit VII-1, Hydrology Map.

2.5 Slopes, Lengths

All slopes and hydraulic lengths were measured directly from the topography on Exhibit VII-1, Hydrology Map.

2.6 Runoff

Runoff was calculated using the SCS Formula for Type II Storms:

$$Q = \frac{(P - 0.2\,S)^2}{P + 0.8\,S}$$

Where:
Q = Runoff in inches
P = Precipitation in inches
$S = \frac{1000}{CN} - 10$
CN= Runoff Curve Number

2.7 Runoff Curve Numbers

Due to the variability of soil types and resulting runoff potential of the drainage areas, a runoff curve number was calculated for each drainage area using a weighted average. The respective area for each soil type occurring in the drainages were planimetered directly from the Hydrology Map.

Curve numbers for the various soil types are based on the SCS determinations for Runoff Curve Numbers for Antecedent Moisture Condition II. Soil types and areas were taken from the November, 1989 Soils Report for the area (see Appendix 1). The following will show the soils type and resulting runoff curve number for each (unit numbers are taken from the Soils Report):

700 #1

Unit	Description	Hydrologic Soils Group	Runoff Curve Number
26	Rock Outcrop - Rubble Land Complex	D	89
40	Mellenthin - Rock Outcrop Complex	D	80
44	Windwistle - Palma - Rizno Complex	C	78
-	Disturbed Area	-	90

The weighted average runoff curve numbers for each drainage area are summarized in the Table entitled "Drainage Area - Runoff Curve Number Summary".

Runoff Curve Number Justification

The runoff curve numbers were selected from Table 2-2d - Runoff curve numbers for arid and semiarid rangelands, pages 2-8, "SCS Publication 210-VI-TR-55", Second Edition, June 1986, supplied by the Division. The following is a description of curve number selection for each of the areas using this Table. All soils information was taken from the BLM soils report in Appendix 1:

Unit 26 - Rock Outcrop - Rubble Land Complex

Cover Type - Desert Shrub (Based on Veg. Types)

Hydrologic Condition - Poor (less than 10% cover)

Hydrologic Soil Group - D (Soils Report)

Runoff Curve Number - 88 (89 Used in Calculations)

Note: The desert shrub cover type best matches the vegetation in this area as shown by descriptions in the Soils Report. The report also confirms the vegetation cover of less than 10% and the Hydrologic Soil Group as D. The more conservative curve number of 89 was selected due to the low vegetation cover and high runoff potential for the unit.

700 #1

Unit 40 - Mellanthin - Rock Outcrop Complex

Cover Type - Pinyon-Juniper (Grass Understory)

Hydrologic Condition - Fair (30% Ground Cover)

Hydrologic Soil Group - D (Soils Report)

Runoff Curve Number - 80 (80 Used in Calculations)

Note: The Pinyon-Juniper cover type, 30% ground cover and Hydrologic Soil Group D are all described in the soils report for this unit.

700 #1

Unit 44 - Windwistle - Palma - Rizno Complex

Cover Type - Herbaceous (Brush-Minor Element)

Hydrologic Condition - Fair/Good (70% Veg. Cover)

Hydrologic Soil Group - C (Soils Report)

Runoff Curve Number - 78 (78 Used in Calculations)

Note: The herbaceous cover type was selected based on vegetation descriptions in the Soils Report. The report also described a potential total cover of 70%, which puts it at the high end of the fair category for Hydrologic Condition - as a result, the Hydrologic Condition was selected as Fair/Good and the runoff curve number was selected between the Fair and Good classifications (Fair - 81, Good - 74, Selected - 78). The Hydrologic Soil Group is described as ranging from B to D for inclusions; however, C was selected because it represents the average and majority section of the unit.

Disturbed Area

The CN of 90 has been selected because it is the number typically used for disturbed areas on Utah mines and has long been accepted by the Division.

2.8 Culvert Sizing

Minimum culvert sizing is based on the following Manning's Equation:

$$D = \left(\frac{2.16\ Q\ n}{\sqrt{s}}\right)^{0.35}$$

Where:
D = Required Diameter (feet)
Q = QP = Peak Discharge (cfs)
n = Roughness Factor (0.025 for cmp)
S = Slope (ft. per ft.)

Using the above formula, minimum required culvert sizes were calculated for each applicable area. Culverts were then selected above the required minimum, and these sizes were checked for adequacy against the Culvert Nomograph included as Figure 1 of this report.

2.9 Culverts

742.300
#2

Culverts have been sized according to the calculations previously described, and are summarized on the following tables. The culverts are shown on Exhibit VII-1A, Minesite Hydrology. Culverts carrying undisturbed drainages are designated with a U number (i.e. U1); contributing undisturbed drainages are marked with a UD-number (i.e. UD-1). All undisturbed area drainage culverts will be fitted with trash racks to minimize plugging by rocks or other debris.

Although the main canyon culvert shows to be adequately sized at 6.3' to 6.9' in diameter, an 8' (96") minimum diameter will be installed in all sections (U1, U3, U5, U7 & U9) for an added safety measure. Side drainages are diverted into the main culvert through the following culverts: U2 (24"), U4 (36"), U6 (48"), U8 (30"), U8A (24") and U8B (24"), as shown on Exhibit VII-IA. A properly sized outlet apron and energy dissipator will be provided

at the outlet of U9 for velocity reduction to eliminate the need for further erosion protection at the outlet.

742.300 #12

Trash racks will be provided at the inlet for all undisturbed drainage culverts. These will consist of 3/4" steel bars welded on 6" centers across the flared inlet structures of each culvert. Bars will be sloped from the front of the inlet structure up to the top of the culvert. This ramp configuration will allow trash, branches and other potential obstructions to be swept up and away from the inlet rather than being impinged against the grates during a flow event. Rip rap will be placed around the flared inlet structure and above it to a height of at least 6" above the required headwall for each culvert. Trash racks will be checked on a routine schedule and following precipitation events and all trash, branches and other obstructions will be removed.

731.100 #3

The main canyon bypass culvert (U1) will be equipped with a flared inlet/headwall section of concrete construction rather than rip rap. (Refer to Figures 4 and 5). The trash rack will be ramped over the inlet to provide a non-clogging design. The trash rack will be of heavy-duty structural steel construction with 18" grate openings. It will also be hinged to allow access to the bypass culvert for inspection and cleanout.

742.300 #2

To provide additional protection for the main bypass culvert, a trash barrier will be installed approximately 30' upstream from the inlet. (Refer to Figure 6). This barrier will consist of a series of vertical posts arranged in a 45° chevron pattern, veeing upstream, and concreted into the stable channel bed. Barrier posts will be 8" diameter, concrete filled, steel pipe installed on 24" centers. The barrier will extend across the width of the channel and up the streambanks beyond the floodplain of a 100 year/6 hour event. Because this

structure is located within the main channel above the mine yard, it is not included within the disturbed area boundary.

The outlet of the main canyon bypass culvert (U9) will be equipped with energy dissipators to slow the outlet velocity sufficiently to prevent erosional damage to the natural downstream channel (refer to Appendix VII-11).

It should be noted that all undisturbed area culverts are adequately sized to handle the expected runoff from a 100 year-6 hour event for maximum protection of the mine area, sediment pond and undisturbed drainage. This is in excess of the 10 year + 6 hour event required by the regulations and is proposed as an extra measure of safety.

Disturbed area culverts and ditches are shown on the Minesite Hydrology Map, Exhibit VII-1A. Culverts carrying disturbed drainage are designated with a C number (i.e., C1), and ditches carrying disturbed drainage are designated with a D number (i.e., D1). Calculations for all disturbed area culverts and ditches are also included with this report, along with design criteria. Disturbed drainage areas draining to culverts and ditches are marked with a CD-number (i.e. CD-1). The area is marked with dashed yellow lines on Exhibit VII-1A.

742.300
#2

Culverts will be inspected regularly, and cleaned as necessary to provide for passage of design flows. Inlets and outlets shall also be maintained so as to prevent plugging or undue restriction of water flow.

All disturbed area culverts are temporary, and will be removed upon final reclamation, with the exception of culverts C9 and C10 which will be left in place during Phase I reclamation as shown on Exhibit V-11 and are designed

to carry runoff from a 100 year-6 hour storm event. They will be removed during Phase II final reclamation (see Exhibit V-12).

2.10 Ditches

742.300 #2

All ditches will carry disturbed area drainage to the pond. Ditches are shown on the Minesite Hydrology Map, Exhibit VII-1A, and are designated with a D number (i.e., D1).

742.300 #6

All ditches are designed to carry the expected runoff from a 10 year - 6 hour event (except D-1, which is sized for a 100 year - 6 hour event) with a minimum freeboard of 0.5' (See Table 8 and Figure 3). The 0.5' freeboard represents a minimum of 20% of the flow depth in all disturbed area ditches.

742.300 #7

Ditches which exhibit expected flow velocities of 5 fps or greater will be lined with concrete. Typical cross sections, flow-depths and areas for all lined and unlined ditches are shown on Figure 3 of this report.

742.300 #1

Ditch slopes have been determined from the construction cross sections (Exhibits V-7A through V-7G) and the proposed construction contour map (Exhibit V-10). For ditches with differing slopes along various segments, the shallowest slopes were used for flow depth determination while the steepest slopes were used for velocity determination. In addition, to provide a more conservative design which allows for some variation of slope along individual ditches, all ditch flow depths have been calculated using a slope 0.5% lower than the minimum design slope, and all ditch velocities have been calculated using a slope 0.5% higher than the maximum design slope. Refer to Table 8 for maximum and minimum slope values used for all disturbed ditch designs.

All ditches will be inspected regularly, and maintained to the minimum dimensions to provide adequate capacity for the design flow. All ditches are temporary and will be removed as described under the Phase I and Phase II final reclamation.

TABLE 1
UNDISTURBED DRAINAGE AREA - RUNOFF CURVE NUMBER SUMMARY

Drainage Area	Acres	Unit 26 CN-89 (acres)	Unit 40 CN-80 (acres)	Unit 44 CN-78 (acres)	Weighted CN
UD-1	2990.42	941.98	1004.78	1043.66	82.14
%	100.0	31.50	33.60	34.90	Use 82
UD-2	64.761	62.805	0	1.956	88.67
%	100.0	96.98	0	3.02	Use 89
UD-3	173.29	67.964	0	105.326	82.31
%	100.0	39.22	0	60.78	Use 82
UD-4	20.638	11.387	0	9.251	84.07
%	100.0	55.17	0	44.83	Use 84
UD-5	27.399	20.816	0	6.58	86.35
%	100.0	75.98	0	24.02	Use 86
UD-6	4.781	4.03	0	0.751	87.27
%	100.0	84.20	0	15.80	Use 87
UD-7	4.805	4.805	0	0	89.00
%	100.0	100.0	0	0	Use 89
UD-8	4.430	4.430	0	0	89.00
%	100.0	100.0	0	0	Use 89
UD-9	16.912	14.552	0	2.360	87.47
%	100.0	86.05	0	13.95	Use 87
UD-10	9.252	9.252	0	0	89.00
%	100.0	100.0	0	0	Use 89
UD-11	19.749	19.749	0	0	89.00
%	100.0	100.0	0	0	Use 89
UD-12	4.093	4.093	0	0	89.00
%	100.0	100.0	0	0	Use 89
Disturbed Area	54.567	0	0	0	90.00
%	100.0	0	0	0	Use 90

Notes: Unit 26 - Rock Outcrop - Rubble Land Complex - CN 89
Unit 40 - Mellenthin - Rock Outcrop Complex - CN 80
Unit 44 - Windwistle - Palma - Rizno Complex - CN 78

Areas planimetered directly from Exhibit VII-1, Hydrology Map.

