APPENDIX 6A

NOTARIZED LETTER FROM JOSEPH A. HARVEY CONCERNING DRILLING OF THE LMC HOLES

March 24, 1992

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Mr. Richard B. White, P.E.
Principal Hydrologist
EarthFax Engineering, Inc.
7324 South Union Park Avenue
Suite 100
Midvale, Utah 84047

Subject: Involvement during drilling and abandonment of LMC drill holes

Dear Mr. White:

The following is provided pursuant to the request of the Utah Division of Oil, Gas & Mining for information regarding the drilling of the LMC drill holes in Sec. 7 and 17, T. 13 S., R. 8 E. The Division's request was made in a letter to Mr. William R. Skaggs of Blue Blaze Coal Company dated March 23, 1992.

My Responsibilities and Background

During the mid-1970s to early 1980s, I was under contract to C&W Coal Producers Corporation as a Mining Consultant. One of my primary responsibilities during this period was to supervise the drilling of four exploratory holes on the property (labeled LMC-1, LMC-2, LMC-3, and LMC-4). My responsibilities during drilling included examining the drill cuttings and assessing the potential for groundwater occurrence to assist me in drawing conclusions regarding probable conditions to be encountered during mining of the property. As such, I was interested in assessing roof and floor conditions, coal conditions, groundwater occurrence, potential splits in the coal seams, etc. Groundwater occurrence in the holes was of particular interest as part of my observations because of its potential influence on future mining conditions. Because of my need to obtain this information, I was on site and made observations during all drilling activities.

My responsibilities also included supervising hole abandonment activities. I was periodically on site during the abandonment activities.

Prior to my work as a Mining Consultant, I was employed by U.S. Steel from 1947 to 1974 at their Columbine and Geneva Mines near East Carbon, Utah. During this period, I held a variety of positions, serving for the last 16 years of my employ with U.S. Steel as superintendent of the Columbine and Geneva Mines. The superintendent position included responsibility for both surface and underground activities at the mines.

Drilling Methods

Each of the LMC holes was drilled using air as the only drilling fluid. No water or drilling mud was injected into the holes during drilling. The holes were all drilled using rotary drilling rigs. One of the primary reasons for remaining with air during drilling was to monitor the holes for the potential occurrence of groundwater. After each break in drilling activities (e.g., rig maintenance, beginning of a new day, etc.), compressed air was injected into each hole prior to the resumption of drilling to determine whether or not groundwater was accumulating in the hole.

Following drilling of each hole, mud was injected into the holes to facilitate down-hole geophysical logging. Again, it is emphasized that no mud or water was injected into the holes during drilling.

Occurrence of Groundwater in Drill Holes

No groundwater was encountered during drilling of any of the LMC holes. This conclusion is based on the following observations:

- As noted above, each hole was drilled using only air. No cuttings returning from the holes were saturated. In addition, no water was observed blowing from the LMC holes during drilling.

- Also as noted above, compressed air was injected into each hole following breaks in drilling. No water was returned from any of the LMC holes during this air injection.

It should be emphasized that the occurrence of groundwater in the holes was of major importance during drilling activities. Thus, the above observations were not made in passing, but were made with care.

Hole Abandonment

Following drilling, the U.S. Geological Survey required that the holes be abandoned. Abandonment was accomplished by introducing a cement/bentonite slurry through the drill rods using the drilling pump. The drill rods were placed on the bottom of each hole at the beginning of abandonment and gradually raised as the cement/bentonite slurry was introduced.

It was the initial intent of the abandonment procedure to cement the holes from the total depth to approximately the surface. However, fractures or previous mine workings were encountered in

holes LMC-1, LMC-3, and LMC-4. These voids were sufficiently large to preclude plugging with the cement/bentonite mixtures. Thus, plugging ceased at these elevations. These three holes remained open above the point where cementing operations ceased.

Please contact me if you have any additional questions.

Sincerely,

Joseph A. Harvey

Joseph A. Harvey
Mining Consultant
500 Harvey Lane
Ferron, Utah 84523

On March 24, 1992 Joseph A. Harvey personally appeared before me and signed the above document.

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COMM. EXP. JUNE-4-95

Patricia Behling
Ferron, Emery Co, Utah

BLUE BLAZE COAL
Drill Hole
Water Monitoring
LMC 1,3 &4

Monitoring (1992)

	Date Sampled											
	2/27	3/28	4/25	5/17	6/25	7/25	8/24	9/29	10/25	11/22	12/28	---
LMC-1	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	
LMC-3	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	
LMC-4	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	

APPENDIX 6B

GROUNDWATER QUALITY AND FLOW RATE DATA

Blue Blaze Coal Company
Water Monitoring Report

Station #1

Property: 1 & 2 Mine
Location: Marakis Spring
Type: Spring
Frequency: Monthly

ld	SPRING			SUMMER		FALL			
	Date Sampled (1989)								Mean
surements:	4/8	5/7	6/2	7/8	8/5	9/4	10/14	11/4	
w (gpm)	22	45	30	7.25	6.75	6.75	5	5	15.97
	7.6	8.2	7.31	8.23	8.08	8.36	8.19	7.8	7.97
Con.(ohms)	740	1260	680	580	540	460	490	520	658.75
p. C	4	6	6	11	12	10	10	9	8.5
s. O(mg/1)									

surements: mg/1	SPRING Date Sampled 6/2	SUMMER 9/4	FALL 11/4	Mean
Aluminum	0.01<	0.01<	0.01<	0.01<
Alk.,Bicarbonate	405HCO3	300HCO3	292HCO3	332.33HCO3
Alk.,Carbonate	1<CaCO3	1<CaCO3	1<CaCO3	1<CaCO3
Arsenic	0.002<	0.002<	0.002<	0.002<
Anions, Total	11.13meq/1	5.30meq/1	5.27meq/1	7.233meq/1
Barium	0.03<	0.03<	0.03<	0.03<
Boron	0.25	0.09	0.37	0.237
Cadmium	0.005<	0.002<	0.002<	0.003<
Calcium	140.2	72.1	67.1	93.13
Cations, Total	11.78meq/1	5.29meq/1	5.18meq/1	7.416meq/1
Chloride	20.0	5.0	5.0	10.0
Chromium	0.04<	0.02<	0.02<	0.03
Copper	0.010<	0.010<	0.010<	0.010<
Fluoride	0.64	0.35	0.46	0.483
Hardness, Total	568CaCO3	254CaCO3	249CaCO3	357CaCO3
Iron	0.02<	0.46	0.51	0.33
Lead	0.050<	0.050<	0.050<	0.050<
Magnesium	52.90	18.00	19.80	30.233
Manganese	0.01<	0.04	0.01<	0.02
Mercury	0.002<	0.009	0.002<	0.0043
Molybdenum	0.10<	0.10<	0.10<	0.10<
Nickel	0.02<	0.02<	0.02<	0.02<
Nitrogen, Ammonia	0.01<	0.00	0.25	0.087
Nitrogen, Nitrate	0.09	0.18	0.10	0.123
Nitrogen, Nitrite	0.02	0.02	0.01<	0.0167
Phosphorus, Total	0.01<	0.01<	0.01<	0.01<
Potassium	3.50	1.40	1.00	1.966
Selenium	0.002<	0.002<	0.002<	0.002<
Sodium	7.90	3.90	3.60	5.13
Solids, Dissolved	517	310	266	364.333
Sulfate	195.0	17.0	29.0	80.333
Sulfide	0.01<	1.40	1.20	0.87
Zinc	0.01<	0.00<	0.00<	0.003

Water Monitoring Report

Station #1

Property: 1 & 2 Mine
Location: Marakis Spring
Type: Spring
Frequency: Monthly

Field Measurements:	SPRING 5/12	6/23	7/10	SUMMER 8/10	9/12	FALL 10/12	11/14	WINTER 12/4	Mean
	Date Sampled (1990)								
Flow (gpm)	9.5	6.25	6.00	6.00	5.75	6.00	6.00	6.00	6.4
pH	8.4	8.48	8.48	8.66	8.60	8.60	8.60	8.60	8.5
Sp.Con.(ohms)	380	530	520	480	470	480	440	492	47-
Temp. C	8	13	13	14	14	12	8	8	11.2
Diss. O(mg/1)									

Measurements: mg/1	SPRING Date Sampled 5/12	SUMMER 8/10	FALL 11/14	Mean
Aluminum	0.01<	0.01<	0.01<	0.01<
Alk.,Bicarbonate	405HCO3	251HCO3	249HCO3	301HCO
Alk.,Carbonate	1<CaCO3	1<CaCO3	5 CaCO3	2CaCO3
Arsenic	0.002<	0.002<	0.005	0.003
Anions, Total	5.96 meq/1	6.35 meq/1	4.69 meq/1	5.66me
Barium	0.03<	0.03<	0.03<	0.03<
Boron	0.18	0.01<	0.01<	0.066
Cadmium	0.002<	0.002<	0.002<	0.002<
Calcium	95.4	80.0	53.3	76.23
Cations, Total	6.13 meq/1	6.51 meq/1	4.85 meq/1	5.73 m
Chloride	10.0	55.0	15.0	26.66
Chromium	0.02<	0.02<	0.02<	0.02<
Copper	0.010<	0.010<	0.010<	0.010<
Fluoride	0.27	0.38	0.21	0.28
Hardness, Total	299CACO3	286CACO3	237CaCO3	274CaC
Iron	0.25	0.07	0.26	0.19
Lead	0.050<	0.050<	0.050<	0.050<
Magnesium	14.70	20.83	25.30	20.27
Manganese	0.02	0.01<	0.02	0.016
Mercury	0.002<	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<	0.010<
Nickel	0.02<	0.02<	0.02<	0.02<
Nitrogen, Ammonia	0.20	0.08	0.12	0.13
Nitrogen, Nitrate	3.90	0.18	0.01<	1.36
Nitrogen, Nitrite	0.06	0.02	0.01<	0.03
Phosphorus, Total	0.01	0.01<	0.01<	0.01<
Potassium	0.00	0.09	0.04	0.043
Selenium	0.002<	0.002<	0.003	0.002
Sodium	3.68	18.50	2.49	8.22
Solids, Dissolved	229	264.0	306.0	266.3
Sulfate	35.0	30.10	18.0	27.7
Sulfide	1.00<	0.00	0.00	0.33
Zinc	0.01<	0.00<	0.00<	0.003

Blue Blaze Coal Company
Water Monitoring Report

Station #1

Property: 1 & 2 Mine (Operational)
Location: Marakis Spring
Type: Spring
Frequency: Monthly

ld	SPRING			SUMMER		FALL		
	Date Sampled (1991)							
surements:	5/25	6/25	7/28	8/25	9/27	10/27	11/4	Mean
w (gpm)	12	9.0	6.0	4.0	6.0	10	12	8.43
	8.4	8.48	8.36	8.19	8.32	8.4	8.36	8.36
Con.(ohms)	380	480	460	468	480	380	378	432
p. C	8	9	11	12	10	8	8	9.43
s. O(mg/1)								

surements: mg/1	SPRING Date Sampled 5/25	SUMMER 9/27	FALL 11/4	Mean
Alk.,Bicarbonate	366 HCO3	399 HCO3	342 HCO3	369 HCO3
Alk.,Carbonate	1< CaCO3	1< CaCO3	1< CaCO3	1< CaCO3
Calcium	198	97.9	97.7	131.2
Cations, Total	11.10 meq/1	6.63 meq/1	6.96 meq/1	8.23 meq/1
Chloride	40	15	15	23.3
Hardness, Total	547 CaCO3	324 CaCO3	332 CaCO3	401 CaCO3
Iron	1.30	0.58	0.26	.71
Magnesium	12.80	19.40	21.40	17.87
Manganese	.27	.11	0.01<	.13
Potassium	.71	0.00<	4.51	1.74
Sodium	3.13	3.38	4.79	3.77
Solids, Dissolved	334	266	313	304.3
Sulfate	23	23	24	23.3

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Blue Blaze Coal Company
Water Monitoring Report

Station #2

Property: 1 & 2 Mine
Location: Spring (right fork)
Type: Spring
Frequency: Monthly

ld	SPRING			SUMMER		FALL			Mean
	Date Sampled (1989)								
surements:	4/8	5/7	6/2	7/8	8/5	9/4	10/14	11/4	
w (gpm)	.95	1.75	1.5	1	1.5	1.25	1.5	1.5	1.37
	7.8	7.8	8.12	7.32	7.8	8.25	7.82	7.64	7.82
Con.(ohms)	640	660	730	1020	940	800	850	1010	831.25
p. C	4	6	8	8	8	9.5	8	9	7.56
s. O(mg/1)									

surements: mg/1	SPRING Date Sampled 6/2	SUMMER 9/4	FALL 11/4	Mean
Aluminum	0.01<	0.01<	0.01<	0.01<
Alk.,Bicarbonate	338HCO3	501HCO3	479HCO3	439.33HO3
Alk.,Carbonate	1<CaCO3	1<CaCO3	1<CaCO3	1<
Arsenic	0.002<	0.002<	0.002<	0.002<
Anions, Total	9.26meq/1	10.25meq/1	10.36meq/1	9.957meq/1
Barium	0.03<	0.03<	0.03<	0.03<
Boron	0.20	0.09	0.08	0.123
Cadmium	0.005<	0.002<	0.002<	0.003<
Calcium	96.1	110.1	98.2	101.47
Cations, Total	9.02meq/1	10.15meq/1	9.40meq/1	9.523meq/1
Chloride	25.0	20.0	40.0	28.33
Chromium	0.04<	0.02<	0.02<	0.027
Copper	0.010<	0.010<	0.010<	0.010<
Fluoride	0.48	0.40	0.49	0.457
Hardness, Total	423CaCO3	476CaCO3	444CaCO3	447.667CaC
Iron	0.06	0.10	0.02<	0.06
Lead	0.050<	0.050<	0.050<	0.050<
Magnesium	44.50	48.90	48.30	47.23
Manganese	0.01<	0.02	0.01<	0.013
Mercury	0.002<	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<	0.10<
Nickel	0.02<	0.02<	0.02<	0.02<
Nitrogen, Ammonia	0.01<	0.00	0.24	0.083
Nitrogen, Nitrate	0.37	0.17	0.12	0.22
Nitrogen, Nitrite	0.02	0.01	0.01<	0.013
Phosphorus, Total	0.10	0.01<	0.01<	0.04
Potassium	5.20	5.70	4.70	5.20
Selenium	0.002<	0.002<	0.002<	0.002<
Sodium	10.00	11.40	9.50	10.30
Solids, Dissolved	538	515	270	441
Sulfate	150.0	80.0	75.0	101.667
Sulfide	0.01<	3.00	0.80	1.27
Zinc	0.01<	0.00<	0.00<	0.003

Blue Blaze Coal Company
Water Monitoring Report

Station #2

Property: 1 & 2 Mine
Location: Spring (right fork)
Type: Spring
Frequency: Monthly

Field Measurements:	SPRING 5/12	6/23	7/10	SUMMER 8/10	9/12	FALL 10/12	11/14	WINTER 12/4	Mear
	Date Sampled (1990)								
Flow (gpm)	2.5	1.0	1.25	1.25	.50	1.0	1.5	1.25	1.1-
pH	8.23	7.4	8.48	7.58	7.2	7.38	7.40	7.58	7.6
Sp.Con.(ohms)	660	970	910	840	880	960	770	670	83
Temp. C	7	8	8	8	8	8	7	7	7.t
Diss. O(mg/1)									

Measurements: mg/1	SPRING Date Sampled 5/12	SUMMER 8/10	FALL 11/14	Mean
Aluminum	0.01<	0.01<	0.01<	0.01<
Alk.,Bicarbonate	439HCO3	478HCO3	479HCO3	465HCO
Alk.,Carbonate	1<CaCO3	1<CaCO3	9 CaCO3	3 CaCO
Arsenic	0.002<	0.002<	0.002<	0.002<
Anions, Total	10.87meq/1	10.27meq/1	9.41meq/1	10.18m
Barium	0.03<	0.12	0.03<	0.06
Boron	0.28	0.01<	0.01<	0.1
Cadmium	0.002<	0.002	0.010	0.004
Calcium	132.2	115.2	103.9	117.1
Cations, Total	10.83meq/1	10.12meq/1	9.34meq/1	9.94me
Chloride	25.0	45.0	25.0	31.66
Chromium	0.02<	0.02<	0.02<	0.02<
Copper	0.010<	0.010<	0.010<	0.010<
Fluoride	0.44	0.38	0.24	0.35
Hardness, Total	514CACO3	478CaCO3	436CaCO3	476CaC
Iron	0.20	0.02<	0.04	0.086
Lead	0.050<	0.050<	0.110	0.07
Magnesium	44.70	46.30	42.80	44.6
Manganese	0.01<	0.01<	0.01<	0.01<
Mercury	0.002<	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<	0.10<
Nickel	0.02<	0.02<	0.06	0.03
Nitrogen, Ammonia	0.38	0.02	0.11	0.51
Nitrogen, Nitrate	0.16	1.80	0.01<	0.66
Nitrogen, Nitrite	0.02	0.02	0.01<	0.016
Phosphorus, Total	0.16	0.01<	0.01<	0.06
Potassium	3.55	4.58	3.05	3.73
Selenium	0.002<	0.002<	0.002<	0.002<
Sodium	10.68	10.37	13.00	11.35
Solids, Dissolved	477	531	223.0	410.33
Sulfate	150.0	65.0	50.0	88.33
Sulfide	7.60	3.60	0.00	3.73
Zinc	0.00<	0.02	0.00<	0.006

Blue Blaze Coal Company
Water Monitoring Report

Station #2

Property: 1 & 2 Mine (Operational)
Location: Spring (right fork)
Type: Spring
Frequency: Monthly

:ld	SPRING			SUMMER		FALL		
	Date Sampled (1991)							
ısurements:	5/12	6/25	7/28	8/25	9/27	10/27	11/4	Mean
›w (gpm)	.125	1.0	Dry	Dry	1.0	1.25	1.75	1.03
	7.58	7.4			7.2	8.25	7.8	7.65
Con.(ohms)	840	880			1010	920	940	918
ıp. C	8	8			9	8	8	8.2
;s. O(mg/1)								

ısurements: mg/1	SPRING Date Sampled 5/25	SUMMER 9/27	FALL 11/4	Mean
Alk.,Bicarbonate	425 HCO3	522 HCO3	342 HCO3	430 HCO3
Alk.,Carbonate	1< CaCO3	1< CaCO3	1< CaCO3	1< CaCO3
Calcium	133.2	123.2	97.7	118
Cations, Total	10.99 meq/1	10.98 meq/1	6.96 meq/1	9.64 meq/
Chloride	35	30.0	15	26.6
Hardness, Total	524 CaCO3	521 CaCO3	332 CaCO3	459 CaCO3
Iron	.02<	0.05	.26	.11
Magnesium	46.40	51.70	21.40	39.83
Manganese	.03	0.06	0.01<	.03
Potassium	5.76	4.67	4.51	4.98
Sodium	8.81	10.74	4.79	8.11
Solids, Dissolved	541	480	513	511.3
Sulfate	120	100	24.0	81.3

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Blue Blaze Coal Company
Water Monitoring Report

Station #3

Property: 1 & 2 Mine
Location: North Fork Gordon Creek (below mine site)
Type: Stream
Frequency: Monthly

d	SPRING				SUMMER		FALL		
	Date Sampled (1989)								Mean
surements:	4/8	5/7	6/2	7/8	8/5	9/4	10/14	11/4	
(gpm)	22	30	26.75	9.5	6.5	5	6.5	17	15.41
	7.95	8.05	8.26	8.42	8.28	8.53	8.38	8.15	8.25
Con.(ohms)	640	720	495	820	680	580	610	680	653.13
. C	5.5	10	15	23.7	18.4	18.4	14	8	14.13
s. O(mg/1)				14.62	14.34	14.18	14.32	14.68	14.43

surements: mg/1	SPRING Date Sampled 6/2	SUMMER 9/4	FALL 11/4	Mean
Acidity	16CaCO3	1<CaCO3	1<CaCO3	6.0CaCO3
Aluminum	0.24	0.01<	0.01<	0.086
Alk.,Bicarbonate	287HCO3	332HCO3	317HCO3	312HCO3O3
Alk.,Carbonate	1<CaCO3	1<CaCO3	1<CaCO3	1<CaCO3
Arsenic	0.004	0.002<	0.002<	0.003
Anions, Total	7.53meq/1	7.34meq/1	6.30meq/1	7.06meq/1
Barium	0.03<	0.03<	0.03<	0.03<
Boron	0.24	0.18	0.14	0.19
Cadmium	0.005<	0.002<	0.002<	0.003<
Calcium	72.4	61.0	61.6	65.0
Cations, Total	7.73meq/1	7.12meq/1	6.16meq/1	7.00meq/1
Chloride	30.0	20.0	10.0	20.0
chromium	0.04<	0.02<	0.02<	0.026<
Copper	0.010<	0.010<	0.010<	0.010<
Fluoride	0.59	0.46	0.49	0.51
Hardness, Total	358CaCO3	333CaCO3	291CaCO3	327.33CaCO
Iron	0.08	0.14	0.49	0.24
Lead	0.050<	0.050<	0.050<	0.050<
Magnesium	43.10	43.80	33.20	40.03
Manganese	0.01<	0.01	0.03	0.016
Mercury	0.002<	0.003	0.002<	0.0023
Molybdenum	0.10<	0.10<	0.10<	0.10<
Nickel	0.04	0.02<	0.02<	0.03
Nitrogen, Ammonia	0.01<	0.00	0.19	0.07
Nitrogen, Nitrate	0.17	0.12	0.14	0.14
Nitrogen, Nitrite	0.08	0.01<	0.05	0.05
Oil and Grease	2.5	2.0	1.2	1.9
Phosphorus, Total	0.08	0.01<	0.06	0.05
Potassium	3.80	3.50	3.20	3.50
Selenium	0.002<	0.002<	0.002<	0.002<
Sodium	11.00	9.40	6.30	8.90
Solids, Dissolved	799	283	335	472.33
Solids, Settleable	1.0<	1.0<	1.0<	1.0<
Solids, Suspended	5.0	10.0	46.0	20.333
Sulfate	100.0	70.0	45.0	71.67
Sulfide	0.01<	7.60	15.20	7.60
Zinc	0.01<	0.00<	0.00<	0.003