TABLE 2
SURFACE WATER HYDROLOGIC SUMMARY

The following is a summary of pertinent information relating to the calculation, design and selection of the various hydraulic control structures for this site:

Drainage	Area(ac.)	Type	Drains To:	Runoff CN
Minesite	54.57	Disturbed	Sediment Pond	90
UD-1	2990.42	Undisturbed	Culvert U1	82
UD-2	64.76	Undisturbed	Culvert U4	89
UD-3	173.29	Undisturbed	Culvert U6	82
UD-4	20.64	Undisturbed	Culvert U2	84
UD-5	27.40	Undisturbed	Culvert U8	86
UD-6	4.78	Undisturbed	Sediment Pond	87
UD-7	4.81	Undisturbed	Sediment Pond	89
UD-8	4.43	Undisturbed	Sediment Pond	89
UD-9	16.91	Undisturbed	Sediment Pond	87
UD-10	9.25	Undisturbed	Sediment Pond	89
UD-11	19.75	Undisturbed	Sediment Pond	89
UD-12	4.09	Undisturbed	Sediment Pond	89

TABLE 3
UNDISTURBED DRAINAGE SUMMARY

Structure	UD.-1	UD.-2	UD.-3	UD.-4	UD.-5	*UD.-6	*UD.-7	*UD.-8	*UD.-9	*UD.-10	*UD.-11	*UD.-12
Drainage area (ac.)	2990.420	64.761	173.290	20.638	27.399	4.781	4.805	4.430	16.912	9.252	19.749	4.093
Runoff CN	82	89	82	84	86	87	89	89	87	89	89	89
Hydraulic length (ft.)	20300	2500	5500	1100	1500	300	900	400	700	900	2800	300
Slope (%)	4.502	10.600	13.64	57.14	53.33	44.94	50.00	42.55	58.82	43.86	43.48	48.39
Time of concentration (hrs.)	2.60	0.25	0.53	0.07	0.08	0.02	0.05	0.03	0.04	0.05	0.13	0.02
10 year - 6 hour event (in.)	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
Q runoff (in.)	0.357	0.646	0.357	0.426	0.506	0.549	0.646	0.046	0.549	0.646	0.646	0.646
Peak flow (cfs)	249.57	30.96	27.34	7.83	12.70	1.83	2.76	2.24	7.85	5.32	10.71	1.85
Total runoff (ac. ft.)	88.88	3.48	5.15	0.73	1.15	0.22	0.26	0.24	0.77	0.50	1.06	0.22
25 year - 6 hour event (in.)	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Q runoff (in.)	0.521	0.865	0.521	0.606	0.701	0.752	0.865	0.865	0.752	0.865	0.865	0.865
Peak flow (cfs)	372.10	42.66	43.89	11.39	17.84	2.51	3.70	2.99	10.79	7.12	14.50	2.46
Total runoff (ac. ft.)	129.80	4.67	7.52	1.04	1.60	0.30	0.35	0.32	1.06	0.67	1.42	0.29
100 year - 6 hour event (in.)	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Q runoff (in.)	0.805	1.221	0.805	0.911	1.027	1.089	1.221	1.221	1.089	1.221	1.221	1.221
Peak flow (cfs)	590.56	61.66	74.29	17.33	26.26	3.62	5.18	4.18	15.58	9.98	20.59	3.45
Total runoff (ac. ft.)	200.53	6.59	11.62	1.57	2.34	0.43	0.49	0.45	1.53	0.94	2.01	0.42
10 year - 24 hour event (in.)	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Q runoff (in.)	0.603	0.970	0.603	0.695	0.796	0.851	0.970	0.970	0.851	0.970	0.970	0.970
Peak flow (cfs)	413.80	53.76	62.82	14.86	22.65	3.13	4.50	3.62	13.45	8.66	17.94	2.99
Total runoff (ac. ft.)	150.29	5.24	8.71	1.19	1.82	0.339	0.388	0.358	1.199	0.748	1.596	0.331
25 year - 24 hour event (in.)	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32
Q runoff (in.)	0.868	1.299	0.868	0.978	1.098	1.162	1.299	1.299	1.162	1.299	1.299	1.299
Peak flow (cfs)	621.66	71.93	93.60	20.67	30.79	4.18	5.90	4.75	18.03	11.36	23.75	3.92
Total runoff (ac. ft.)	216.31	7.01	12.53	1.68	2.51	0.46	0.52	0.48	1.64	1.00	2.14	0.44

* Drainage to Pond
Refer to Appendix 2A for computer backup data.

TABLE 4
UNDISTURBED CULVERT DESIGN PARAMETERS

Culvert	* U.-1	U.-2	* U.-3	U.-4	* U.-5	U.-6	* U.-7	*U.-8	U.-8a	U.-8b	* U.-9
Drainage Area (acres)	2990.42	20.64	-	64.76	-	173.29	-	27.40	13.70	13.70	-
Runoff Curve No. (CN)	82	84	-	89	-	82	-	86	86	86	-
Hyd. Length (ft.)	20,300	1,100	-	2,500	-	5,500	-	1,500	-	-	-
Land Slope (%)	4.502	57.14	-	10.60	-	13.64	-	53.33	-	-	-
Time of Conc. (hr.)	2.60	0.07	-	0.25	-	0.53	-	0.08	0.08	0.08	-
Manning's No.	.025	.025	.025	.025	.025	.025	.025	.025	.025	.025	.025
Culvert Slope (%)	High 2.75 0.9	29.10 14.5	2.75 3.1	8.62 15.5	2.75 3.2	4.84 10	2.75 2.9	5.40 7.1	18.33 14.6	18.33 14.6	2.75 3.6
Culvert Length (ft.)	fair 710 700	280 275	470 487	380 387	630 625	1750 1825	1150 1112	490 462	280 275	280 275	550 525

DEL 90

Total Main Culvert = 3,480

TABLE 4A
UNDISTURBED CULVERT DESIGN SUMMARY

Culvert	U.-1	U.-2	U.-3	U.-4	U.-5	U.-6	U.-7	*U.-8	U.-8a	U.-8b	U.-9
10 year - 6 hour event (in.)	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
Peak flow (cfs)	249.57	7.83	257.40	30.96	288.36	27.34	315.70	12.70	6.35	6.35	328.40
Min. Diam. Req'd (ft.)	4.66	0.92	4.71	1.84	4.90	1.95	5.06	1.46	0.93	0.93	5.13
25 year - 6 hour event (in.)	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Peak flow (cfs)	372.10	11.39	383.49	42.66	426.15	43.89	470.04	17.84	8.92	8.92	487.88
Min. Diam. Req'd (ft.)	5.36	1.05	5.42	2.06	5.62	2.30	5.82	1.64	1.04	1.04	5.89
100 year - 6 hour event (in.)**	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Peak flow (cfs)	590.56	17.33	607.89	61.66	669.55	74.29	743.84	26.26	13.13	13.13	770.10
Min. Diam. Req'd (ft.)	6.30	1.21	6.37	2.34	6.58	2.76	6.831	1.88	1.19	1.19	6.91
Proposed Const. Diam. (min. ft.)	8.00	2.00	8.00	3.00	8.00	4.00	8.00	2.50	2.00	2.00	8.00
Velocity (fps)	11.75	5.52	12.09	8.72	13.32	5.91	14.80	5.35	4.18	4.18	15.32
Headwater Req'd*** (100/6) ft.	10.40	2.50	-	4.80	-	4.08	-	-	2.00	2.00	-
Flow Capacity (cfs)	1168.00	72.00	1168.00	125.00	1168.00	214.00	1168.00	59.00	57.00	57.00	1168.00

742.300 #11

cumulative

Assumes Twin 48" culvert

* Includes flow from U-8a and U-8b

** All culverts for proposed construction have been sized for 100 year - 6 hour events.

*** Based on Culvert Nomograph - Figure 1

590
12
6.83

TABLE 5
PROPOSED CONSTRUCTION
UNDISTURBED CULVERT SUMMARY

Culvert	Diameter (ft.)	*Flow (cfs)	Headwater Required (ft.)	Length (ft.)	Remarks
U1	8.0	590.56	10.4	710'	Upper Portion
U2	2.0	17.33	2.50	280'	Drains from UD-4
U3	8.0	607.89	-	470'	Below U2
U4	3.0	61.66	4.80	380'	Drains from UD-2
U5	8.0	669.55	-	630'	Below U4
U6	4.0	74.29	4.08	1750'	Drains from UD-3
U7	8.0	743.84	-	1150'	Below U6
U8	2.5	26.26	-	490'	Drains from UD-5
U8a	2.0	13.13	2.00	280'	Drains from UD-5
U8b	2.0	13.13	2.00	280'	Drains from UD-5
U9	8.0	770.10	-	550'	Below U8

* Peak flow for 100 year, 6 hour event (see Table 4A)

TABLE 6
PROPOSED CONSTRUCTION
DRAINAGE AREAS CONTRIBUTING TO POND

Disturbed Drainage-Area (acres)		
CD-1		1.72
CD-2		3.21
CD-3		5.64
CD-4		0.48
CD-5		26.15
CD-6		6.33
CD-7		1.01
CD-8		1.37
CD-9		3.06
CD-10		0.35
CD-11		1.11
SD-1		3.01
Total To Pond-		53.44 Acres
ND-1		1.13
Total Disturbed Area		54.57 Acres

Undisturbed Drainage-Area (acres)		
UD-6		4.78
UD-7		4.81
	Upper	(1.60)
	Lower	(3.21)
UD-8		4.43
	Upper	(3.67)
	Lower	(0.76)
UD-9		16.91
	Upper	(13.06)
	Middle	(2.98)
	Lower	(0.87)
UD-10		9.25
UD-11		19.75
	Upper	(17.69)
	Lower	(2.06)
UD-12		4.09
	Upper	(1.35)
	Lower	(2.74)
Total to Pond -		64.02 Acres

Notes: Above acreages drain to sediment pond, except ND-1.

Areas planimetered from Exhibits VII-1A and VII-1.

Areas used for Table 7 - Proposed Construction Drainage Structures

Refer to Exhibit VII-1A for drainage area boundaries.

TABLE 7
PROPOSED CONSTRUCTION-DRAINAGE STRUCTURES

Structure	Drainage Areas	Undisturbed Area (acres)	Disturbed Area (acres)
C1	D1	1.60	0.86
C2	D3	8.45	3.21
C3	D5	14.02	11.05
C4	D8	26.94	26.15
C5	D6	14.02	12.06
C6	Upper UD-9 + CD-6	13.06	6.33
C7	D7	14.02	13.43
C8	D10	16.04	6.33
C9	D9	40.96	39.58
C10	D13	2.06	1.11
D1	Upper UD-7 + 1/2 CD-1	1.60	0.86
D2	1/2 CD-1	-	0.86
D3	UD-6 + Upper UD-8 + CD-2	8.45	3.21
D4	D1 + D2 + Lower UD-7 + CD-3	4.81	7.36
D5	D3 + D4 + Lower UD-8 + CD-4	14.02	11.05
D6	D5 + CD-7	14.02	12.06
D7	D6 + CD-8	14.02	13.43
D8	Upper UD-11 + UD-10 + CD-5	26.94	26.15
D9	D7 + D8	40.96	39.58
D10	Upper UD-9 + Middle UD-9 + CD-6	16.04	6.33
D11	Lower UD-9 + Upper UD-12 + CD-9	2.22	3.06
D12	D9 + D10 + D11 + CD-10	59.22	49.32
D13	Lower UD-11 + CD-11	2.06	1.11
Pond Area	D12 + D13 + Lower UD-12 + SD-1	64.02	53.44
*BTCA Area #1	ND-1	-	1.13

* Outslope of Pond - Doesn't drain to Pond. Protected by Vegetation, Rip-Rap and/or Silt Fences.

Refer to Exhibit VII-1A for proposed culvert and ditch locations.

TABLE 8
DISTURBED DITCH DESIGN PARAMETERS

Ditch Structure	*D.1	D.2	D.3	D.4	D.5	D.6	D.7	D.8	D.9	D.10	D.11	D.12	D.13
Undist. Drainage Area (ac)	1.60	-	8.45	4.81	14.02	14.02	14.02	26.94	40.96	16.04	2.22	59.22	2.06
Dist. Drainage Area (ac)	0.86	0.86	3.21	7.36	11.05	12.06	13.43	26.15	39.58	6.33	3.06	49.32	1.11
Disturbed Runoff CN	90	90	90	90	90	90	90	90	90	90	90	90	90
Dist. Hyd. Length (ft)	100	100	100	250	200	50	150	700	100	600	300	100	50
Dist. Land Slope (%)	2.0	1.0	1.0	1.0	1.0	6.2	2.1	2.0	2.1	2.1	4.0	3.0	2.4
Dist. Area Time of Conc (hr)	0.06	0.06	0.04	0.09	0.07	0.02	0.06	0.20	0.04	0.18	0.10	0.04	0.02
Manning's No.	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Ditch Slope (%) min.	0.50	0.50	0.50	0.50	0.50	5.50	1.60	1.60	1.60	1.60	4.50	9.50	1.90
Ditch Slope (%) max.	2.00	1.50	1.50	1.50	1.50	6.50	2.60	3.60	2.60	2.60	5.50	13.40	2.90
Ditch Length (ft)	500	430	1150	900	120	620	420	1300	75	350	300	150	260

*100 year - 6 hour design for drainage around refuse pile

TABLE 8A
DISTURBED DITCH DESIGN SUMMARY

Ditch Structure	*D.1	D.2	D.3	D.4	D.5	D.6	D.7	D.8	D.9	D.10	D.11	D.12	D.13
10 year - 6 hour event (in.)	-	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
Disturbed flow (cfs)	-	0.55	1.90	4.75	7.13	5.88	8.58	14.30	23.46	3.47	1.93	29.23	0.54
Undisturbed flow (cfs)	-	-	3.69	2.76	6.83	6.83	6.83	14.91	21.74	7.45	1.01	30.20	1.12
Peak flow (cfs)	-	0.55	5.59	7.51	13.96	12.71	15.41	29.21	45.20	10.92	2.94	59.43	1.66
Velocity** (fps)	-	2.16	3.85	4.14	4.83	8.18	6.09	8.07	7.96	5.59	5.33	15.78	3.64
Min. ditch area req'd ($ft.^2$)	-	0.39	2.20	2.74	4.36	1.65	3.04	4.91	6.81	2.35	0.59	4.29	0.53
Min. flow depth *** (ft.)	-	0.41	1.02	1.15	1.45	0.88	1.21	1.54	1.82	1.06	0.52	1.44	0.49
100 year - 6 hour event (in.)	2.23	-	-	-	-	-	-	-	-	-	-	2.23	2.23
Disturbed flow (cfs)	1.00	-	-	-	-	-	-	-	-	-	-	53.19	0.98
Undisturbed flow (cfs)	1.73	-	-	-	-	-	-	-	-	-	-	58.12	2.15
Peak flow (cfs)	2.73	-	-	-	-	-	-	-	-	-	-	111.31	3.13
Velocity** (fps)	3.58	-	-	-	-	-	-	-	-	-	-	N/A	N/A
Min. ditch area req'd ($ft.^2$)	1.28	-	-	-	-	-	-	-	-	-	-	N/A	N/A
Min. flow depth*** (ft.)	0.78	-	-	-	-	-	-	-	-	-	-	N/A	N/A
Concrete lined (Y/N)	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N

* 100 year - 6 hour design for drainage around refuse pile
** Based on maximum slope (0.5% greater than proposed construction)
*** Based on minimum slope (0.5% less than proposed construction)

Refer to Figure 3 for typical ditch section
Undisturbed flows from Table 3 (using areas from Table 7)
Refer to Appendix 2B for computer backup data

TABLE 9
UNLINED DISTURBED DITCH FLOW CALCULATIONS

Ditch	*D1		D2		D3		D4		D5		D13	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Flow depth (ft.)	0.78	0.59	0.41	0.33	1.02	0.83	1.15	0.93	1.45	1.18	0.49	0.45
Side slopes	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1
Bottom width (ft)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Slope of diversion** (ft./ft.)	0.005	0.020	0.005	0.015	0.005	0.015	0.005	0.015	0.005	0.015	0.019	0.029
Manning's No	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Peak flow rate (cfs)	2.73	2.73	0.55	0.55	5.59	5.59	7.51	7.51	13.96	13.96	1.66	1.66
Cross sectional area (ft^2)	1.28	0.76	0.39	0.26	2.20	1.45	2.74	1.81	4.36	2.89	0.53	0.46
Hydraulic radius	0.36	0.28	0.20	0.16	0.47	0.38	0.52	0.43	0.66	0.54	0.23	0.21
Velocity (fps)	2.13	3.58	1.43	2.16	2.55	3.85	2.74	4.14	3.20	4.83	3.10	3.64
Froude number	0.63	1.20	0.57	0.95	0.65	1.10	0.67	1.12	0.69	1.16	1.13	1.38

* 100 year - 6 hour design used for drainage around refuse pile

** Minimum slope is 0.5% less than proposed construction for flow depth determination
Maximum slope is 0.5% greater than proposed construction for velocity determination

Note: Refer to Exhibit VII-1A for ditch locations.
Refer to Appendix 2C for computer backup data.