Blue Blaze Coal Company
Water Monitoring Report

Station #3

Property: 1 & 2 Mine
Location: North Fork Gordon Creek (below mine site)
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/12	6/23	7/10	SUMMER 8/10	9/12	FALL 10/12	11/14	WINTER 12/4	Mean
	Date Sampled (1990)								
Flow (gpm)	17	15	7.5	.5	Dry	3	15	13	10.1
pH	8.18	8.47	8.57	9.05		9.00	8.40	8.20	8.55
Sp.Con.(ohms)	540	780	670	570		540	760	744	657
Temp. C	17	24	20	18.5		18	17	10	17
Diss. O(mg/1)	14.68	14.60	14.42	14.00		14.00	14.58	14.55	14.40

Measurements: mg/1	SPRING Date Sampled 5/12	SUMMER 8/10	FALL 11/14	Mean
Aluminum	0.01<	0.67	0.73	0.47
Alk.,Bicarbonate	318HCO3	172HCO3	355HCO3	281HCO3
Alk.,Carbonate	1<CaCO3	1<CaCO3	27CaCO3	9CaCO3
Arsenic	0.002<	0.002<	0.004	.0026
Anions, Total	9.11meq/1	7.02meq/1	7.09meq/1	7.74meq
Barium	0.03<	0.07	0.03<	0.043
Boron	0.14	0.06	0.01<	0.07
Cadmium	0.002<	0.002<	0.002<	0.002<
Calcium	98.2	60.1	8.36	55.55
Cations, Total	9.02meq/1	6.87meq/1	6.98meq/1	7.62meq
Chloride	50.0	115.0	10.0	58.33
Chromium	0.02<	0.02<	0.02<	0.02<
Copper	0.010<	0.010<	0.010<	0.010<
Fluoride	0.38	0.41	0.24	0.34
Hardness, Total	417CaCO3	319CaCO3	334CaCO3	356CaCO
Iron	0.68	0.48	0.40	0.52
Lead	0.050<	0.050<	0.050<	0.050<
Magnesium	41.70	41.10	30.50	37.76
Manganese	0.01	0.02	0.03	0.02
Mercury	0.002<	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<	0.10<
Nickel	0.02<	0.02<	0.02<	0.02<
Nitrogen, Ammonia	0.51	0.04	0.10<	0.216
Nitrogen, Nitrate	0.14	0.09	0.01<	0.08
Nitrogen, Nitrite	0.04	0.04	0.01<	0.03
Oil and Grease	1.0<	1.0<	1.0<	1.0<
Phosphorus, Total	0.01	0.01<	0.01<	0.01<
Potassium	11.56	2.59	1.37	5.17
Selenium	0.002<	0.002<	0.002<	0.002<
Sodium	9.00	9.91	6.17	8.36
Solids, Dissolved	432.0	388.0	517.0	445.6
Solids, Suspended	22.0	27.0	4.0	17.6
Sulfate	125.0	50.0	54.0	76.33
Sulfide	1.00<	4.00	0.00	1.66
Zinc	0.00<	0.00<	0.24	0.08

Blue Blaze Coal Company
Water Monitoring Report

Station #3

Property: 1 & 2 Mine (Operational)
Location: North Fork Gordon Creek (below mine site)
Type: Stream
Frequency: Monthly

ld	SPRING			SUMMER		FALL		
	Date Sampled (1991)							
surements:	5/25	6/25	7/28	8/25	9/27	10/27	11/4	Mean
w (gpm)	10	8	3.5	Dry	Dry	1.5	6	5.8
	8.40	8.20	9.00			9.5	8.30	8.68
Con.(ohms)	760	780	670			545	600	671
p. C	17	20	20			18.7	10	17.14
s. O(mg/1)	14.42	14.00	14.00			13.80	14.46	14.14

surements: mg/1	SPRING Date Sampled 5/25	SUMMER 9/27	FALL 11/4	Mean
Acidity	1< CaCO3	Dry	35 CaCO3	18 CaCO3
Alk.,Bicarbonate	302 HCO3		364 HCO3	333 HCO3
Alk.,Carbonate	1< CaCO3		1< CaCO3	1< CaCO3
Alk., Total	263 CaCO3		299 CaCO3	281 CaCO3
Anions, Total	7.72 meq/1		8.24 meq/1	7.98 meq/1
Calcium	88		101.3	94.65
Cations, Total	7.89 meq/1		8.83 meq/1	8.36 meq/1
Chloride	25		35	30
Hardness, Total	368 CaCO3		415 CaCO3	392 CaCO3
Iron	.02<		.25	.135
Magnesium	36		39.36	37.68
Manganese	.01<		0.01<	0.01<
Oil and Grease	2.8		4.2	3.5
Potassium	3.33		6.94	5.14
Sodium	10.60		8.32	9.46
Solids, Dissolved	441		425	433
Solids, Settleable	1.0<		1.0<	1.0<
Solids, Suspended	7		9.0	8
Sulfate	90		68	79

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Blue Blaze Coal Company
Water Monitoring Report

Station #4

Property: 1 & 2 Mine
Location: Lower Marakis Spring
Type: Spring
Frequency: Monthly

ld	SUMMER			FALL		
	Date Sampled (1989)					
surements:	7/8	8/5	9/4	10/14	11/4	Mean
) (gpm)	1.12	1.5	1.5	1.75	1.5	1.47
	8.5	8.21	8.53	8.35	7.83	8.28
Con.(Ohms)	740	710	590	580	830	690
p. C	17	14	9.5	8	1	9.9
s. O(mg;1)						

surements: mg/1	SUMMER Date Sampled 9/4	FALL 11/4	Mean
Aluminum	0.61	0.85	0.73
Alk.,Bicarbonate	323HCO3	353HCO3	338HCO3
Alk.,Carbonate	1<CaCO3	1<CaCO3	1<CaCO3
Arsenic	0.002<	0.002<	0.002<
Anions, Total	7.09meq/1	7.97meq/1	7.53meq/1
Barium	0.23	0.03	0.13
Boron	0.12	0.10	0.11
Cadmium	0.002<	0.002<	0.002<
Calcium	59.1	76.5	67.80
Cations, Total	7.03meq/1	8.01meq/1	7.52meq/1
Chloride	15.0	13.0	14.0
Chromium	0.02<	0.02<	0.02<
Copper	0.010<	0.010<	0.010<
Floride	0.37	0.46	0.42
Hardness, Total	334CaCO3	382CaCO3	358CaCO3
Iron	0.33	1.78	1.055
Lead	0.050<	0.050<	0.050
Magnesium	45.20	46.30	45.75
Manganese	0.02	0.15	0.09
Mercury	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<
Nickel	0.02<	0.02<	0.02<
Nitrogen, Ammonia	0.00	0.22	0.11
Nitrogen, Nitrate	0.11	0.01<	0.06
Nitrogen, Nitrite	0.01<	0.01<	0.01<
Phosphorus, Total	0.02	0.17	0.095
Potassium	4.40	5.50	4.95
Selenium	0.002<	0.002<	0.002<
Sodium	6.00	5.70	5.85
Solids, Dissolved	190	399	294.50
Sulfate	70.0	65.0	67.50
Sulfide	1.80	0.80	1.30
Zinc	0.00<	0.02	0.01

Blue Blaze Coal Company
Water Monitoring Report

Station #4

Property: 1 & 2 Mine
Location: Lower Marakis Spring
Type: Spring
Frequency: Monthly

Field Measurements:	SPRING 5/12	6/23	7/10	SUMMER 8/10	9/12	FALL 10/12	11/14	WINTER 12/4	Mea
	Date Sampled (1990)								
Flow (gpm)	1.75	1.25	1.25	1.00	.50	.33	.33	.75	.8
pH	8.49	8.68	8.72	8.94	8.80	8.82	8.82	8.85	8.7
Sp.Con.(Ohms)	530	710	650	650	640	660	660	650	62
Temp. C	7	16	16.5	13.5	14	12.8	8	8	11.
Diss. O(mg;1)									

Measurements: mg/1	SPRING Date Sampled 5/12	SUMMER 8/10	FALL 11/14	Mean
Aluminum	0.01<	2.48	0.01<	.83
Alk.,Bicarbonate	380HCO3	293HCO3	379HCO3	350HCC
Alk.,Carbonate	1<CaCO3	1<CaCO3	29CaCO3	11 CaC
Arsenic	0.002<	0.002<	0.002<	0.002<
Anions, Total	9.07meq/1	7.94meq/1	7.64meq/1	8.22me
Barium	0.03	0.03<	0.03<	0.03<
Boron	0.43	0.01<	0.01<	0.15
Cadmium	0.002<	0.002<	0.002<	0.002<
Calcium	97.3	74.1	82.6	81.33
Cations, Total	8.88meq/1	7.67meq/1	7.43meq/1	7.11me
Chloride	55.0	60.0	15.0	43.33
Chromium	0.02<	0.02<	0.02<	0.02<
Copper	0.010<	0.010<	0.010<	0.010<
Floride	0.17	0.38	0.27	0.27
Hardness, Total	424CaCO3	367CaCO3	358CaCO3	383CaC
Iron	0.33	0.37	0.32	0.34
Lead	0.050<	0.050<	0.050<	0.050<
Magnesium	44.00	44.20	36.90	41.70
Manganese	0.02	0.02	0.03	0.023
Mercury	0.002<	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<	0.10<
Nickel	0.02<	0.05	0.02<	0.03
Nitrogen, Ammonia	0.46	0.02	0.09	0.19
Nitrogen, Nitrate	0.12	0.16	0.01<	0.096
Nitrogen, Nitrite	0.02	0.02	0.01<	0.016
Phosphorus, Total	0.01<	0.01<	0.01<	0.01<
Potassium	2.08	2.69	2.41	2.39
Selenium	0.002<	0.002<	0.002<	0.002<
Sodium	8.31	6.28	4.85	6.48
Solids, Dissolved	544	428	333	255.48
Solids, Suspended		71.0		71.0
Sulfate	78.0	75.0	55.0	69.33
Sulfide	1.0	3.60	0.00	1.53
Zinc	0.00<	0.04	0.00<	0.013

Blue Blaze Coal Company
Water Monitoring Report

Station #4

Property: 1 & 2 Mine (Operational)
Location: Lower Marakis Spring
Type: Spring
Frequency: Monthly

	SPRING		SUMMER			FALL		
eld	Date Sampled (1991)							
asurements:	5/25	6/25	7/28	8/25	9/27	10/27	11/4	Mean
ow (gpm)	1.00	.50	1	.75	1.25	.5	.5	.79
	8.90	8.82	7.80	8.90	8.72	8.80	8.80	8.68
.Con.(Ohms)	650	660	830	660	680	640	660	683
mp. C	8	14	13.5	13.9	16	14	14	13.34
ss. O(mg;1)								

asurements: mg/1	SPRING Date Sampled 5/25	SUMMER 9/27	FALL 11/4	Mean
Alk.,Bicarbonate	209 HCO3	372 HCO3	370 HCO3	317 HCO3
Alk.,Carbonate	1< CaCO3	1< CaCO3	1< CaCO3	1< CaCO3
Anions, Total	9.78 meq/1	8.22 meq/1	8.35 meq/1	8.78 meq/
Calcium	171.2	83.9	91.5	115.5
Cations, Total	12.57 meq/1	8.64 meq/1	8.18 meq/1	9.79 meq/
Chloride	110	25	40	58.3
Hardness, Total	605 CaCO3	416 CaCO3	389 CaCO3	470 CaCO3
Iron	1.40	0.62	0.65	.89
Magnesium	43.10	50.10	39.06	44
Manganese	.24	0.01<	0.01<	.086
Potassium	5.83	3.70	5.85	5.13
Sodium	7.53	5.61	5.84	6.33
Solids, Dissolved	481	354	405	413
Sulfate	75	75	63	71

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Beaver Creek Coal Company

Water Monitoring Report

2-6-W
Station #

Property: 2 & 7 Mine

Location: Gunnison Spring

Type: Spring

Frequency: Bi-annual

Field Measurements:	SPRING Date Sampled 6/4/88	SUMMER Date Sampled 9/19/88	Mean
Flow [gpm]	22	4.2	13.1
PH	7.8	7.9	7.8
Temperature [C°]	6	1°	3.5
Specific Cond. [ohms]	210	340	275

Laboratory Measurements [mg/l]	Date Sampled 6/4/88	Date Sampled 9/19/88	Mean
Total Suspended Solids	32	86	59
Total Dissolved Solids	284	301	292.5
Total Hardness [as $CaCO_3$]	287	283	285
Acidity [$CaCO_3$]	<1	<1	<1
Carbonate [CO_3^{-2}]	0	0	0
Bicarbonate [$HC]_3^{-1}$]	318	328	324
Calcim [Ca]	89	93	91
Chloride [Cl^-]	3	6	4.5
Iron [Fe]	<.05	<.05	<.05
Magnesium [Mg]	16	13	14.5
Total Manganese [Mn]	<.02	<.02	<.02
Potassium [K]	1	2	1.5
Sodium [Na]	3	5	4
Sulfate [SO_4^{-2}]	16	23	19.5
Cation - Anion Balance	2.08%	.92%	1.50%
HCO_3	318	328	323

Beaver Creek Coal Company
Water Monitoring Report

2-5-W
Station

Property: 2 & 7 Mine
Location: Jewkes Spring
Type: Spring
Frequency: Bi-annual

Field Measurements:	SPRING Date Sampled 6/4/88	SUMMER Date Sampled 9/19/88	Mean
Flow [gpm]	185	22	103.5
PH	7.9	8	8
Temperature [C°]	3°	4°	3.5°
Specific Con. [ohms]	400	290	345

Laboratory Measurements [mg/l]	Date Sampled 6/4/88	Date Sampled 9/19/88	Mean
Total Suspended Solids	24	10	17
Total Dissolved Solids	240	294	267
Total Hardness [as $CaCO_3$]	236	283	260
Acidity [$CaCO_3$]	< 1	< 1	< 1
Carbonate [CO_3^{-2}]	0	0	0
Bicarbonate [$HC]_3^{-1}$]	265	326	296
Calcim [Ca]	75	92	83.5
Chloride [Cl^-]	4	4	4
Iron [Fe]	.13	< .05	.09
Magnesium [Mg]	12	13	12.5
Total Manganese [Mn]	<.02	<.02	<.02
Potassium [K]	2	2	2
Sodium [Na]	3	4	3.5
Sulfate [SO_4^{-2}]	15	19	17
Cation - Anion Balance	1.76%	.43	1.09
HCO_3	265	326	295

Blue Blaze Coal Company
Water Monitoring Report

Station #1

Property: 1 & 2 Mine (Operational)
Location: Marakis Spring
Type: Spring
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	FALL 10/25	11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	9	7.25	6.75	5.75	6	6.25	6.25	6	6.66
pH	8.4	8.23	8.00	8.20	8.00	8.22	8.00	8.25	8.16
Sp.Con.(ohms)	380	560	545	540	555	540	545	480	518
Temp. C	9.5	11	12	16.5	16	16	5.2	1.0	10.9

Diss. O(mg/l)	SPRING	SUMMER	FALL	
Measurements: mg/l	Date Sampled 5/17	9/29	12/28	Mean
Alk.,Bicarbonate	224 CaCO3	358 CaCO3	357 CaCO3	313 CaCO3
Alk.,Carbonate	0 CaCO3	0 CaCO3	0 CaCO3	0 CaCO3
AlK., Total	200 CaCO3	294 CaCO3	293 CaCO3	262 CaCO3
Anions	4.80 meq/l	6.54 meq/l	6.62 meq/l	5.98 meq/l
Calcium	78.4	80.1	98.2	85.6
Cations, Total	5.50 meq/l	6.52 meq/l	7.05 meq/l	6.36 meq/l
Chloride	15.0	10.0	10.0	11.67
Hardness, Total	266 CaCO3	306 CaCO3	344 CaCO3	305 CaCO3
Iron	0.19	0.31	0.06	0.186
Magnesium	17.00	25.83	24.00	22.28
Manganese	0.00	0.02	0.00	.0007
Potassium	0.00	4.62	0.51	1.71
Sodium	4.38	6.64	3.80	4.94
Solids, Dissolved	269	299	233	267
Sulfate	23	25	30	26

Blue Blaze Coal Company
Water Monitoring Report

Station #2

Property: 1 & 2 Mine (Operational)
Location: Spring (right fork)
Type: Spring
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	FALL 10/25	11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	.187	1.0	Dry	Dry	Dry	Dry	Dry	Dry	.148
pH	7.8	7.30							1.89
Sp.Con.(ohms)	920	1010							241
Temp. C	9.5	8							2.19
Diss. O(mg/1)									

Measurements: mg/1	SPRING Date Sampled 5/17	SUMMER 9/29	FALL 12/28	Mean
Alk.,Bicarbonate	434 CaCO3	Dry	Dry	145 CaCO3
Alk.,Carbonate	0 CaCO3			0 CaCO3
Alk., Total	356 CaCO3			119 CaCO3
Anions	9.21 meq/1			3.07 meq/1
Calcium	99.7			33.2
Cations, Total	10.99 meq/1			3.66 meq/1
Chloride	30.0			10.0
Hardness, Total				
Iron	.03			.01
Magnesium	47.50			15.8
Manganese	0.02			.007
Potassium	2.13			.17
Sodium	11.99			3.99
Solids, Dissolved	471			157
Sulfate	68.0			22.66

Blue Blaze Coal Company
Water Monitoring Report

Station #3

Property: 1 & 2 Mine (Operational)
Location: North Fork Gordon Creek (below mine site)
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	10/25	FALL 11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	6.75	5	3.5	Dry	Dry	Dry	Dry	Dry	1.9
pH	8.30	8.44	8.05						3.10
Sp.Con.(ohms)	600	590	550						217
Temp. C	15	18	18						6
Diss. O(mg/1)	14.42	14.00	14.00						5.3

Measurements: mg/1	SPRING 5/17	SUMMER 9/29	FALL 12/28	Mean
	Date Sampled			
Acidity	0 CaCO3	Dry	Dry	0 CaCO3
Alk.,Bicarbonate	385 CaCO3			128 CaCO3
Alk..Carbonate	0 CaCO3			0 CaCO3
Alk., Total	316 CaCO3			105 CaCO3
Anions, Total	8.08 meq/1			2.69 meq/1
Calcium	77.4			25.8
Cations, Total	8.85 meq/1			2.95 meq/1
Chloride	25			8.33
Hardness, Total	4.14 CaCO3			1.38 CaCO3
Iron	0.13			0.04
Magnesium	53.50			17.83
Manganese	0.05			0.016
Oil and Grease	0.9			0.03
Potassium	0.51			0.17
Sodium	13.45			4.48
Solids, Dissolved	4.31			1.44
Solids, Settleable	0.0			0.0
Solids, Suspended	2.0			0.66
Sulfate	58.0			19.33

Blue Blaze Coal Company
Water Monitoring Report

Station #4

Property: 1 & 2 Mine (Operational)
Location: Lower Marakis Spring
Type: Spring
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	FALL 10/25	11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	.75	.50	.50	.50	.75	.75	.75	.75	.656
pH	8.90	8.82	8.72	8.74	8.70	8.75	8.75	8.74	8.76
Sp.Con.(Ohms)	660	640	660	660	645	645	660	645	652
Temp. C	12	14	13.5	14	13.5	13	8	2	11.25
Diss. O(mg;1)									