TABLE 9A
LINED DISTURBED DITCH FLOW CALCULATIONS

Ditch	D6		D7		D8		D9		D10		D11		D12	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Flow Depth (ft.)	0.73	0.70	0.99	0.90	1.27	1.09	1.50	1.37	0.87	0.79	0.43	0.41	1.18	1.11
Side Slopes	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1
Bottom Width (ft.)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Slope of Diversion* (ft./ft.)	0.055	0.065	0.016	0.026	0.016	0.036	0.016	0.026	0.016	0.026	0.045	0.055	0.095	0.134
Manning's No.	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Peak Flow Rate (cfs)	12.71	12.71	15.41	15.41	29.21	29.21	45.20	45.20	10.92	10.92	2.94	2.94	59.43	59.43
Cross Sectional Area ($ft.^2$)	1.13	1.06	2.07	1.73	3.34	2.47	4.64	3.87	1.60	1.33	0.41	0.38	2.92	2.57
Hydraulic Radius	0.34	0.33	0.46	0.42	0.58	0.50	0.68	0.62	0.40	0.37	0.20	0.19	0.54	0.51
Velocity (fps)	11.27	12.00	7.44	8.93	8.73	11.84	9.74	11.68	6.83	8.20	7.26	7.83	20.34	23.15
Froude Number	3.42	3.70	1.94	2.44	2.02	2.96	2.08	2.61	1.90	2.39	2.85	3.13	4.87	5.72

* Minimum slope is 0.5% less than proposed construction for flow depth determination
Maximum slope is 0.5% greater than proposed construction for velocity determination

Note: Refer to Exhibit VII-1A for ditch locations
Refer to Appendix 2D for computer backup data

TABLE 10
DISTURBED CULVERT DESIGN PARAMETERS

Culvert	*C.-1	C.-2	C.-3	C.-4	C.-5	C.-6	C.-7	C.-8	**C.-9	**C.-10
Undist. Drainage Area (ac)	1.60	8.45	14.02	26.94	14.02	13.06	14.02	16.04	40.96	2.06
Dist. Drainage Area (ac)	0.86	3.21	11.05	26.15	12.06	6.33	13.43	6.33	39.58	1.11
Dist. Runoff CN	90	90	90	90	90	90	90	90	90	90
Dist. Hyd. Length (ft)***	100	100	200	700	50	600	150	600	100	50
Dist. Land Slope (%)	1.0	1.0	2.0	50.0	2.0	50.0	2.0	2.0	2.0	3.0
Dist. Area Time of Conc (hr)	0.06	0.04	0.07	0.20	0.02	0.18	0.06	0.18	0.04	0.02
Manning's No.	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Culvert Slope (%)	2.0	2.0	3.0	50.0	3.0	50.0	3.0	3.0	3.0	2.0
Culvert Length (ft)	20	40	40	60	40	60	40	40	50	80

* 100 year - 6 hour design used for drainage around refuse pile
** 100 year - 6 hour design used for permanent culvert under road
*** From Table 8

TABLE 10A
DISTURBED CULVERT DESIGN SUMMARY

Culvert	*C.-1	C.-2	C.-3	C.-4	C.-5	C.-6	C.-7	C.-8	**C.-9	**C.-10
10 year - 6 hour event (in.)	-	1.52	1.52	1.52	1.52	1.52	1.52	1.52	-	-
Dist. flow	-	1.90	7.13	14.30	5.88	3.47	8.58	3.47	-	-
Undist. flow	-	3.69	6.83	14.91	6.83	12.03	6.83	7.45	-	-
Peak flow*** (cfs)	-	5.59	13.96	29.21	12.71	15.50	15.41	10.92	-	-
Min. diam. req'd	-	1.30	1.67	1.32	1.62	1.06	1.73	1.54	-	-
100 year - 6 hour event (in.)	2.23	-	-	-	-	-	-	-	2.23	2.23
Dist. flow	1.00	-	-	-	-	-	-	-	42.68	0.98
Undist. flow	1.73	-	-	-	-	-	-	-	41.40	2.15
Peak flow*** (cfs)	2.73	-	-	-	-	-	-	-	84.08	3.13
Min. diam. req'd	1.01	-	-	-	-	-	-	-	3.14	1.06
Proposed construction dia.	1.50	2.00	2.00	2.00	3.00	2.00	3.00	2.00	4.00	1.50
Velocity (fps)	1.55	1.78	4.44	9.30	1.80	4.93	2.18	3.48	6.69	0.64
Headwater	0.90	1.20	2.08	4.40	1.59	2.26	1.80	1.76	4.44	0.95

* 100 year - 6 hour design used for drainage around refuse pile
** 100 year - 6 hour design used for permanent culvert under road
*** For peak flows, refer to Tables 7 and 8A.

Note: Refer to Appendix 2E for computer backup data.

FIGURES

Figure 1	Culvert Nomograph
Figure 2	Rip-Rap Chart
Figure 3	Disturbed Ditch, Typical Section
Figure 4	Main Culvert Inlet, Plan View
Figure 5	Main Culvert Inlet, Section View
Figure 6	Main Culvert Inlet, Trash Barrier

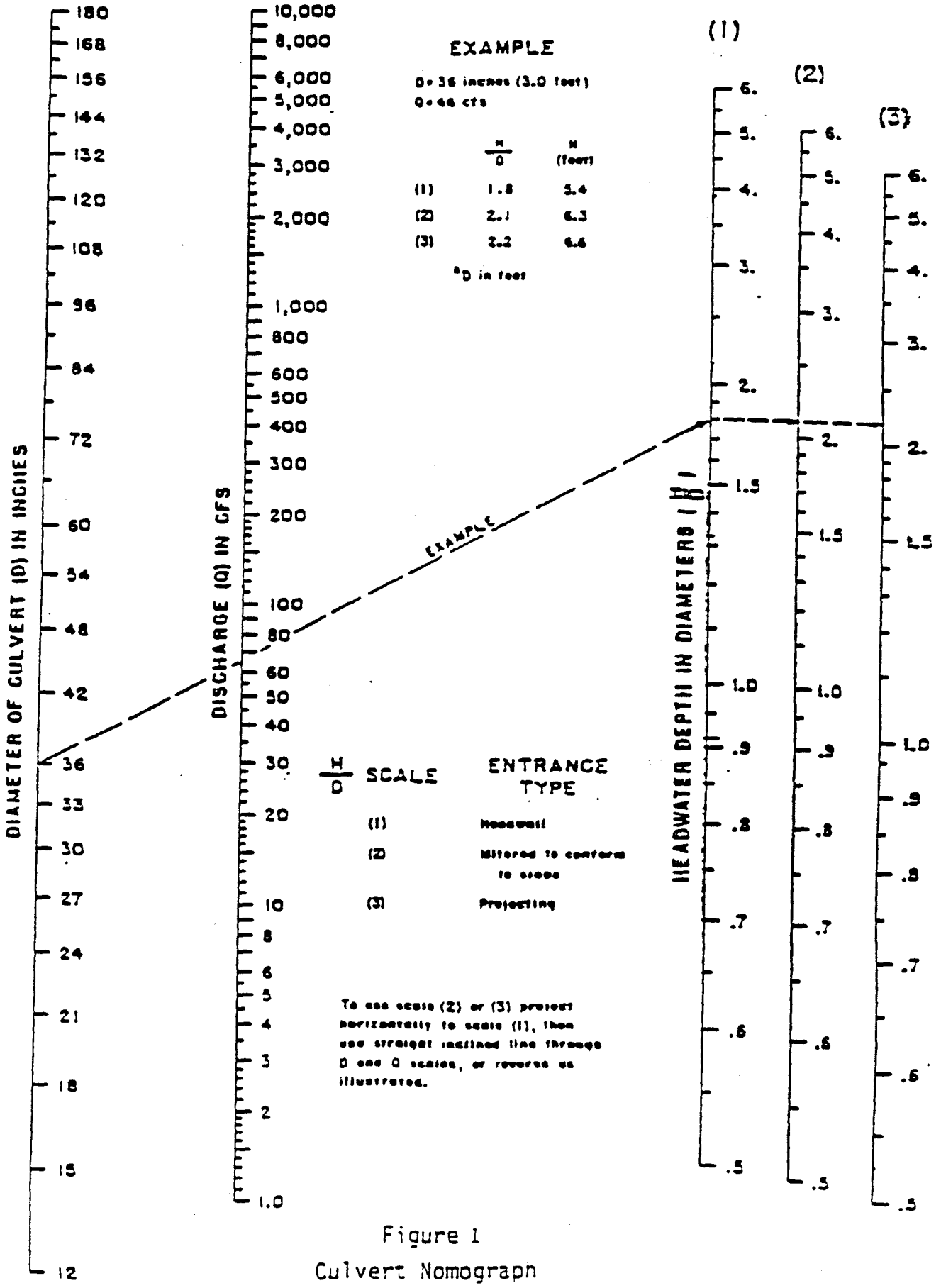
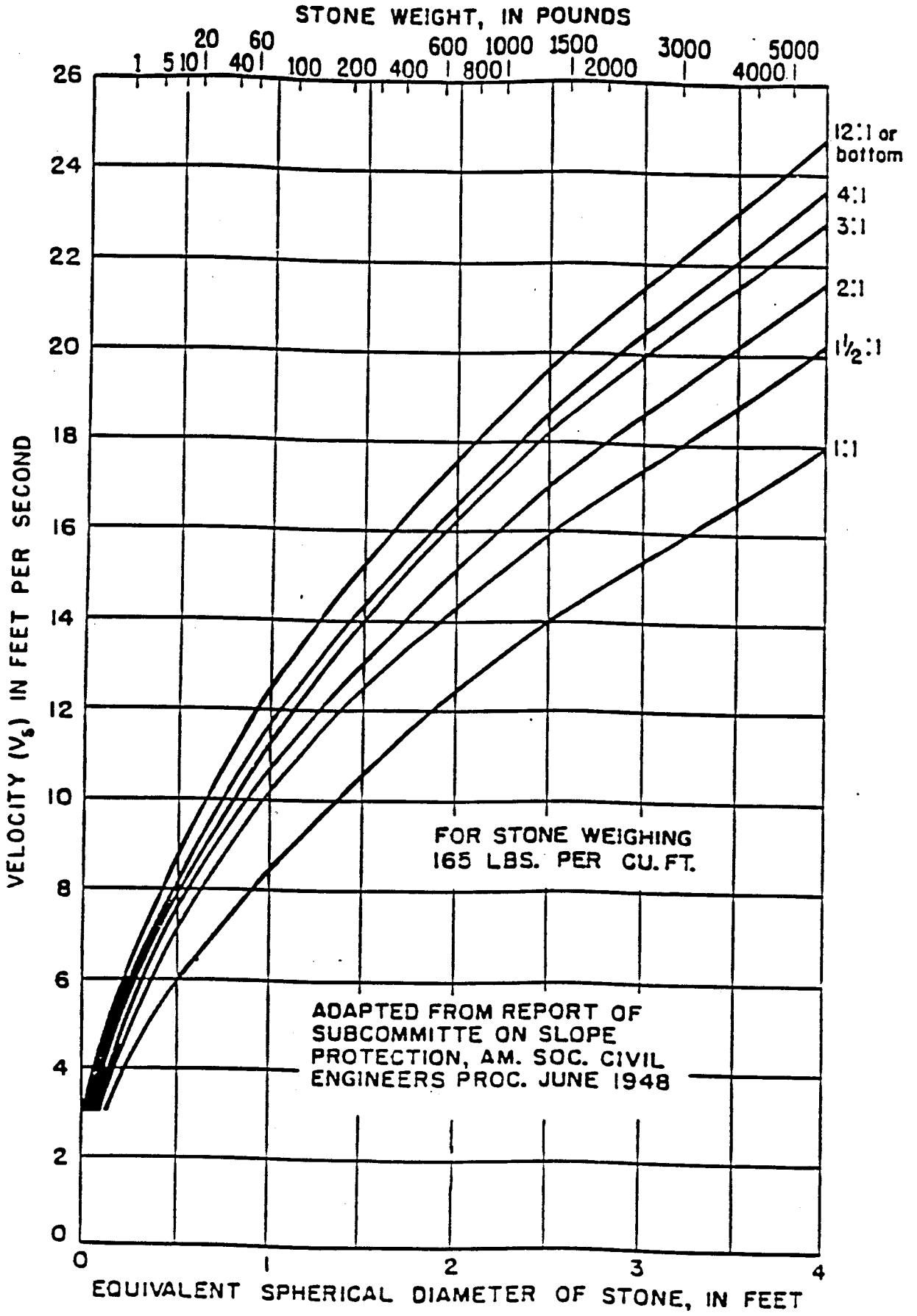


Figure 1

Culvert Nomograph

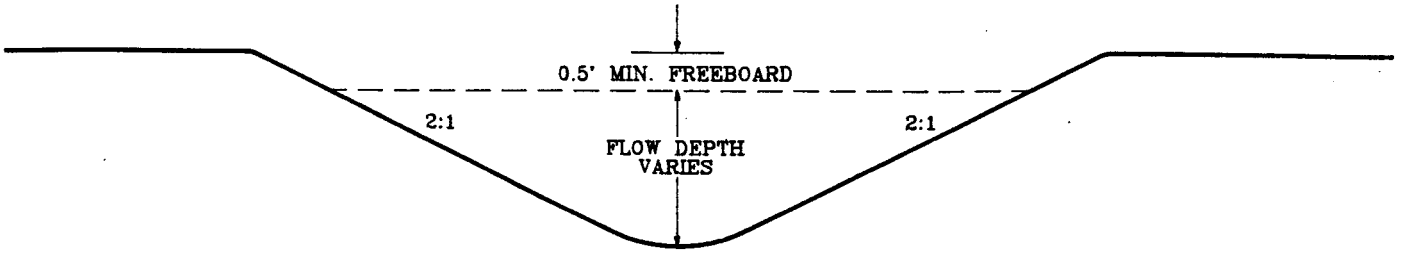
*Headwater depth for corrugated-metal pipe culverts with entrance control. (U.S. Bureau of Public Roads.) 238-D-1909.