Measurements: mg/1	SPRING Date Sampled 5/17	SUMMER 9/29	FALL 12/28	Mean
Alk.,Bicarbonate	337 CaCO3	386 CaCO3	435 CaCO3	386 CaCO3
Alk.,Carbonate	0 CaCO3	0 CaCO3	0 CaCO3	0 CaCO3
Alk., Total	277 CaCO3	317 CaCO3	358 CaCO3	335 CaCO3
Anions, Total	7.36 meq/1	9.82 meq/1	9.92 meq/1	9.03 meq/1
Calcium	67.0	98.0	128.0	97.66
Cations, Total	7.86 meq/1	10.92 meq/1	10.60 meq/1	9.79 meq/1
Chloride	25	25	15	21.66
Hardness, Total	372 CaCO3	523 CaCO3	507 CaCO3	467 CaCO3
Iron	0.19	13.2	.05	4.48
Magnesium	49.80	67.5	45.40	54.23
Manganese	0.03	0.12	0.00	0.05
Potassium	1.13	11.82	2.81	5.25
Sodium	9.29	4.14	9.30	7.58
Solids, Dissolved	394	407	399	400
Sulfate	60	140	120	107

APPENDIX 6C

SURFACE WATER QUALITY AND FLOW RATE DATA

Blue Blaze Coal Company
Water Monitoring Report

Station #5

Property: 1 & 2 Mine
Location: North Fork Gordon Creek (above Mine site)
Type: Stream
Frequency: Monthly

ld	SUMMER			FALL		
	Date Sampled (1989)					
surements:	7/8	8/5	9/4	10/14	11/4	Mean
w (gpm)	13	9.5	10	15	20	13.5
	8.54	8.32	8.59	8.45	8.13	8.41
Con.(Ohms)	820	740	620	600	720	700
p. C	19.8	15.9	15.2	12	6	13.78
s. O(mg;1)	15.45	15.41	15.32	15.4	15.43	15.4

surements: mg/1	SUMMER Date Sampled 9/4	FALL 11/4	Mean
Acidity	1<CaCO3	1<CaCO3	1<CaCO3
Aluminum	1.50	0.01<	0.76
Alk.,Bicarbonate	354HCO3	384HCO3	369HCO3
Alk.,Carbonate	1<CaCO3	1<CaCO3	1<CaCO3
Arsenic	0.002<	0.002<	0.002<
Anions, Total	7.80meq/1	8.57meq/1	8.19meq/1
Barium	0.03<	0.50	0.27
Boron	0.10	0.08	0.09
Cadmium	0.002<	0.002<	0.002<
Calcium	74.2	90.2	82.20
Cations, Total	7.80meq/1	8.39meq/1	8.10meq/1
Chloride	15.0	23.0	19.0
Chromium	0.02<	0.02<	0.02<
Copper	0.010<	0.010<	0.010<
Floride	0.40	0.52	0.46
Hardness, Total	350CaCO3	399CaCO3	375CaCO3
Iron	0.51	0.90	0.705
Lead	0.50<	0.050<	0.50<
Magnesium	40.10	42.10	41.10
Manganese	0.05	0.08	0.07
Mercury	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<
Nickel	0.02<	0.02<	0.02<
Nitrogen, Ammonia	0.00	0.21	0.11
Nitrogen, Nitrate	0.10	0.08	0.09
Nitrogen, Nitrite	0.01<	0.01<	0.01<
Oil and Grease	1.0<	1.4	1.2
Phosphorus, Total	0.12	0.18	0.15
Potassium	5.00	4.40	4.70
Selenium	0.002<	0.002<	0.002<
Sodium	15.7	7.40	11.55
Solids, Dissolved	198.0	411.0	304.5
Solids, Settleable	1.0<	2.0	1.5
Solids Suspended	65.0	170.0	117.5
ulfate	75.0	85.0	80.0
Sulfide	1.80	21.40	11.60
Zinc	0.00<	0.00<	0.00<

Blue Blaze Coal Company
Water Monitoring Report

Station #5

Property: 1 & 2 Mine
Location: North Fork Gordon Creek (above Mine site)
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/12	6/23	SUMMER 7/10	8/10	9/12	FALL 10/12	11/14	WINTER 12/4	Mean
	Date Sampled (1990)								
Flow (gpm)	40	23	14.5	7.0	9.0	12.0	20	22.0	18.43
pH	8.31	8.52	8.57	8.99	8.75	8.60	8.50	8.55	8.58
Sp.Con.(Ohms)	560	790	790	590	610	680	780	783	697
Temp. C	12	18.5	8	17	17	12	10	10	13
Diss. O(mg;1)	15.66	15.67	15.49	15.40	15.48	15.48	15.60	15.60	15.55

Measurements: mg/1	SPRING Date Sampled 5/12	SUMMER 8/10	FALL 11/14	Mean
Aluminum	0.01<	4.47	1.13	1.87
Alk.,Bicarbonate	372HCO3	370HCO3	344HCO3	362HCO3
Alk.,Carbonate	1<CaCO3	1<	27	11
Arsenic	0.002<	0.002<	0.002<	0.002<
Anions, Total	10.29meq/1	7.88meq/1	6.83meq/1	8.33meq
Barium	0.03<	4.61	0.03<	1.56
Boron	0.24	0.38	0.01<	0.21
Cadmium	0.002<	0.002<	0.002<	0.002<
Calcium	134.8	70.9	68.1	91
Cations, Total	10.66meq/1	7.78meq/1	6.89meq/1	8.44meq
Chloride	20.0	25.0	10.0	18.33
Chromium	0.02<	0.02<	0.02<	0.02<
Copper	0.010<	0.010<	0.020	.013
Floride	0.38	0.41	0.19	0.33
Hardness, Total	511CaCO3	367CaCO3	329CaCO3	402CaCO
Iron	0.05	0.56	0.07	0.227
Lead	0.050<	0.050<	0.050<	0.050<
Magnesium	42.40	46.20	38.60	42.40
Manganese	0.09	0.10	0.03	.073
Mercury	0.002<	0.002<	0.002<	0.002<
Molybdenum	0.10<	0.10<	0.10<	0.10<
Nickel	0.02<	0.02<	0.02<	0.02<
Nitrogen, Ammonia	0.48	0.03	0.08	0.59
Nitrogen, Nitrate	0.15	0.20	0.01<	0.36
Nitrogen, Nitrite	0.07	0.02	0.01<	0.03
Oil and Grease	1.0<	1.0<	1.0<	1.0<
Phosphorus, Total	0.01<	0.01<	0.01<	0.01<
Potassium	3.93	2.69	2.10	2.91
Selenium	0.002<	0.002	0.005	0.003<
Sodium	8.00	8.69	6.07	7.59
Solids, Dissolved	448.0	359.0	413.0	406.6
Solids, Settleable	1.0<		1.0<	1.0<
Solids Suspended	190.0	191.0	1.0<	127.3
Sulfate	180.0	60.0	50.0	96.66
Sulfide	1.00<	0.60	0.00	1.20
Zinc	0.00<	0.02	0.00	0.006

Blue Blaze Coal Company
Water Monitoring Report

Station #5

Property: 1 & 2 Mine (Operational)
Location: North Fork Gordon Creek (above Mine site)
Type: Stream
Frequency: Monthly

	SPRING		SUMMER		FALL			
ld	Date Sampled (1991)							
surements:	5/25	6/25	7/28	8/25	9/27	10/27	11/4	Mean
w (gpm)	30	15	10	6	7	15	22	15
	8.50	8.70	8.90	8.72	8.99	8.45	8.14	8.63
Con.(Ohms)	790	790	740	628	590	600	780	703
p. C	12	18	19.2	19.9	18.7	18.2	12.4	16.9
s. O(mg;1)	15.66	15.49	15.40	15.40	15.43	15.48	15.60	15.49

surements: mg/1	SPRING Date Sampled 5/25	SUMMER 9/27	FALL 11/4	Mean
Alk.,Bicarbonate	386 HCO3	369 HCO3	380 HCO3	378 HCO3
Alk.,Carbonate	1< HCO3	1< HCO3	1< HCO3	1< HCO3
Anions, Total	8.76 meq/1	7.80 meq/1	7.73 meq/1	8.09 meq/1
Calcium	112.9	91.7	84.9	96.5
Cations, Total	9.48 meq/1	7.72 meq/1	8.02 meq/1	8.41 meq/1
Chloride	50	15	25	30
Hardness, Total	449 CaCO3	369 CaCO3	381 CaCO3	400
Iron	1.19	.70	.50	.80
Magnesium	34.6	33.99	41	36.53
Manganese	.14	1.0<	0.02	0.39
Oil and Grease	1.0<	1.0<	2.2	1.4
Potassium	4.73	2.11	4.62	3.82
Sodium	8.75	6.74	6.70	7.40
Solids, Dissolved	460	364	400	408
Solids, Settleable	1.0<	1.0<	1.0<	1.0<
Solids Suspended	245	56	87	129
Sulfate	70.0	70	45	61.67

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Blue Blaze Coal Company
Water Monitoring Report

Station #6

Property: 1 & 2 Minw
Location: East Mine Site
Type: Stream
Frequency: Monthly

Field Measurements:	SUMMER 7/8	8/5	9/4	FALL 10/14	11/4	Mean
	Date Sampled (1989)					
Flow (gpm)	Dry	Dry	Dry	Dry	Dry	
pH						
Sp.Con.(Ohms)						
Temp. C						
Diss. O(mg;1)						

Measurements: mg/1	Date Sampled	Mean
Aluminum		
Alk.,Bicarbonate		
Alk.,Carbonate		
Arsenic		
Anoins, Total		
Barium		
Boron		
Cadmium		
Calcium		
Cations, Total		
Chloride		
Chromium		
Copper		
Floride		
Hardness, Total		
Iron		
Lead		
Magnesium		
Manganese		
Mercury		
Molybdenum		
Nickel		
Nitrogen, Ammonia		
Nitrogen, Nitrate		
Nitrogen, Nitrite		
Phosphorus, Total		
Potassium		
Selenium		
Sodium		
Solids, Dissolved		
Sulfate		
Sulfide		
Zinc		

Blue Blaze Coal Company
Water Monitoring Report

Station #6

Property: 1 & 2 Mine
Location: East Mine Site
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/12	6/23	SUMMER 7/10	8/10	FALL 9/12	10/12	11/14	WINTER 12/4	Mean
	Date Sampled (1990)								
Flow (gpm)	Dry	Dry	Dry	Dry	Dry	Dry	Dry		
pH									
Sp.Con.(Ohms)									
Temp. C									
Diss. O(mg;1)									

Measurements: mg/1	Date Sampled	Mean
Aluminum		
Alk.,Bicarbonate		
Alk.,Carbonate		
Arsenic		
Anoins, Total		
Barium		
Boron		
Cadmium		
Calcium		
Cations, Total		
Chloride		
Chromium		
Copper		
Floride		
Hardness, Total		
Iron		
Lead		
Magnesium		
Manganese		
Mercury		
Molybdenum		
Nickel		
Nitrogen, Ammonia		
Nitrogen, Nitrate		
Nitrogen, Nitrite		
Phosphorus, Total		
Potassium		
Selenium		
Sodium		
Solids, Dissolved		
Sulfate		
Sulfide		
Zinc		

Blue Blaze Coal Company
Water Monitoring Report

Station #6

Property: 1 & 2 Mine (Operational)
Location: East Mine Site
Type: Stream
Frequency: Monthly

:ld	SPRING			SUMMER		FALL		
	Date Sampled (1991)							
ısurements:	5/25	6/25	7/28	8/25	9/27	10/27	11/4	Mean
›w (gpm)	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
Con.(Ohms)								
ıp. C								
;s. O(mg;1)								

ısurements: mg/1	SPRING	SUMMER	FALL	Mean
	Date Sampled			
	5/25	9/27	11/4	
Aluminum	Dry	Dry	Dry	
Alk.,Bicarbonate				
Alk.,Carbonate				
Arsenic				
Anoins, Total				
Barium				
Boron				
Cadmium				
Calcium				
Cations, Total				
Chloride				
Chromium				
Copper				
Floride				
Hardness, Total				
Iron				
Lead				
Magnesium				
Manganese				
Mercury				
Molybdenum				
Nickel				
Nitrogen, Ammonia				
Nitrogen, Nitrate				
Nitrogen, Nitrite				
Phosphorus, Total				
Potassium				
Selenium				
Sodium				
Solids, Dissolved				
Sulfate				
Sulfide				
Zinc				

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Blue Blaze Coal Company
Water Monitoring Report

Station #7

Property: 1 & 2 Mine (Baseline)
Location: Upper Beaver Creek
Type: Stream
Frequency: Monthly

ld	SPRING		SUMMER			FALL		
	Date Sampled (1991)							
surements:	5/25	6/25	7/28	8/25	9/27	10/27	11/4	Mean
w (gpm)	370	220	49.5	49.5	28.5	22	33	110.36
	7.9	8	8	8.26	8.2	8	8.15	8.07
Con.(Ohms)	320	340	495	520	650	320	330	425
p. C	4	8	8	11	11.2	7	4	7.6
s. O(mg;1)	15.40	14.80	14.40	14.78	14.20	14.18	14.84	14.66

surements: mg/1	SPRING	SUMMER	FALL	Mean
	Date Sampled			
	5/25	9/27	11/4	
Aluminum	.01<	.01<	.50	.17
Alk.,Bicarbonate	176 HCO3	402 HCO3	319 HCO3	299 HCO3
Alk.,Carbonate	1< CaCO3	1< CaCO3	1< CaCO3	1< CaCO3
Arsenic	.002<	.002<	.002<	.002<
Anoins, Total	3.91 meq/1	7.09 meq/1	5.99 meq/1	5.66 meq/
Barium	.03<	.03<	.68	.25
Boron	.01<	.04	.05	.03
Cadmium	.041	.002<	.005	.017
Calcium	61.5	99.2	100.7	87.1
Cations, Total	38.4 meq/1	6.56 meq/1	6.55 meq/1	17.17 meq
Chloride	25	10	15	16.7
Chromium	.02<	.02<	.02<	.01<
Copper	.024	.069	.010<	.034
Floride	.21	.12		.16
Hardness, Total	187 CaCO3	321 CaCO3	314 CaCO3	274 CaCO3
Iron	.11	.06	.14	.10
Lead	.050<	.050<	.050<	.050<
Magnesium	8.00	17.80	15.20	13.66
Manganese	.04	.01<	.02	.023
Mercury	.002<	.002<	.002<	.002<
Molybdenum	.10<	.10<	.31	.17
Nickel	.02<	.27	.21	.166
Nitrogen, Ammonia	.02	.25		.135
Nitrogen, Nitrate	.01<	.01<	.01<	.01<
Nitrogen, Nitrite	.01<	.01<	.01<	.01<
Oil and Grease	1.0<	1.0<	1.0<	1.0<
Phosphorus, Total	.01<	.24	.02	.09
Potassium	.42	.00<	3.83	1.41
Selenium	.002<	.002<	.002<	.002<
Sodium	2.19	3.21	3.86	3.09
Solids, Dissolved	216	288	300	268
Solids, Settleable	1.0<	1.0<	1.0<	1.0<
Solids, Suspended	9.0	5.0	1.0<	5
Sulfate	18	18	22	19
Sulfide	21.80	4	.00	12.9
Zinc	.14	.00<	.33	.16

Blue Blaze Coal Company
Water Monitoring Report

Station #8

Property: 1 & 2 Mine (Baseline)
Location: Lower Beaver Creek
Type: Stream
Frequency: Monthly

:ld	SPRING			SUMMER		FALL		
	Date Sampled (1991)							
ısurements:	5/25	6/25	7/28	8/25	9/27	10/27	11/4	Mean
›w (gpm)	476	370	35.4	28	12.5	Dry	.12	153.67
	8	8	7.9	7.5	8		8.1	7.92
Con.(Ohms)	400	320	380	470	520		540	438.33
ıp. C	4	8	8	7.4	10		8	7.57
ıs. O(mg;1)	14.68	14.34	14.68	14.18	12.80		10.26	13.49

ısurements: mg/1	SPRING Date Sampled 5/25	SUMMER 9/27	FALL 11/4	Mean
Aluminum	.01<	.01<	.50	.17
Alk.,Bicarbonate	189 HCO3	333 HCO3	342 HCO3	288 HCO3
Alk.,Carbonate	1<	1<	1<	1<
Arsenic	.002	.002<	.005	.003
Anoins, Total	4.79 meq/1	5.83 meq/1	6.72 meq/1	5.78 meq/1
Barium	.03<	.03<	.09	.05
Boron	.01<	.06	.01<	.026
Cadmium	.027	.002<	.005	.011
Calcium	73.8	105.1	114.2	97.7
Cations, Total	4.56 meq/1	6.69 meq/1	7.16 meq/1	6.14 meq/1
Chloride	40	15	15	23.3
Chromium	.02<	.05	.02<	.03
Copper	.010<	.010<	.010<	.010<
Floride	.20	.08		.14
Hardness, Total	222 CaCO3	325 CaCO3	357 CaCO3	301 CaCO3
Iron	.08	.02<	.09	.06
Lead	.060	.050<	.050<	.053
Magnesium	9.06	15.10	17.50	13.89
Manganese	.02	.01<	.01<	.013
Mercury	.003	.002<	.002<	.0023
Molybdenum	.10<	.10<	.10<	.10<
Nickel	.02<	.20	.02<	.08
Nitrogen, Ammonia	0.00	.28		.14
Nitrogen, Nitrate	.01<	.01<	.01<	.01<
Nitrogen, Nitrite	.01<	.01<	.01<	.01<
Oil and Grease	1.0<	1.0<	1.4	1.13
Phosphorus, Total	.01<	.01<	.01<	.01<
Potassium	.97	0.00	0.76	.58
Selenium	.002<	.002<	.018	.007
Sodium	2.30	4.55	0.00	2.28
Solids, Dissolved	233	309	353	298
Solids, Settleable	1.0<	1.0<	1.0<	1.0<
Solids, Suspended	5.0	4.0	7.0	5.33
Sulfate	31	4.0	39	24.67
Sulfide	5.20	4.0	0.00	3.06
Zinc	.06	.00<	.10	.05

Table 7-1

Beaver Creek Coal Company
Water Monitoring Report

2-2-W
Station

Property: 2 & 7 Mine

Location: N. Fk. Gordon Creek (Swift's Cr.)

Type: Per. Stream

Frequency: Monthly - Quarterly

	WINTER			SPRING			SUMMER			FALL		WINTER	
	Date Sampled												
Field Measurements	1/19	2/22	3/22	4/25	5/18	6/4	7/29	8/29	9/19	10/26	11/30	12/8	Mea
[ppm]	180	190	240	359	340	219	178	87	120	129	97	140	190
	7.9	7.9	8.1	8.1	8.1	7.9	8.0	8.1	8.1	8	8	7.8	8
on. [ohms]	410	400	410	540	610	260	610	640	550	340	290	410	46
. [C°]	0	0	1°	2°	2°	4°	11°	11°	10°	7°	1°	1°	4.3
O mg/l	9	9	9	9	9	10	10	9	10	9	9	10	9.4

		WINTER	SPRING	SUMMER	FALL	
		Date Sampled				
Measurements		3/22/88	4/25/88	7/29/88	11/30/88	Mean
mg/l	HCO_3	320	278	235	309	285.5
	TSS	18	6	16	0.10	10
	TDS	388	308	284	395	344
	$CaCO_3$	375	294	264	356	322
	A $CaCO_3$	<1	<1	<1	<1	<1
	CO_3^{-2}	0	0	0	0	0
	Ca	74	74	54	87	72
	Cl^-	12	8	9	10	9.8
	Fe	.05	.06	<.05	12	.07
	Mg	46	27	31	33	34
	Mn	<.02	<.02	<.02	<.02	<.02
	K	1	2	2	2	1.75
	Na	4	5	5	6	5
	SO_4^{-2}	93	57	67	105	80.5
	Cat-Anion	.98%	1.24%	.54	.74	.88%
	Oil & G.	<5	<5	Broken in shipping	<5	<5

Table 7-1

Beaver Creek Coal Company

Water Monitoring Report

2-3-
Stati

Property: 2 & 7 Mine

Location: Lower Beaver Creek

Type: Per. Stream

Frequency: Monthly - Bi-annually

	WINTER			SPRING		SUMMER			FALL		WINTER	
	Date Sampled											
eld ements	1/19	2/22	3/22	4/25	5/18	6/4	7/14	8/29	9/19	10/26	11/30	12/8
gpm]	NA	NA	NA	NA	NA	640	186	129	92	62	NA	NA
						8.1	7.9	7.9	8.1	8		
. [ohms]						410	580	400	900	315		
[C°]						4°	6°	7°	5°	4°		
[mg/l]						9	9	10	10	9		

	SPRING	SUMMER	
	Date Samoled		
aboratory Measurements [mg/l]	6/4	9/19/88	Mean
Total Suspended Solids	42	<.01	21
Total Dissolved Solids	239	278	259
Total Hardness [as $CaCO_3$]	232	265	249
Acidity [$CaCO_3$]	<1	<1	<1
Carbonate [CO_3^{-2}]	0	0	0
Bicarbonate [$HC]_3^{-1}$]	261	307	284
Calcim [Ca]	73	79	76
Chloride [Cl^-]	5	4	4.5
Iron [Fe]	.32	<.05	.18
Magnesium [Mg]	12	16	14
Total Manganese [Mn]	<.02	<.02	<.02
Potassium [K]	1	2	1.5
Sodium [Na]	4	4	4
Sulfate [SO_4^{-2}]	16	22	19
Cation - Anion Balance	.83%	.90%	.84%
HCO_3	261	307	284