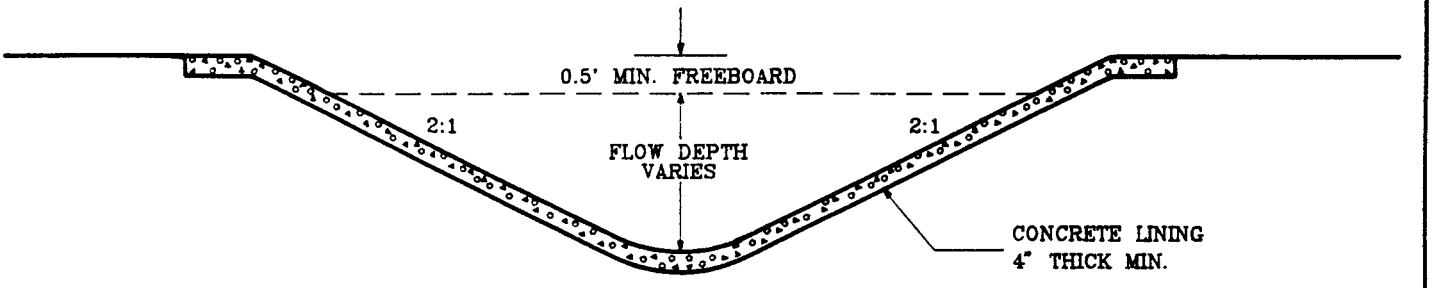
SIZE OF STONE THAT WILL RESIST DISPLACEMENT FOR VARIOUS VELOCITIES AND SIDE SLOPES

Figure 2

DISTURBED DITCH
TYPICAL SECTION



UNLINED DITCH		
DITCH	FLOW DEPTH	FLOW AREA (FT^2)
D1	0.78	1.28
D2	0.41	0.39
D3	1.02	2.20
D4	1.15	2.74
D5	1.45	4.36
D13	0.49	0.53



LINED DITCH		
DITCH	FLOW DEPTH	FLOW AREA (FT^2)
D6	0.73	1.13
D7	0.99	2.07
D8	1.27	3.34
D9	1.50	4.64
D10	0.87	1.60
D11	0.43	0.41
D12	1.18	2.92

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742.300 #4, #5 FIGURE 3

MAIN CULVERT INLET
PLAN VIEW

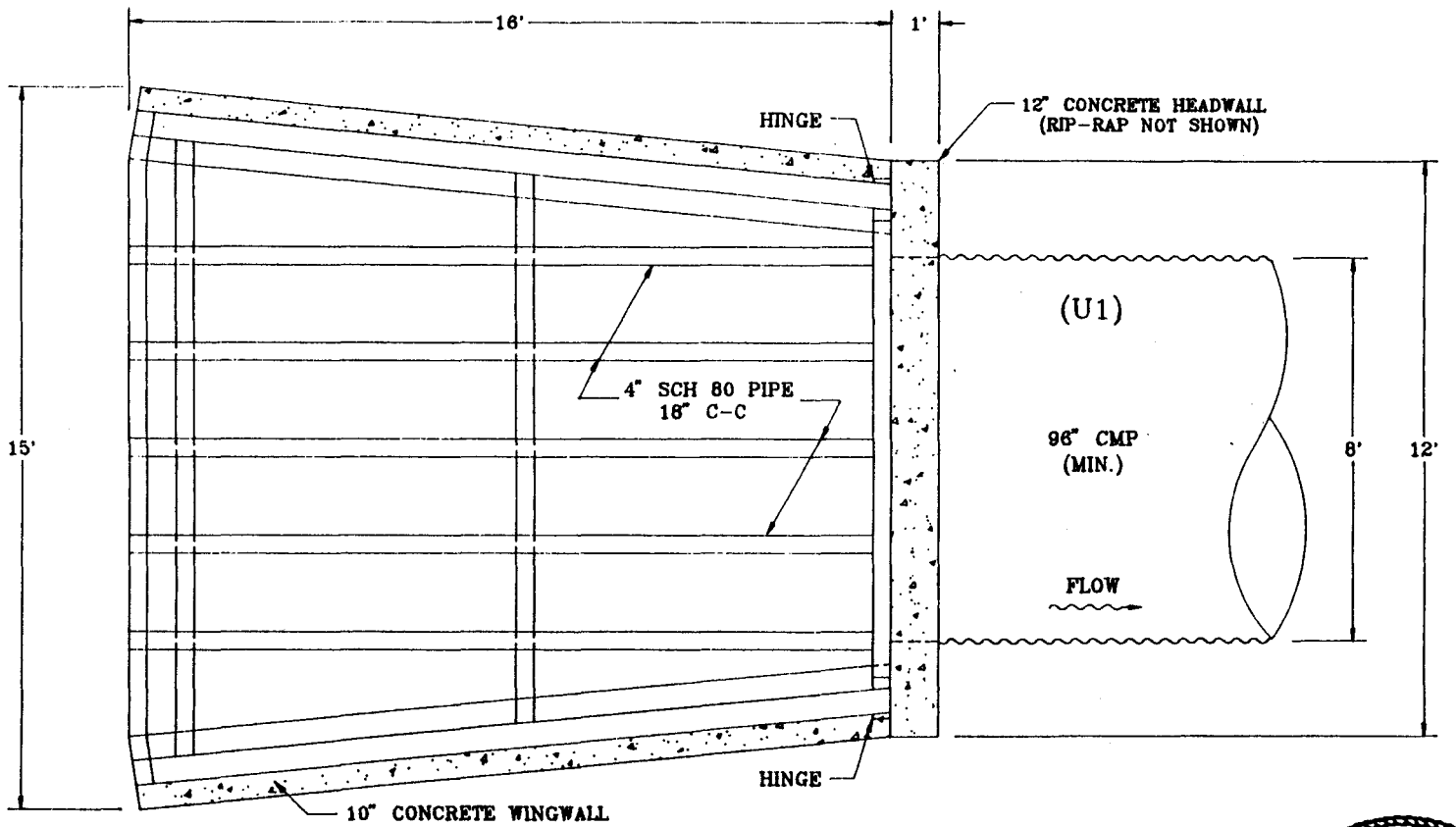

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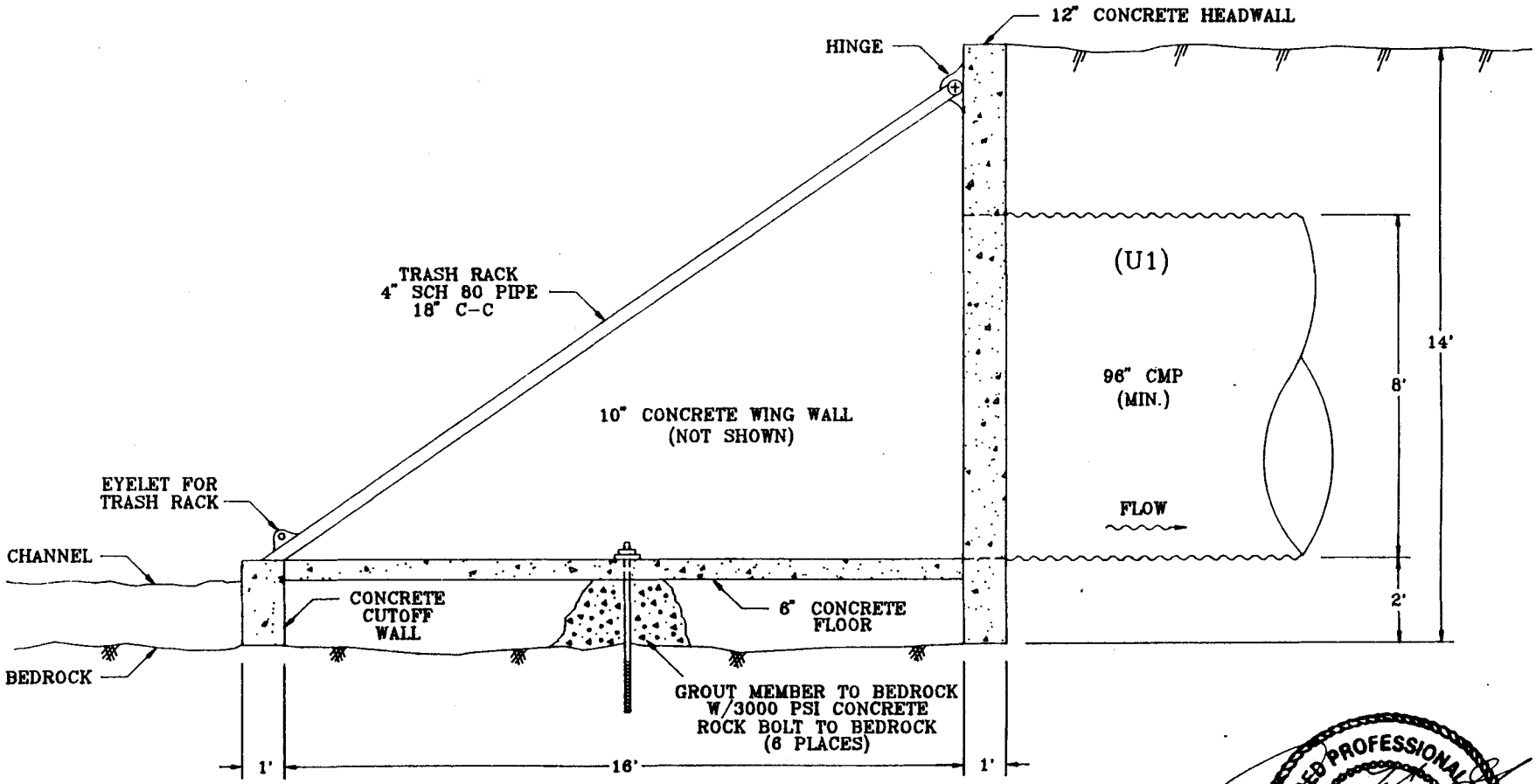
FIGURE 4

MAIN CULVERT INLET
SECTION VIEW



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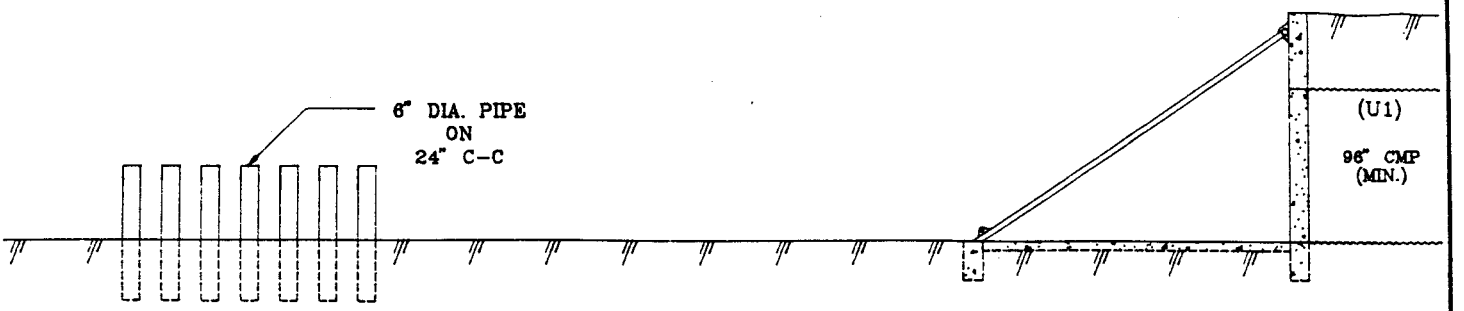
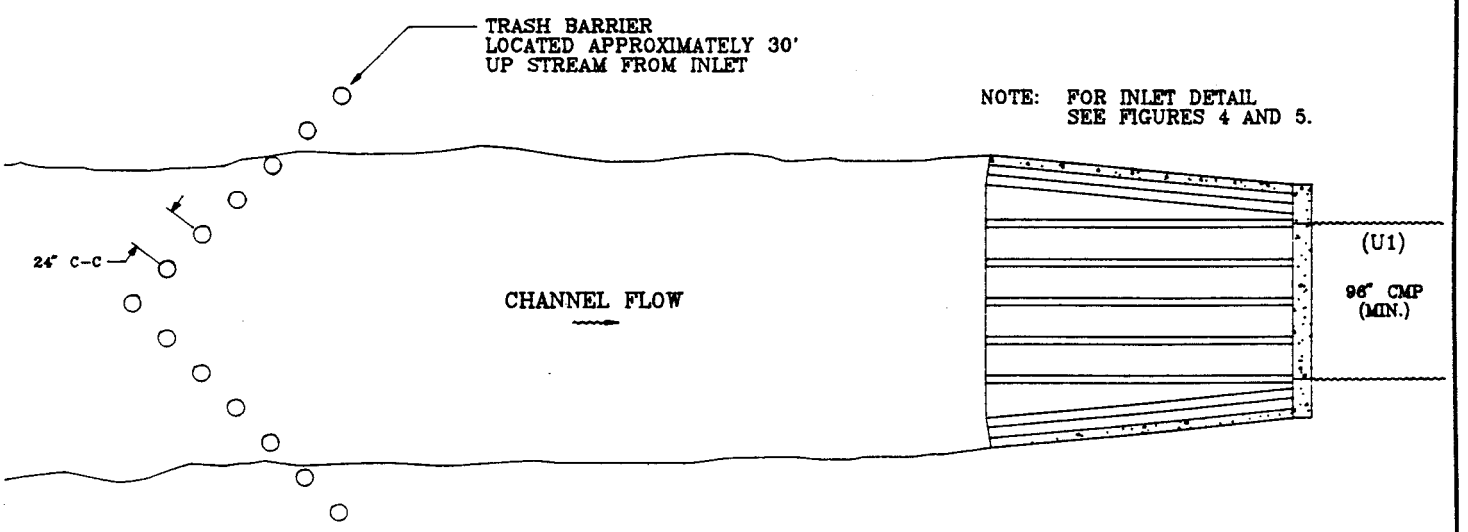
NOTE: TRASH RACK PIVOTS UPWARD
FOR ACCESS TO CULVERT

FIGURE 5

MAIN CULVERT INLET TRASH BARRIER



SECTION VIEW



PLAN VIEW

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FIGURE 6

DESIGN OF SEDIMENT CONTROL STRUCTURES

3.1 Design and Construction Specification for Sedimentation Pond
3.2 Sediment Yield
3.3 Sediment Pond Volume

Table 11 Sediment Pond Design
Table 12 Sediment Pond Stage Volume Data
Table 12A Sediment Pond Stage Discharge Data

3.4 Sediment Pond Summary

Figures

Figure 7 Sediment Pond Stage-Volume Curve
Figure 8 Sediment Pond Stage-Discharge Curve

3.1 Design And Construction Specifications for Sedimentation Pond

a) All construction of sedimentation ponds will be performed under the direction of a qualified, registered professional engineer.

b) The impoundment shall be constructed with an open channel spillway a minimum of 4' below the top of the dam. The spillway will be constructed of concrete or grouted rip-rap and will be keyed-in at the inlet and outlet to prevent undercutting.

c) The area of pond construction shall be examined for topsoil, and where present in removable quantities, such soil shall be removed separately and stored in an approved topsoil storage location.

d) In areas where fill is to be placed, natural ground shall be removed for at least 12" below the base of the structure.

e) Native materials shall be used where practical. Fill will be placed in lifts not to exceed 15" and compacted prior to placement of next lift. Compaction of all fill materials shall be at least 95%.

f) Rip-rap or other protection (belting, culverts, concrete, etc.) will be placed at all inlets and outlets to prevent scouring. Rip-rap will consist of substantial (non-slaking) rock material of adequate size.

g) The pond will be equipped with a decant device mounted with the inlet a minimum of 1' above the maximum sediment level. This device will be equipped with a secure, manual control valve and an inverted inlet (or equivalent) to prevent passage of oil into the discharge. The decant control valve will be locked in the closed position to prevent

unauthorized discharge. Samples will be collected prior to decanting of the pond. If the quality of the water meets the requirements of the UPDES Permit, decanting will proceed. Discharge samples will be collected as per the approved U.P.D.E.S. Discharge Permit.

h) Slopes of the embankment shall not be steeper than 2h : 1v, inside or outside, with a total of the inslope and outslope not less that 5h : 1v, except where areas of the pond are incised.

i) Tops and external slopes of the impoundment will be planted with an approved seed mix to help prevent erosion and promote stability.

j) Top width of the impoundment shall be not less than (H+35)/5, where H = Height of Dam in feet.

3.2 Sediment Yield

The Universal Soil Loss Equation (USLE) was used to estimate sediment yield from disturbed areas. All soil loss from this area was assumed to be delivered to, and deposited in the sedimentation pond.

Erosion rate (A) in tons-per-acre-per-year is determined using the USLE as follows:

$$A = (R)\ (K)\ (LS)\ (CP)$$

Where the variables R, K, LS, and CP are defined as follows:

Variable "R" is the rainfall factor which can be estimated from $R = 27P^{2.2}$; where P is the 2-year, 6-hour precipitation value. P for the Smoky Mountain area is 1.06 as shown on the chart for Glen Canyon City, page 27 of the "Estimated Return Period for Short Duration Precipitation in Utah", U.S.U. Therefore, the estimated value of "R" for this area is 30.69.

Variable "K" is the soil erodibility factor. For disturbed areas, the "K" value is conservatively estimated to be 0.5. K is estimated to be 0.35 for undisturbed areas.

Variable "LS" is the length-slope factor. This figure was determined by applying the slope length and percentage for each sub-drainage area to the chart in Figure 5.15, p. 334, "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner and Haan, 1983.

Variable "CP" is the control practice factor, which can be divided into a cover and a practice factor. For purposes of these calculations, the following "CP" values were used:

Site	CP Factor
Compacted Areas	1.20
Highwalls	1.00
Reseeded/Undisturbed	0.38

The sediment volume is based on a density of 100 pounds per cubic foot of sediment.

Sediment Yield Calculations - USLE

Drainage	R	K	Acres	Slope Length Feet	Slope %	LS	CP	A*	Yield**
West Side	30.69	0.5	17.471	200	20	5.70	1.0	87.47	0.702
Side Canyon	30.69	0.5	14.550	150	30	9.75	1.0	149.61	0.999
Main Canyon	30.69	0.5	22.546	300	5	0.90	1.2	16.57	0.171

Total Sediment 1 year (ac. ft.) 1.872

Total Sediment 3 years (ac. ft.) 5.616

* A = tons/acre-year

** Yield = acre-ft/year

It should be noted that the USLE method compares favorably to another accepted method of using 0.1 acre feet of sediment per disturbed acre. With a disturbed area of 54.57 acres, the required sediment storage using the 0.1 acre foot/acre would be 5.457 acre feet. The USLE Method shows the required storage to be 5.616 acre feet. The higher figure of 5.616 acre feet has been used for the sediment pond design.

3.3 Sediment Pond Volume

The volumes shown in Table 11 are from the volumes calculated from the precipitation, runoff and sediment yield for a 10 year-24 hour precipitation event. The volumes were calculated based on the disturbed areas (and contributing undisturbed areas) runoff values, developed using the design parameters described in this section.

TABLE 11

SEDIMENT POND DESIGN

1. Use 1.93" for 10 year-24 hour event.

2. Disturbed Watershed - 54.567 acres.

3. Runoff Curve No. = CN = 90 (Disturbed)

4. Disturbed Area Runoff = Q (in.) = $(P - 0.2\ S)^2 / (P + 0.8\ S)$

   where: S = (1000/CN) - 10; P = 1.93".

   Q = 1.035" = 0.086 ft.

   Volume = QA = 0.086 ft. x 54.567 ac. = **4.693 ac. ft.**

5. Undisturbed Watershed = 64.022 ac.

6. Runoff Curve Number (See Table 3)

7. Runoff Volume (from Table 3, 10 yr/24 hr) = **4.959 ac. ft.**

8. Sediment Storage Volume

   USLE 1.872 ac.ft./yr. x 3 yrs. = **5.616 ac. ft.**

9. Direct Precipitation into Pond

   3.01 acres x 1.93" / 12 in./ft. = **0.484 ac. ft.**

10. Total Required Pond Volume

    4.693 + 4.959 + 5.616 + 0.484 = **15.752 ac. ft.**

*11. Peak Flow (100 yr. - 6 hr. event) = **114.44 cfs**

12. Pond Design Volume (See Table 12)
    (@ Spillway) = **16.94 ac. ft.**

* Peak flow values from Table 8A (D-12 + D-13 @ 100/6).

Note: Refer to Appendix 2F for computer backup data.

TABLE 12
SEDIMENT POND
STAGE-VOLUME DATA
(see Figure 7)

Elevation	Area ($ft.^2$)	Volume (ac.ft.)	Acc. Volume (ac.ft.)	Remarks
4638	21,512	0	0	Bottom of Pond
4640	37,032	1.34	1.34	-
4642	46,876	1.93	3.27	-
4644	58,553	2.42	5.69	Max. Sed. Level
4645	60,886	1.40	7.09	Decant Level
4646	67,884	1.50	8.59	-
4648	71,650	3.20	11.79	-
4650	75,538	3.39	15.18	-
4651	77,500	1.76	16.94	Open Spillway Level

Notes: (1) Bottom of Spillway is 4' below top of dam.
(2) Areas digitized from Exhibit VII-3.

TABLE 12A
SEDIMENT POND
STAGE-DISCHARGE DATA
(see Figure 8)

Totally Weir Controlled

Stage (ft.)	Discharge (cfs)
0	0
0.2	4.14
0.4	11.71
0.6	21.52
0.8	33.13
1.0	46.31
1.2	60.87
1.4	76.70
1.6	93.72
1.8	111.82
1.83	114.63
2.0	130.97
2.2	151.10
2.4	172.17
2.6	194.13
2.8	216.95
3.0	240.61
3.2	265.07
3.4	290.30
3.6	316.29
3.8	343.01
4.0	370.44

Broad Crested Weir Formula $Q = 3.0876\ H^{1.5}$

Q = Flow (cfs)
b = Bottom Width = 15'
H = Depth (ft.)

3.4 Sediment Pond Summary

a) The sedimentation pond has been designed to contain the disturbed area (and contributing undisturbed area) runoff from a 10 year-24 hour precipitation event, along with 3 years of sediment storage capacity. Runoff to the pond will be directed by various ditches and culverts as described in the plan.

b) The required volume for the sediment pond is calculated at 15.752 acre feet, including 3 years of sediment storage. The sediment pond size will be approximately 200' wide x 500' long x 13' deep at the spillway with a volume of approximately 16.940 acre feet (at the elevation of 4651, open spillway), which is more than adequate.

c) The pond will meet a theoretical detention time of 24 hours. It is equipped with an open-channel spillway. Any discharge from the pond will be in accordance with the approved UPDES Permit.

d) The pond inlets will be protected from erosion, and the spillway will discharge into adequately sized culverts beneath the Kane County roadway to carry the flow to the main canyon drainage.

e) The pond is temporary, and will be removed upon final reclamation of the property.

f) The pond will be constructed according to the design criteria listed under "Construction Specifications for Sedimentation Ponds".

g) The pond will be equipped with an open channel spillway constructed of concrete. Dimensions on the spillway will be a minimum depth of 4' and a minimum bottom width of 15' with 2:1 sideslopes. The spillway is designed to carry the runoff from a 100 year-6 hour precipitation event, which is shown on Table 11 as 114.44 cfs. Using the Broad Crested Weir Formula, the spillway will carry this flow at a depth of 1.83', leaving 2.17' of freeboard to the top of the dam. This is considered more than adequate since the pond does not meet MSHA pond criteria and therefore is only required to pass a 25 year-6 hour event.

h) The runoff from the pond spillway will travel down the 3:1 pond outslope through a concrete-lined channel with a 15' bottom width, 2:1 side slopes and a depth of 4'. At the design flow of 114.44 cfs, flow depth will be 0.30' at a velocity of 24.66 cfs, as shown on the following flow calculations. See page A VII-5.41.

i) From the base of the spillway outslope, the runoff water is then carried through two 42" cmp culverts in parallel beneath the road. The culverts will be equipped with inlet sections and trash racks, and will have concrete headwalls and sidewalls at a minimum height of 5' at the road. A 42" cmp will carry 80 cfs at a head of 1.4 x D or 5' (see Figure 1, Culvert Nomograph). The two culverts will therefore easily carry the expected flow of 114.44 cfs at the design headwall depth. The culverts will be on a minimum slope of 3% and will carry the runoff at a velocity of approximately 7.5 fps. The culverts will be spaced at 6.5' centers, allowing 3' between culverts to facilitate proper compaction during construction.

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j) The spillway culverts will discharge near the outlet of the mine bypass culvert U9. The culvert outlets will be equipped with energy dissipators to slow the combined flow sufficiently to prevent erosion of the downstream channel. Refer to Appendix VII-11 for energy dissipator detail.

k) It should be noted that all of the above described structures are designed for runoff from a 100 year-6 hour event, and are therefore considerably oversized according to regulatory requirements.