Beaver Creek Coal Company

Water Monitoring Report

2-1
Stat

Property: 2 & 7 Mine

Location: Upper Beaver Creek

Type: Per. Stream

Frequency: Monthly - Bi-annually

	WINTER			SPRING		SUMMER			FALL		WINTER
	Date Sampled										
eld ements	1/19	2/22	3/22	4/25	5/18	6/4	7/14	8/29	9/19	10/26	11/30	12/8
[ppm]	NA	NA	NA	NA	NA	480	170	115	69	47	NA	NA
						7.9	8	7.9	8.1	7.9		
n. [ohms]						320	500	380	910	210		
[C°]						4°	6°	7°	4°	3°		
) [mg/l]						10	9	10	9	9		

	SPRING	SUMMER	
	Date Sampled		
Laboratory Measurements [mg/l]	6/4	9/19/88	Mean
Total Suspended Solids	4.0	9	6.5
Total Dissolved Solids	206	289	247
Total Hardness [as $CaCO_3$]	202	288	245
Acidity [$CaCO_3$]	1	1	1
Carbonate [CO_3^{-2}]	0	0	0
Bicarbonate [$HC]_3^{-1}$]	229	321	275
Calcim [Ca]	64	88	76
Chloride [Cl^-]	3	5	4
Iron [Fe]	<.05	< .05	<.05
Magnesium [Mg]	10	17	13.5
Total Manganese [Mn]	<.02	< .02	<.02
Potassium [K]	1	1	1
Sodium [Na]	3	4	3.5
Sulfate [SO_4^{-2}]	12	18	15
Cation - Anion Balance	1.20%	1.62 %	1.41%
HCO_3	229	321	275

FLOW RATES AT BEAVER CREEK MONITORING STATIONS

Date	2-1-W Sed Pond	2-2-W USGS 2-4 Gordon Creek	2-3-W USGS 2-3 Lower Beaver Creek	2-4-W USGS 2-1 Upper Beaver Creek	2-5-W Jewkes Spring	2-6-W Gunnison Homestead	2-7-W S. Fork Bryner	2-8-W N. Fork Bryner	2-9-W Lower Bryner	USGS 2-2 Middle Beaver Creek	USGS 2-5 Gordon Creek	USGS Lower Bryner
June, 78	694	123	34.2							123	725.5	Dry
8-16-78	70.2	8.89	2.19							12.4	81.7	Dry
9-15-78	59.7	---	Dry							6.05	94.2	Dry
11-10-78	70.2	8.89	Frozen							**	**	**
12-13-79	Dry	Dry	**	**	Dry							
1/23/80	Dry	Dry	**	**	**							
2-29-80	Dry	Dry	**	**	**							
3-14-80	Dry	Dry	**	**	**							
4-17-80	Dry	50gpm	**	**	**							
5-2-80	Dry	700gpm	**	**	**							
6-6-80	Dry	620	1100	910	110	136	60	20	60			
7-21-80	Dry	1609	397	367	38	22	Dry	5	Dry			
8-27-80	Dry						Dry	Dry	Dry			
9-22-80	Dry	48	34	25	9		Dry	Dry	Dry			
11-3-80	Dry	50	30	38	5	3	Dry	Dry	Dry			
12-12-80	Dry	--	|-------Inaccessible			----------|	Dry	Dry	Dry			
1-81												
2-81												
3-81												
4-81												
5-81												
6-81												
7-81												
8-81												
9-19-81	Dry	Dry	-	Dry	1	-	Dry	Dry	Dry			
10-81	Dry	-	**	**	**	**	Dry	Dry	Dry			
11-16-81	Dry	Dry	-	Frozen	Frozen	-	Dry	Dry	Dry			
12-10-81	Dry	Dry	Frozen	Frozen	Frozen	Frozen	Dry	Dry	Dry			
1-12-82	Dry	Dry	Frozen	Frozen	Frozen	Frozen	Dry	Dry	Dry			
2-15-82	Dry	-	**	**	**	**	Frozen	Frozen	Frozen			

FLOW RATES AT BEAVER CREEK MONITORING STATIONS

Date	2-1-W Sed Pond	2-2-W USGS 2-4 Gordon Creek	2-3-W USGS 2-3 Lower Beaver Creek	2-4-W USGS 2-1 Upper Beaver Creek	2-5-W Jewkes Spring	2-6-W Gunnison Homestead	2-7-W S. Fork Bryner	2-8-W N. Fork Bryner	2-9-W Lower Bryner	USGS 2-2 Middle Beaver Creek	USGS 2-5 Gordon
3-23-82	Dry	-	**	**	**	**	Dry	Dry	Dry		
4-23-82	Dry	-	**	**	**	**	Dry	Dry	Dry		
5-25-82	Dry	-	**	**	**	**	220-30	210-15	20-25		
6-21-82	Dry	-	-	-	60	-	-	-	-		
7-19-82	Dry	Dry	-	-	30	-	Dry	-	Dry		
8-20-82	Dry	Dry	-	-	17.5	-	Dry	-	Dry		
9-22-82	Dry	Dry	-	-	10	-	Dry	-	Dry		
10-15-82	Dry	Dry	21095	21993	9	-	Dry	-	Dry		
11-20-82	Dry	Frozen	**	**	**	**	Dry	Dry	Dry		
12-21-82	Dry	Frozen	**	**	**	**	Dry	Dry	Dry		
1-26-83	Dry	Frozen	**	**	**	Frozen	Frozen	Frozen	Frozen		
2-16-83	Dry	Frozen	**	**	**	**	Frozen	Frozen	Frozen		
3-23-83	Dry	Frozen	**	**	**	**	Frozen	Frozen	Frozen		
4-28-83	12	448	**	**	**	**	Frozen	Frozen	---		
6-6-83	4.4	---	**	**	**	**	582	627	---		
6-29-83	492	4480	**	**	**	**	448	448	492		
7-31-83	---	---	**	**	**	**	2.1	4.2	2.35		
8-29-83	Dry	85	--	--	--	.42	.45	2.5	---		
9-19-83	Dry	---	23	18	1.6	1.3	.36	1.87	---		
10-25-83	Dry	64	83	18.6	6.2	2.34	.5	Dry	Dry		
11-28-83	Dry	---	---	1.2	Dry	---	---	Dry	Dry		

*all readings in gallons per minute
**inaccessible

Blue Blaze Coal Company
Water Monitoring Report

Station #5

Property: 1 & 2 Mine (Operational)
Location: North Fork Gordon Creek (above Mine site)
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	FALL 10/25	11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	20	15	10	5	6.5	6	6	6	9.3
pH	8.14	8.70	8.90	8.90	8.92	8.90	8.80	8.90	8.77
Sp.Con.(Ohms)	780	790	740	716	722	714	724	712	737
Temp. C	12	18	19.2	19.4	18	19	8	2	14.5
Diss. O(mg;1)	15.60	15.49	15.40	15.40	15.00	15.20	14.90	14	15.12

Measurements: mg/1	SPRING Date Sampled 5/17	SUMMER 9/29	FALL 12/28	Mean
Acidity	6 CaCO3		6 CaCO3	6 CaCO3
Alk.,Bicarbonate	360 CaCO3	385 CaCO3	420 CaCO3	388 CaCO3
Alk.,Carbonate	0 CaCO3	0 CaCO3	0 CaCO3	0 CaCO3
Alk., Total	316 CaCO3	316 CaCO3	345 CaCO3	326 CaCO3
Anions, Total	8.75 meq/1	7.84 meq/1	8.20 meq/1	8.26 meq/1
Calcium	88.1	99.5	124	103.9
Cations, Total	8.13 meq/1	7.12 meq/1	9.57 meq/1	8.27 meq/1
Chloride	25	15	15	18.3
Hardness, Total	385 CaCO3	343 CaCO3	457 CaCO3	395 CaCO3
Iron	1.52	0.19	.07	0.59
Magnesium	40.0	23	35.9	32.96
Manganese	0.10	0.05	.02	0.06
Oil and Grease	3.0	0.3	0.0	1.1
Potassium	0.70	3.34	0.63	1.56
Sodium	9.92	3.97	9.60	7.83
Solids, Dissolved	393	340	378	370
Solids, Settleable	0.1	0.0	0.0	0.03
Solids Suspended	209	43	7.0	86.3
Sulfate	90.0	60	50.0	66.7

Blue Blaze Coal Company
Water Monitoring Report

Station #6

Property: 1 & 2 Mine (Operational)
Location: East Mine Site
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	FALL 10/25	11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
pH									
Sp.Con.(Ohms)									
Temp. C									
Diss. O(mg;1)									

Measurements: mg/1	SPRING Date Sampled 5/17	SUMMER 9/29	FALL 12/28	Mean
Aluminum	Dry	Dry	Dry	
Alk.,Bicarbonate				
Alk.,Carbonate				
Arsenic				
Anoins, Total				
Barium				
Boron				
Cadmium				
Calcium				
Cations, Total				
Chloride				
Chromium				
Copper				
Floride				
Hardness, Total				
Iron				
Lead				
Magnesium				
Manganese				
Mercury				
Molybdenum				
Nickel				
Nitrogen, Ammonia				
Nitrogen, Nitrate				
Nitrogen, Nitrite				
Phosphorus, Total				
Potassium				
Selenium				
Sodium				
Solids, Dissolved				
Sulfate				
Sulfide				
Zinc				

Blue Blaze Coal Company
Water Monitoring Report

Station #7

Property: 1 & 2 Mine (Baseline)
Location: Upper Beaver Creek
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	FALL 10/25	11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	42	20	8	Dry	Dry	Dry	Dry	Dry	8.75
pH	8	8	8						8
Sp.Con.(Ohms)	495	510	650						207
Temp. C	9	11	12.5						4.06
Diss. O(mg;1)	14.78	14.20	14.00						5.37