FLOW CALCULATIONS

POND SPILLWAY (OUTSLOPE)

SOLVING FOR ..... = DEPTH NORMAL

TRAPEZOID

Flow Depth (ft)	=	0.30
First Sideslope	=	2.0
Second Sideslope	=	2.0
Bottom Width (ft)	=	15.00
Slope of Diversion	=	0.33
Manning's n	=	0.015
CFS	=	114.44
Cross Section Area (sq. ft.)	=	4.64
Hydraulic Radius	=	0.28
FPS	=	24.66
Froude Number	=	8.15

STAGE-VOLUME
SMOKY HOLLOW SEDIMENT POND

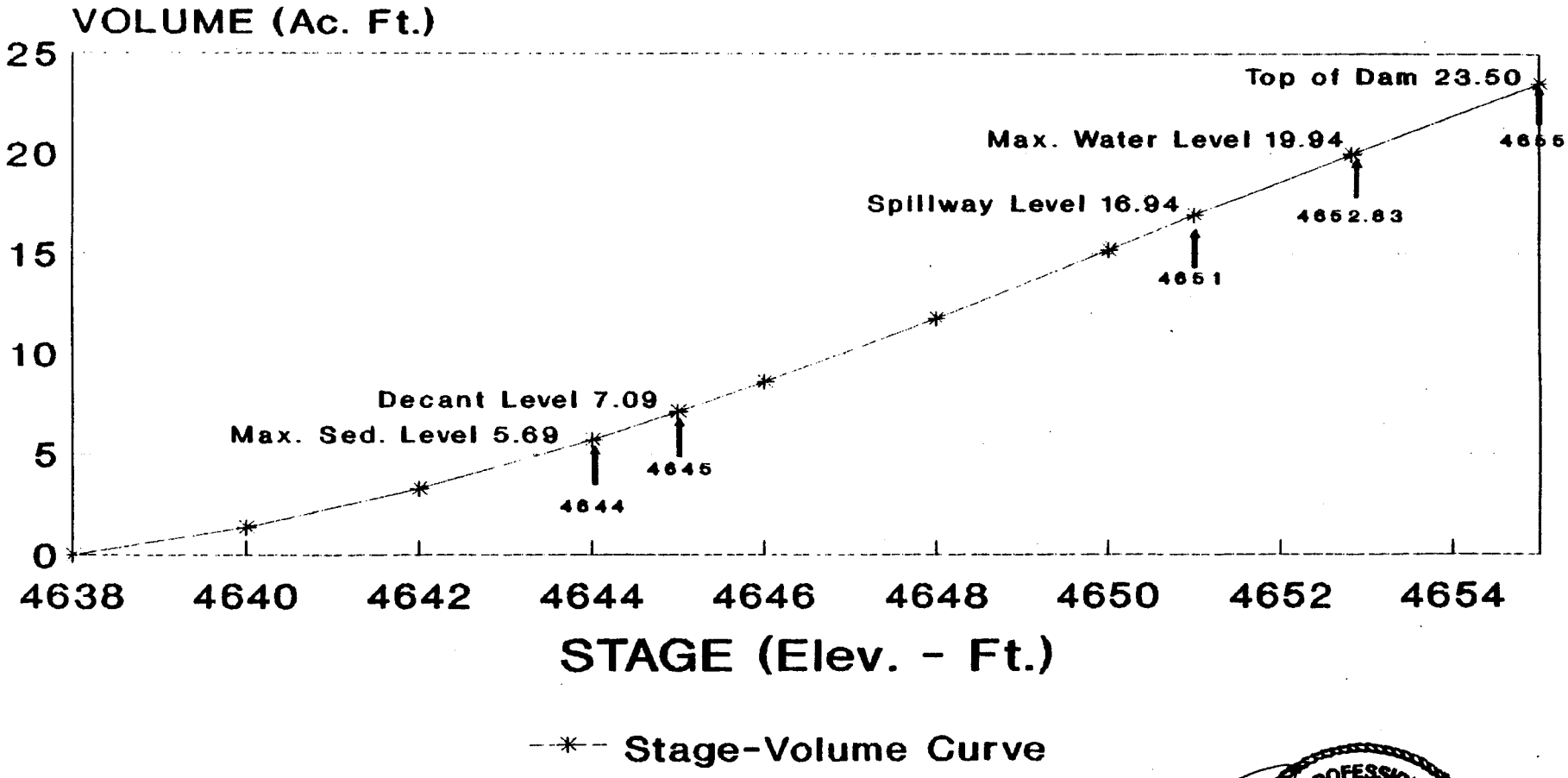
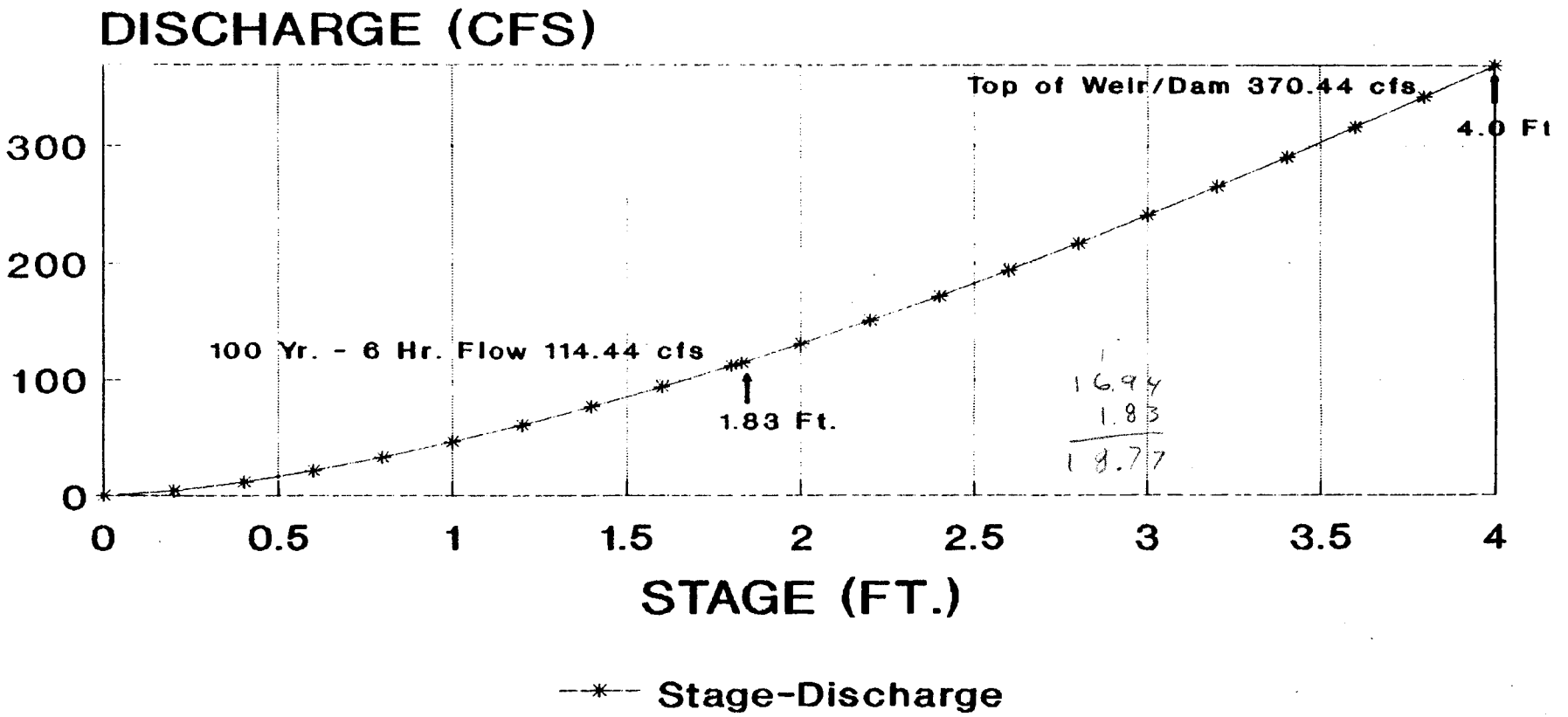


FIGURE 7

REGISTERED PROFESSIONAL ENGINEER
No 4848
DAN W. GUY
3/25/93
STATE OF UTAH

732.200 #1

STAGE-DISCHARGE
SMOKY HOLLOW SEDIMENT POND



Note: Flow is Totally Weir Controlled.

FIGURE 8

732.200 #1

REGISTERED PROFESSIONAL ENGINEER
No 4548
DAN W. GUY
STATE OF UTAH

DESIGN OF DRAINAGE CONTROL STRUCTURES FOR RECLAMATION

Reclamation Hydrology

4.1 General (Phase I)
4.2 General (Phase II)
4.3 Reclamation Disturbed Drainage Control
4.4 Restored Channels
4.5 Sediment Pond

Table 13 Reclamation - Phase I Drainage Areas Contributing to Pond
14 Reclamation - Phase I Drainage Structures
15 Reclaimed Ditch Design Parameters
15A Reclaimed Ditch Design Summary
16 Reclamation - Phase I Reclaimed Ditch Flow Calculations
17 Final Reclamation - Phase II Drainage Areas Contributing to Channel
18 Final Reclamation - Phase II Drainage Structures
19 Final Reclamation - Phase II Restored Channel Design Parameters
19A Final Reclamation - Phase II Restored Channel Design Summary
20 Final Reclamation - Phase II Restored Channel Flow Calculations

Figure 9 Restored Channel Typical Section

Appendix 1 Soil Reference Data
Appendix 2 Computer Backup Data

Reclamation Hydrology

4.1 General (Phase I)

During Phase I of reclamation, disturbed culverts C9 and C10 will remain in place to carry disturbed drainage to the sediment pond. These culverts have been sized for a 100 year - 6 hour storm event. Approximately 100' of undisturbed culverts U2, U4 and U6 will remain in place adjacent to the main restored channel. This will allow disturbed drainage to pass over the undisturbed culverts and continue on to the sediment pond. Portions of undisturbed culverts U7, U8 and all of U9 will remain in place to convey undisturbed drainage from the restored channel past the sediment pond embankment (Exhibit V-11).

4.2 General (Phase II)

Upon final reclamation, all culverts, diversions and the sediment pond will be removed with the exception of a portion of culvert U-9 which passes through the road embankment (pond embankment). This culvert was previously sized for a 100 year - 6 hour storm event and will be part of the permanent road drainage after final reclamation.

Four additional culverts will be installed under the retained county road during Phase II, to direct drainage from the west side to the reclaimed main channel. All of these culverts will be 36" cmp, and will be installed per AASHTO (American Association of State Highway Transportation Officials) and Kane County road requirements. The culvert sizing is based on the largest expected flow, which is that for reclaimed ditch RD-7 as shown on Plate V-11. The peak flow for a 100 year - 6 hour storm event for ditch RD-7 is 28.32 cfs as shown on Table 15A. A 36" culvert will handle this flow at a head of 2.58' (Culvert Nomograph - Figure 1), which is more than

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adequate. Since this is the largest expected flow at the lower end of the road drainage, each of the other 36" road culverts above will also be more than adequate to handle the runoff from their respective areas. All roadway culverts shown on Exhibit V-12 will be newly installed during Phase II reclamation except for two segments of undisturbed drainage culvert U9 which will remain inplace permanently under the road near the location of the reclaimed sediment pond.

All permanent Phase II roadway culverts are sized to handle the runoff from a 100 year - 6 hour storm event. All permanent structures are shown on Exhibit V-12 "Final Reclamation - Phase II".

4.3 Reclamation Disturbed Drainage Control

The drainage on the down slope of the county road will be treated through silt fences and/or straw bales and drained directly to the restored main channel. The berms will direct runoff from the east side of the reclaimed area across undisturbed culverts U4, U6 and U7 down to disturbed culvert C9 and into the sediment pond. The drainage on the west side of the road will be carried to the sediment pond by reclaim ditches RD6 and RD7 across undisturbed culvert U8.

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4.4 Restored Channels

Upon final reclamation, the main canyon drainages will be restored as shown on Exhibit V-12. Undisturbed culverts U1, U3, U5 and U7 will be replaced by RC-1, culvert U2 will be replaced by RC-4, culvert U4 will be replaced by RC-2, culvert U6 will be replaced by RC-3 and culverts U8, U8a, and U8b will be replaced by RC-5 (see Table 19). A portion of undisturbed drainage culvert U9 will be left in place as a permanent draining control structure for the Kane County road.

Table 19A summarizes the design criteria and flow characteristics for the reclaimed channels.

Calculations for the restored channels are shown on Table 20. A typical section of the restored channel is shown on Figure 9.

The restored channel configuration will be capable of passing the 100 year, 6 hour event. The design capacity of the restored channel is as great or greater than the capacity of the unmodified stream channel immediately upstream and downstream from the location of the proposed restored channel.

4.5 Sediment Pond

The sediment pond will remain in place during Phase I of the reclamation as described above. The pond will be removed during Phase II and all drainage will be returned to the main channel at that time.

TABLE 13
RECLAMATION - PHASE I
DRAINAGE AREAS CONTRIBUTING TO POND

Disturbed Drainage-Area (acres)	
RDA1	3.80
RDA2	2.88
RDA3	8.66
RDA4	8.50
RDA5	1.67
RDA6	2.20
RDA7	5.74
RDA8	1.19
RDA9	0.74
RDA10	1.10
RSD1	2.69
Total To Pond -	39.17 Acres
RDA11	1.62
RDA12	1.22
Reclaimed Channel Area	11.43
RND1	1.13
Total Disturbed Area	54.57 Acres

Undisturbed Drainage-Area (acres)		
UD-7		4.81
UD-8		4.43
UD-9		16.91
	UD-9A	(16.04)
	UD-9B	(0.87)
UD-10		9.25
UD-11		19.75
	UD-11A	(10.46)
	UD-11B	(7.23)
	UD-11C	(2.06)
UD-12		4.09
	UD-12A	(2.74)
	UD-12B	(1.35)
Total to Pond -		59.24 Acres

Notes: Areas have been planimetered from boundaries shown on Exhibits V-11 and VII-1.

All disturbed areas drain to pond except RND1, RDA11, RDA12 and Reclaimed Channel .

Areas are used for Table 14 "Reclamation - Phase I Drainage Structures"

TABLE 14
RECLAMATION - PHASE I
DRAINAGE STRUCTURES

Ditch	Contributing Drainage	Undisturbed (acres)	Disturbed (acres)
RD1	(UD-7)(RDA1)	4.81	3.80
RD2	(RD1)(RDA2)	4.81	6.68
RD3	(UD-10)(RDA3)	9.25	8.66
RD4	(UD-11A)(RDA4)	10.46	8.50
RD5	(RD2)(RD3)(RD4)(UD-11B)(RDA5)	31.75	25.51
RD6	(UD-8)(RDA6)	4.43	2.20
RD7	(RD6)(UD-9A)(RDA7)	20.47	7.94
RD8	(UD-9B)(RDA8)	0.87	1.19
RD9	(UD-12B)(RDA9)	1.35	0.74
RD10	(UD-11C)(RDA10)	2.06	1.10
RD11	(RD5)(RD7)(RD8)(RD9)	54.44	35.38
Pond	(RD10)(RD11)(UD-12A)(RSD1)	59.24	39.17
Restored Channel	(UD-1)(UD-2)(UD-3)(UD-4)(UD-5)(UD-6)(RDA11)(RDA12)(Restored Channel Area)	3281.29	14.27
Outslope	(RND1)		1.13

Note: 14.27 acres of disturbed area will drain to the restored channel RC-1 rather than to the pond. This area includes RDA11, RDA12, the outslope of the Kane County road, and the restored channel itself. Sediment will be controlled by revegetation, silt fences and straw bales as necessary.

The outslope of the sediment pond (RND1 = 1.13 acres) does not drain to the pond and will not be reclaimed because it remains a permanent part of the Kane County road. Sediment will be controlled by revegetation, silt fences and straw bales as necessary.

Areas have been planimetered from boundaries shown on Exhibits V-11 and VII-1.

TABLE 15
RECLAIMED DITCH DESIGN PARAMETERS

Ditch Structure	RD.1	RD.2	RD.3	RD.4	RD.5	RD.6	RD.7	RD.8	RD.9	RD.10	RD.11
Undist. Drainage Area (ac)	4.81	4.81	9.25	10.46	31.75	4.43	20.47	0.87	1.35	2.06	54.44
Dist. Drainage Area (ac)	3.80	6.68	8.66	8.50	25.51	2.20	7.94	1.19	0.74	1.10	35.38
Disturbed Runoff CN	90	90	90	90	90	90	90	90	90	90	90
Dist. Hyd. Length (ft)	150	250	300	300	100	150	300	150	150	300	-
Dist. Land Slope (% - av.)	2.31	3.61	4.23	4.23	3.02	1.00	4.00	7.31	7.31	2.43	3.00
Dist. Area Time of Conc (hr)	0.05	0.06	0.07	0.07	0.03	0.08	0.07	0.03	0.03	0.06	-
Manning's No.	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Ditch Slope (% - av.)	2.31	3.61	4.23	4.23	3.02	1.00	4.00	7.31	7.31	2.43	3.00
Ditch Length (ft)	1200	550	1400	1500	950	580	1300	450	450	250	180

Refer to Table 15A for peak flow calculations

TABLE 15A
RECLAIMED DITCH DESIGN SUMMARY

Ditch Structure	RD.1	RD.2	RD.3	RD.4	RD.5	RD.6	RD.7	RD.8	RD.9	RD.10	*RD.11
10 year - 6 hour event (in)	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
Disturbed Flow (cfs)	2.37	4.27	5.59	5.49	13.93	1.44	5.12	0.65	0.40	0.70	20.10
Undisturbed Flow (cfs)	2.76	2.76	5.32	5.67	17.67	2.24	9.69	0.40	0.61	1.12	28.37
Peak Flow (cfs)	5.13	7.03	10.91	11.16	31.16	3.68	14.81	1.05	1.01	1.82	*48.47
Velocity (fps)	4.42	5.66	6.70	6.74	7.68	2.98	7.08	4.59	4.54	3.48	8.55
Min. Ditch Area Req'd ($ft.^2$)	1.16	1.24	1.63	1.66	4.06	1.24	2.09	0.23	0.22	0.52	5.67
Min. Flow Depth (ft.)	0.74	0.76	0.88	0.89	1.40	0.76	1.00	0.31	0.31	0.49	1.66
Rip-Rap Req'd (Y/N)	N	Y	Y	Y	Y	N	Y	N	N	N	Y
Rip-Rap D_{50} (ft.)	-	0.50	0.50	0.50	0.50	-	0.50	-	-	-	0.50
100 year - 6 hour event (in.)	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Disturbed Flow (cfs)	4.31	7.78	10.20	10.02	25.30	2.63	9.36	1.18	0.73	1.28	36.57
Undisturbed Flow (cfs)	5.18	5.18	9.98	10.91	33.61	4.18	18.96	0.80	1.14	2.15	54.51
Peak Flow (cfs)	9.49	12.96	20.18	20.93	58.91	6.81	28.32	1.98	1.87	3.43	*91.08
Velocity (fps)	5.16	6.59	7.82	7.89	9.00	3.47	8.33	5.38	5.30	4.08	10.01
Min. Ditch Area Req'd ($ft.^2$)	1.84	1.97	2.58	2.65	6.55	1.96	3.40	0.37	0.35	0.84	9.10
Min. Flow Depth (ft.)	0.93	0.97	1.11	1.13	1.78	0.97	1.28	0.40	0.40	0.62	2.11

* Peak flows for RD-11 are sums of flows from RD-5, RD-7, RD-8 and RD-9 (see Table 14).

Note: Refer to Appendix 2G for computer backup data.
Refer to Table 16 for reclaimed ditch flow calculations.

TABLE 16
RECLAMATION-PHASE I
RECLAIMED DITCH FLOW CALCULATIONS

Ditch	RD.1	RD.2	RD.3	RD.4	RD.5	RD.6	RD.7	RD.8	RD.9	RD.10	RD.11
Flow depth	0.74	0.76	0.88	0.89	1.40	0.76	1.00	0.31	0.31	0.49	1.66
Side slopes	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1
Bottom width (ft)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Slope (%)	2.31	3.61	4.23	4.23	3.02	1.00	4.00	7.31	7.31	2.43	3.00
Manning's No.	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Peak flow rate (cfs)*	5.13	7.03	10.91	11.16	31.16	3.68	14.81	1.05	1.01	1.82	48.47
Cross sectional area (ft^2)	1.16	1.24	1.63	1.66	4.06	1.24	2.09	0.23	0.22	0.52	5.67
Hydraulic radius	0.34	0.35	0.40	0.41	0.64	0.35	0.46	0.15	0.15	0.23	0.75
Velocity (fps)	4.42	5.66	6.70	6.74	7.68	2.98	7.08	4.59	4.54	3.48	8.55
Froude number	1.33	1.68	1.86	1.86	1.69	0.88	1.84	2.07	2.07	1.28	1.74

* 10 year/6 hour event

Note: Refer to Exhibit V-11 for ditch locations.

Refer to Appendix 2H for computer backup data.

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TABLE 17
FINAL RECLAMATION - PHASE II
DRAINAGE AREAS CONTRIBUTING TO CHANNEL

Reclaimed Drainage-Area (acres)	
RDA1	3.80
RDA2	2.88
RDA3	8.66
RDA4	8.50
RDA5	1.67
RDA6	2.20
RDA7	5.74
RDA8	1.19
RDA9	0.74
RDA10	1.10
RDA11	1.62
RDA12	1.22
RSD1	2.69
Reclaimed Channel Area	11.43
RND1	1.13
Total Reclaimed Area -	54.57 Acres

Undisturbed Drainage-Area (acres)		
UD-1		2990.42
UD-2		64.76
UD-3		173.29
UD-4		20.64
UD-5		27.40
UD-6		4.78
UD-7		4.81
UD-8		4.43
UD-9		16.91
	UD-9A	(16.04)
	UD-9B	(0.87)
UD-10		9.25
UD-11		19.75
	UD-11A	(10.46)
	UD-11B	(7.23)
	UD-11C	(2.06)
UD-12		4.09
	UD-12A	(2.74)
	UD-12B	(1.35)
	UD-12B	(1.35)
Total Undisturbed Area		3340.53 Acres

Notes: Areas have been planimetered from boundaries shown on Exhibits V-11 and VII-1.

Areas are used for Table 18 "Reclamation Phase II Drainage Structures".

TABLE 18
FINAL RECLAMATION - PHASE II
DRAINAGE STRUCTURES

Channel	Contributing Drainage	Undisturbed acres	Reclaimed acres
RC1	All undisturbed areas and all reclaimed areas	3340.53	54.57
RC2	(UD2)	64.76	–
RC3	(UD3)(UD10)(UD11A)(RDA3)(RDA4)	193.00	17.16
RC4	(UD4)	20.64	–
RC5	(UD5)(UD9B)(UD12A)(UD12B)(RDA8)(RDA9)(RDA11)	32.36	3.55

Areas have been planimetered from Exhibits V-11 and VII-1.

TABLE 19
FINAL RECLAMATION-PHASE II
RESTORED CHANNEL DESIGN PARAMETERS

Restored Channel	RC.-1	RC.-2	RC.-3	RC.-4	RC.-5
Undisturbed Drainage Area (ac.)	3340.53	64.76	193.00	20.64	32.36
Reclaimed Drainage Area (ac.)	54.57	-	17.16	-	3.55
Reclaimed Runoff CN	90	-	90	-	90
Reclaimed Hyd. Length (ft.)	300	-	300	-	150
Reclaimed Land Slope (%)	3.00	-	4.23	-	7.31
Reclaimed Area Time of Conc. (hrs.)	0.08	-	0.07	-	0.03
Manning's No.	0.040	0.040	0.040	0.040	0.040
Channel Slope %	2.52	10.67	4.20	15.33	8.72
Channel Length	3510	380	1750	280	770

Note: Refer to Table 20 for restored channel flow calculations.

Reclaim Channel	replaces Undisturbed Culvert
RC-1	U1, U3, U5, U7, U9
RC-2	U4
RC-3	U6
RC-4	U2
RC-5	U8, U8A, U8B

TABLE 19A
FINAL RECLAMATION-PHASE II
RESTORED CHANNEL DESIGN SUMMARY

Restored Channel	RC.-1	RC.-2	RC.-3	RC.-4	RC.-5
100 year - 6 hour event (in.)	2.23	2.23	2.23	2.23	2.23
Disturbed Flow (cfs)	65.19	-	20.22	-	3.52
Undisturbed Flow (cfs)	770.10	61.66	74.29	17.33	26.26
Peak Flow (cfs)	835.29	61.66	94.51	17.33	29.78
Velocity (fps)	10.25	9.05	7.29	6.97	6.80
Min. Ditch Area Req'd ($ft.^2$)	81.52	6.81	12.96	2.49	4.38
Min. Flow Depth (ft.)	3.28	0.89	1.41	0.40	0.63

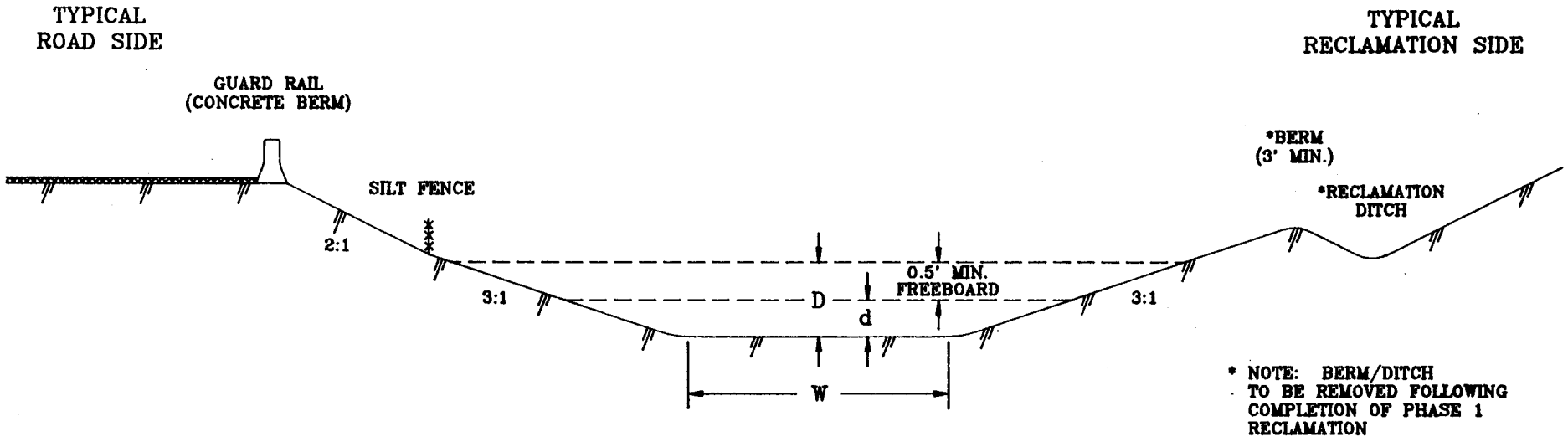
Refer to Appendix 2I for computer backup data.

TABLE 20
FINAL RECLAMATION-PHASE II
RESTORED CHANNEL FLOW CALCULATIONS

Restored Channel	RC.-1	RC.-2	RC.-3	RC.-4	RC.-5
Flow depth	3.28	0.89	1.41	0.40	0.63
Side slopes	3:1	3:1	3:1	3:1	3:1
Bottom width (ft)	15	5	5	5	5
Slope (%)	2.52	10.67	4.20	15.33	8.72
Manning's No.	0.04	0.04	0.04	0.04	0.04
Peak flow rate 100/6 (cfs)	835.29	61.66	94.51	17.33	29.78
Cross sectional area (ft^2)	81.52	6.81	12.96	2.49	4.38
Hydraulic radius	2.28	0.64	0.93	0.33	0.49
Velocity* (fps)	10.25	9.05	7.29	6.97	6.80
Froude number	1.20	1.99	1.33	2.14	1.72

Note: Refer to Exhibit V-12 for channel locations.
Refer to Appendix 2J for computer backup data.
* Based on velocity calculations, rip-rap is recommended for erosion control.

RESTORED CHANNEL
TYPICAL SECTION



SIZING CHART					
CHANNEL	CONST. D	CONST. W	CONST. AREA	FLOW d	FLOW AREA
RC-1	4.00	15.00	108.00	3.28	81.52
RC-2	1.50	5.00	14.25	0.89	6.81
RC-3	2.00	5.00	22.00	1.41	12.96
RC-4	1.50	5.00	14.25	0.40	2.49
RC-5	1.50	5.00	14.25	0.63	4.38

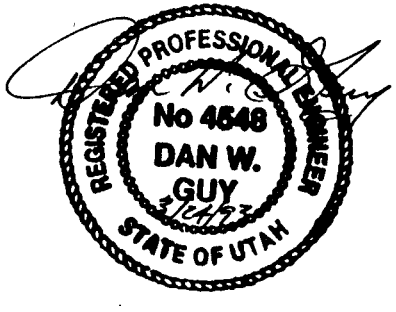


FIGURE 9

APPENDIX VII-6

WATER RIGHTS SUMMARY

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T41S R3E

WATER RIGHTS AND FILINGS WITHIN AND ADJACENT TO THE PERMIT AREA
(Refer To Exhibit VII-2)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0 VII-2	89-1157 mapped	15.7000 or Water Use(s): Mining AMCA Coal Leasing, Inc. P.O. Box 902 Price, UT 84501 Priority Date: 12/23/74	11315.00	10 750	S 1263	E 1677	NW	15	SL	X					X		
0 VII-2	89-1157 mapped	15.7000 or Water Use(s): Mining AMCA Coal Leasing, Inc. P.O. Box 902 Price, UT 84501	11315.00	Underground Water Well	S 317	W 3814	NE	23	SL	X					X		
0 VII-2	89-1426 mapped	.0150 Water Use(s): Stockwatering USA Bureau of Land Management 176 East DL Sargent Drive Cedar City, UT 84720	.00	Mission Canyon				25				X		X		X	
1 VII-2	89-1157 mapped	15.7000 or Water Use(s): Mining AMCA Coal Leasing, Inc. P.O. Box 902 Price, UT 84501	11315.00	Underground Water Well	N 297	W 1876	SE	25	SL	X					X		

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T41S R4E

WATER RIGHTS AND FILINGS WITHIN AND ADJACENT TO THE PERMIT AREA
(Refer To Exhibit VII-2)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0 VII-2 mapped	89-719	.0000 Water Use(s): Stockwatering USA Bureau of Land Managment 324 South State, Suite #301 Salt Lake City, UT 84111-2303	.00	Needle Eye Canyon Creek				8				X		X		X	
0 VII-2 mapped	89-1425	.0150 Water Use(s): Stockwatering USA Bureau of Land Management 176 East DL Sargent Drive Cedar City, UT 84720	.00	Warm Creek Tributary				18				X		X		X	
1 VII-2 mapped	89-1426	.0150 Water Use(s): Stockwatering USA Bureau of Land Management 176 East DL Sargent Drive Cedar City, UT 84720	.00	Mission Canyon				18				X		X		X	
0 VII-2 mapped	89-744	.0000 Water Use(s): Stockwatering USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, UT 84111-1203 Priority Date: 12/23/74	.00	Smoky Hollow Stream				20				X		X		X	

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T41S R4E

WATER RIGHTS AND FILINGS WITHIN AND ADJACENT TO THE PERMIT AREA
(Refer To Exhibit VII-2)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0 VII-2	89-1157 mapped	15.7000 or Water Use(s): Mining AMCA Coal Leasing, Inc. P.O. Box 902 Price, UT 84501	11315.00	Underground Water Well	N 1500		S4	29	SL	X					X		
1 VII-2	89-744 mapped	.0000 Water Use(s): Stockwatering USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, UT 84111-2303	.00	Smoky Hollow Stream				29				X		X		X	

LIST OF ABBREVIATIONS:

UNN Unapproved water right application
PER Perfected water right
SUR Surface water right
PTP Point to point right
APP Approved water right application
TER Terminated water right
UGW Underground water right
RED Point of rediversion

SEASON OF USE:

Irrigation - April 1 - October 31
Domestic, municipal - Year-round
Mining - Year-round
Stockwatering - Year-round

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T41S R4E

APPROVED WATER RIGHTS OUTSIDE OF THE PERMIT AREA
(Refer To Figure VII-16)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0	89-883	.0070 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Needle Eye Water Seep Spring				4				X		X		X	
0	89-1425	.0150 Water Use(s): Stockwatering USA Bureau of Land Management 176 East DL Sargent Drive Cedar City, UT 84720	.00	Warm Creek Tributary Priority Date: / /1864				6				X		X		X	
0	89-1037	.0000 Water Use(s): Stockwatering USA Bureau of Land Mangement 324 South State, Suite #301 Salt Lake City, UT 84111-2303	.28	Smoky Hollow Stream				32				X		X		X	
2	89-1037	.0000 Water Use(s): Stockwatering USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, UT 84111-2303	.28	Smoky Hollow Stream				32				X		X		X	

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T41S R3E

APPROVED WATER RIGHTS OUTSIDE OF THE PERMIT AREA
(Refer to Figure VII-16)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0	89-717	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Wesses Canyon Creek Priority Date: / /1864				5				X		X		X	
2	89-717	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Wesses Canyon Creek				9				X		X		X	
0	89-1392	.0150 Water Use(s): Stockwatering USA Bureau of Land Management 176 DL Sargent Drive Cedar City, Utah 84720	.00	Clints Canyon Priority Date: / /1864				18				X		X		X	
0	89-741	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Tibbits Canyon Creek Priority Date: / /1864				31				X		X		X	
1	89-741	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Tibbits Canyon Creek Priority Date: / /1864				31				X		X		X	

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T41S R3E

APPROVED WATER RIGHTS OUTSIDE OF THE PERMIT AREA
(Refer To Figure VII-16)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0	89-1036	.0000 Water Use(s): Stockwatering State of Utah Division of State Lands 3 Triad Center, Suite 400 355 West North Salt Lake City, Utah 84180	.00	Tibbits Canyon Creek Priority Date: / /1864				32				X		X		X	
3	89-1165	.0000 Water Use(s): Stockwatering State of Utah Division of State Lands 3 Triad Center, Suite 400 355 West North Salt Lake City, Utah 84180	.00	Tibbets Spring Priority Date: / /1864	1800	650	NW	32				X		X			
6	89-1036	.0000 Water Use(s): Stockwatering State of Utah Division of State Lands 3 Triad Center, Suite 400 355 West North Salt Lake City, Utah 84180	.00	Tibbits Canyon Creek Priority Date: / /1864				32				X		X		X	
3	89-742	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Tibbits Canyon Creek Priority Date: / /1864				33				X		X		X	

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T41S R3E

APPROVED WATER RIGHTS OUTSIDE OF THE PERMIT AREA
(Refer To Figure VII-16)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0	89-716	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	John Henry Canyon Priority Date: / /1864				35				X		X		X	
2	89-718	.0000 Water Use(s) USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Warm Creek Priority Date: / /1864				35				X		X		X	
0	89-1035	.0000 Water Use(s): Stockwatering State of Utah Division of State Lands 3 Triad Center, Suite 400 355 West North Salt Lake City, Utah 84180	.28	Warm Creek Priority Date: / /1864				36				X		X		X	
1	89-1035	.0000 Water Use(s): Stockwatering State of Utah Division of State Lands 3 Triad Center, Suite 400 355 West North Salt Lake City, Utah 84180	.28	Warm Creek Priority Date: / /1864				36				X		X		X	

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T42S R3E

APPROVED WATER RIGHTS OUTSIDE OF THE PERMIT AREA
(Refer To Figure VII-16)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0	89-761	.0000 Water Use(s): USA Bureau of Land Management P.O. Box 45155 Salt Lake City, Utah 84145	.00	Warm Creek				1				X		X		X	
0	89-743	.0000 Water Use(s): USA Bureau of Land Management P.O. Box 45155 Salt Lake City, Utah 84145	.00	Tibbits Canyon Creek				13				X		S		S	
0	89-743	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Tibbits Canyon Creek				14				X		X		X	
0	89-742	.0000 Water Use(s): USA Bureau of Land Management 324 South State, Suite #301 Salt Lake City, Utah 84111-2303	.00	Tibbits Canyon Creek				14				X		X		X	

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T42S R3E

APPROVED WATER RIGHTS OUTSIDE OF THE PERMIT AREA
(Refer To Figure VII-16)

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
1	89-1440	.0150 Water Use(s): Stockwatering USA Bureau of Land Management 176 East DL Sargent Drive Cedar City, Utah 84720	.00	Tributary to Tibbits Canyon				14				X		X		X	
1	89-1440	.0150 Water Use(s): USA Bureau of Land Management 176 DL Sargent Drive Cedar City, Utah 84720	.00	Tributary to Tibbets Canyon				15				X		X		X	

UTAH DIVISION OF WATER RIGHTS
NWPLAT POINT OF DIVERSION LOCATION PROGRAM
T42S R4E

APPROVED WATER RIGHTS OUTSIDE OF THE PERMIT AREA
(Refer To Figure VII-16)S

MAP CHAR	WATER RIGHT	QUANTITY CFS AND/OR	AC-FT.	SOURCE DESCRIPTION OR WELL INFORMATION DIAMETER-DEPTH-YR-LOG	POINT OF DIVERSION DESCRIPTION					UNN	APP	PER	TER	SUR	UGW	PTP	RED
					NORTH	EAST	CNR	SEC	B&M								
0	89-1442	.0150 Water Use(s): Stockwatering USA Bureau of Land Management 176 East DL Sargent Drive Cedar City, Utah 84720	.00	Tributary to Warm Creek				19				X		X		X	
0	89-906	.0000 Water Use(s): USA Bureau of Land Management P.O. Box 45155 Salt Lake City, Utah 84145	.00	Smoky Hollow Stream				29				X		X		X	

APPENDIX VII-7

X-RAY DIFFRACTION RESULTS

TerraTek

Geoscience Services

Terra Tek Core Services

February 27, 1992

Anthony Magliocchino
Earthfax Engineering, Inc.
7324 South 1300 East Suite 100
Midvale, Utah 84047

Dear Mr. Magliocchino:

Enclosed are the results of the bulk X-ray diffraction analysis performed on the shale outcrop sample you recently submitted.

Bulk Analysis: A representative one-gram split of the crushed sample is ground in acetone in agate mortar to <325 mesh (<45 um) then scanned at 2°2θ per minute from 2-65°2θ. Diagnostic peaks of minerals identified on resulting diffractograms are rescanned on duplicate samples. Approximate weight percentages of the minerals are determined by comparing diagnostic peak intensities with those generated by standard pure phases mixed in various known proportions.

X-RAY DIFFRACTION ANALYSIS

Quartz	40
Potassium Feldspar	4
Gypsum	1
Kaolin	15
Illite	2
Smectite	16*
Amorphous/ Below detection	22+

* Smectite is poorly crystalline and may also contain some mixed-layer illite-smectite.

\+ Organic matter and possibly poorly crystalline clay.

We have enjoyed working on this project for Earthfax. If you have any questions concerning this analysis please give me a call.

Sincerely,

Gregory Lord

Gregory Lord
Manager Petrography

University Research Park • 360 Wakara Way • Salt Lake City, Utah 84108 USA • Telephone (801) 584-2480 • FAX (801) 584-2408

APPENDIX VII-8

PERMEABILITY RESULTS - CALICO SANDSTONE

TerraTek

Geoscience Services

EARTHFAX ENGINEERING, INC.

PERMEABILITY TO WATER TEST RESULTS

TEST DATE: 03-15-92 TTGS PROJECT NO. 5173

SAMPLE	ORIENTATION	LENGTH (in.)	DIAMETER (in.)	FLOW RATE (cc/sec)	DELTA PRESSURE (psi)	PERMEABILITY (md)
SS-1	//	2.795	1.485	1.54E-02	13.87	10.37
	⊥	2.803	1.486	0.33E-02	15.82	1.97
SS-2	//	2.803	1.487	2.86E-02	13.33	20.02
	⊥	2.803	1.485	3.60E-02	13.34	25.19
OBS-1	//	2.077	1.520	0.30E-04	14.61	0.014
	⊥	2.134	1.482	2.30E-04	18.61	0.034

// = Parallel to bedding
⊥ = Perpendicular to bedding
Flow Medium: Deionized water filtered to 0.22 microns.
Temperature = 75°F
Technician: Ed Trimble
Confining Pressure: 500 psi
Test Method: API RP 27 Recommend Practice for Determining Permeability of Porous Media

University Research Park • 360 Wakara Way • Salt Lake City, Utah 84108, U.S.A. • Telephone (801) 584-2480 • FAX (801) 584-2408