Measurements: mg/1	SPRING	SUMMER	FALL	
	Date Sampled			
	5/17	9/29	12/28	Mean
Acidity	8 CaCO3	Dry	Dry	2.6 CaCO3
Alk.,Bicarbonate	296 CaCO3			98 CaCO3
Alk.,Carbonate	0 CaCO3			0 CaCO3
Alk., Total	243 CaCO3			81 CaCO3
Aluminum	0.00			0.00
Anions	5.50 meq/1			1.83 meq/1
Arsenic	0.00			0.00
Barium	0.00			0.00
Boron	0.02			0.006
Cadmium	0.00			0.00
Calcium	85.0			28.33
Cations	5.42 meq/1			1.81
Chloride	10.0			3.33
Chromium	0.00			0.00
Copper	0.000			0.00
Floride	0.05			0.016
Hardness, Total	264 CaCO3			88 CaCO3
Iron	0.20			0.066
Lead	0.000			0.00
Magnesium	12.60			4.2
Manganese	0.05			0.017
Mercury	0.000			0.00
Molybdenum	0.00			0.00
Nickel	0.00			0.00
Nitrogen, Ammonia	0.49			0.163
Nitrogen, Nitrate	0.21			0.07
Nitrogen, Nitrite	0.00			0.00
Oil and Grease	0.3			0.1
Phosphorus, Total	0.00			0.00
Potassium	0.00			0.00
Selenium	0.000			0.000
Sodium	3.17			1.06
Solids, Dissolved	292.0			97.33
Solids, Settleable	0.0			0
Solids, Suspended	6.0			2.0
Sulfate	23			7.66
Sulfide	5.20			1.73
Zinc	0.07			0.023

Blue Blaze Coal Company
Water Monitoring Report

Station #8

Property: 1 & 2 Mine (Baseline)
Location: Lower Beaver Creek
Type: Stream
Frequency: Monthly

Field Measurements:	SPRING 5/17	6/27	SUMMER 7/25	8/24	9/29	FALL 10/25	11/22	12/28	Mean
	Date Sampled (1992)								
Flow (gpm)	10.2	7.5	Dry	Dry	Dry	Dry	Dry	Dry	2.2
pH	8	8							2
Sp.Con.(Ohms)	540	580							140
Temp. C	12	15							3.4
Diss. O(mg;1)	14.05	13.20							3.4

Measurements: mg/1	SPRING Date Sampled 5/17	SUMMER 9/29	FALL 12/28	Mean
Acidity	0 CaCO3	Dry	Dry	0 CaCO3
Alk.,Bicarbonate	278 CaCO3			93
Alk.,Carbonate	0 CaCO3			0 CaCO3
Alk., Total	228 CaCO3			76 CaCO3
Aluminum	0.00			0.00
Anions	5.73 meq/1			1.91 meq/1
Arsenic	0.000			0.000
Barium	0.00			0.00
Boron	0.02			0.007
Cadmium	0.000			0.00
Calcium	90.1			30.03
Cations	5.17 meq/1			1.72 meq/1
Chloride	25.0			8.33
Chromium	0.00			0.00
Copper	0.000			0.000
Floride	0.05			0.016
Hardness, Total	279 CaCO3			93 CaCO3
Iron	0.26			0.086
Lead	0.000			0.000
Magnesium	13.20			4.4
Manganese	0.08			0.026
Mercury	0.000			0.000
Molybdenum	0.00			0.00
Nickel	0.00			0.00
Nitrogen, Ammonia	0.60			0.2
Nitrogen, Nitrate	0.25			0.083
Nitrogen, Nitrite	0.00			0.00
Oil and Grease	0.1			0.03
Phosphorus, Total	0.00			0.00
Potassium	0.00			0.00
Selenium	0.000			0.000
Sodium	4.20			1.4
Solids, Dissolved	309.0			130.0
Solids, Settleable	0.0			0.0
Solids, Suspended	4.0			1.33
Sulfate	28.0			9.33
Sulfide	6.0			2.0
Zinc	0.05			.016

APPENDIX 6D

WATER RIGHTS

RECEIVED
MAY 1 1 1992
DIVISION OF
OIL GAS & MINING

FILED WATER RIGHTS
IN THE
GORDON CREEK AREA
(see Appendix 1 map)

File No.	Class	Use	Owner	Quantity
257	Gordon Creek	Cattle	Utah Division Wildlife Resources	1.62af
330	Underground Mine	Mining	Sweets Coal Company	0.557cfs
348	Gordon Creek	Cattle & Horses	Pete Frandsen Tooele, Utah	0.095af
353	Spring	Mining	Sweets Coal Company	0.015cfs
398	Coal Canyon Creek	Cattle	Utah Division Wildlife Resources	1.62af
* 487	Spring Stream	Sheep & Horses	John Marakis Estate Price, Utah	0.22af
488	Spring	"	"	0.22af
777	North Fork Gordon Creek	Cattle & Irrigation	Utah Division Wildlife Resources	1.56cfs
778	"	"	"	0.15cfs
779	Beaver Creek	"	"	2.00cfs
1401	Sado Gulch Spring	Sheep, Cattle and Horses; Domestic	Clarance Anderson Estate Price, Utah	0.37af
1402	Spring	"	"	0.37af
1404	Gordon Creek	Sheep and Horses; Domestic	Helper State Bank Helper, Utah	0.37af
1405	Spring Stream	"	"	0.37af
1406	Trib. To Beaver Creek	"	"	0.37af
1407	Beaver Creek	Sheep and Horses	"	1.30af
1414	Single Fork Beaver Creek	"	"	1.30af
1464	Beaver Creek	Sheep, Cattle and Horses	Catherine Jewkes 1/3int. Price, Utah	0.06af

1465	Beaver Creek	Sheep, Cattle and Horses	Margaret P. Grant 1/3int. Price, Utah	0.06af
1466	Beaver Creek	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1467	Stream	"	Catherine Jewks 1/3int. Price, Utah	0.06af
1468	Stream	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1469	Stream	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1470	Spring	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1471	Spring	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
1472	Spring	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1473	North Fork Gordon Creek	"	E.E.Peirce, Jr. Price, Utah	0.34af
1675	Coal Canyon Creek	Sheep and Horses	John Marakis Estate Price, Utah	0.22af
1676	Spring	"	John Marakis Estate Price, Utah	0.22af
1926	Spring	Sheep, Cattle and Horses	Margaret P. Grant 1/3int. Price, Utah	0.06af
1927	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
1928	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
* 1929	"	"	Margaret P. Grant 1/3int. Price, Utah	0.06af
* 1930	"	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af
* 1931	"	"	Catherine Jewkes 1/3int. Price, Utah	0.06af
1932	"	Sheep, Cattle and Horses	Margaret P. Grant 1/3int. Price, Utah	0.06af
1933	Spring	"	Peggy Ann Peirce 1/3int. Price, Utah	0.06af

1934	"	"	Catherine Jewkes 1/3Int. Price, Utah	0.06af
1935	"	"	Margaret P. Grant 1/3Int. Price, Utah	0.06af
1936	"	"	Peggy Ann Peirce 1/3Int. Price, Utah	0.06af
1937	"	"	Catherine Jewkes 1/3Int. Price, Utah	0.06af
1938	"	"	Margaret P. Grant 1/3Int. Price, Utah	0.06af
1939	"	"	Peggy Ann Peirce 1/3Int. Price, Utah	0.06af
1940	"	"	Catherine Jewkes 1/3Int. Price, Utah	0.06af
1941	"	"	Margaret P. Grant 1/3Int. Price, Utah	0.06af
1943	"	"	Peggy Ann Peirce 1/3Int. Price, Utah	0.06af
1944	"	"	Catherine Jewkes 1/3Int. Price, Utah	0.06af
1945	"	"	Margaret P. Grant 1/3Int. Price, Utah	0.06af
1946	"	"	Peggy Ann Peirce 1/3Int. Price, Utah	0.06af
1947	"	"	Catherine Jewkes 1/3Int. Price, Utah	0.06af
1948	"	"	Margaret P. Grant 1/3Int. Price, Utah	0.06af
1949	"	"	Peggy Ann Peirce 1/3Int. Price, Utah	0.06af
1950	"	"	Catherine Jewkes 1/3Int. Price, Utah	0.06af
1954	Stream	Sheep, Cattle and Horses	Margaret P. Grant 1/3Int. Price, Utah	0.06af
1955	"	"	Peggy Ann Peirce 1/3Int. Price, Utah	0.06af
1956	"	"	Catherine Jewkes 1/3Int. Price, Utah	0.06af

2697	Gordon Creek	Sheep, Cattle and Horses	John Marakis Estate Price, Utah	0.22af
3614	Spring	Cattle & Horses	Della Simonsen Tooele, Utah	0.17af
3616	"	"	"	0.17af
3618	"	"	"	0.17af
3669	"	Sheep & Horses	John Marakis Estate Price, Utah	0.22af
3670	"	"	"	0.22af
3671	"	"	"	0.22af
* 3672	"	"	"	0.22af
3681	Gordon Creek	"	Calvin K. Jacob Pleasant Grove, Utah	0.33af
3682	"	Cattle	R.L. Bird Company Salt Lake City, Utah	0.14af
3683	"	Sheep, Cattle	Milton A. Oman Salt Lake City Utah	0.45af
3686	"	Cattle & Sheep	Bureau of Land Management	3.67af
3687	Coal Canyon Spring	Sheep & Horses	Calvin K. Jacob Pleasant Grove, Utah	0.33af
3688	Gordon Creek	Sheep, Cattle and Horses	E.E. Peirce, Jr. Price, Utah	0.34af
* 3881	Spring	Sheep & Horses	John Marakis Estate Price, Utah	0.22af
4095	"	"	Calvin K. Jacob Pleasant Grove, Utah	0.33af
4096	"	"	"	0.33af

Total Water Rights located in the Gordon Creek area 19.085af
..... 4.282cfs

Total Water Rights that could be impacted by Blue Blaze Mining... 0.84af

* Rights that could possibly be impacted by the Blue Blaze No. 1 & No. 2 Mine operations.

APPENDIX 6E
CALCULATIONS

RECEIVED
MAY 29 1992
DIVISION OF
OIL GAS & MINING

REGISTERED PROFESSIONAL ENGINEER
No. 7102
RICHARD B. WHITE
STATE OF UTAH

Richard B. White
29 May 1992

DETERMINATION OF PEAK FLOWS
FOR UNDISTURBED DRAINAGES
AROUND
BLUE BLAZE MINES.

DETERMINATION OF DRAINAGE AREAS FOR UNDISTURBED AREA DIVERSION DITCHES (TAKEN FROM PLATE 7-4)

WATERSHED I.D.	DRAINAGE (IN^2)	AREA (AC)
UD-1	2.17	12.45
UD-2	1.31	7.54
UD-3	1.99	11.42
UD-4	0.61	3.50
UD-5 (DRAINAGE AREA ABOVE MINE SITE)	24.86	142.68
NORTH FORK OF GORDON CREEK	61.35	352.10

DETERMINATION OF HYDRAULIC LENGTH FOR UNDISTURBED DRAINAGES (TAKEN FROM PLATE 7-4)

WATERSHED I.D.	HYDRAULIC (IN)	LENGTH (FT)
UD-1	3.90	1950
UD-2	3.10	1550
UD-3	3.50	1750
UD-4	1.30	650
UD-5	8.40	4200
NORTH FORK	11.60	5800

WATERSHED I.D.	COVER* & SOIL TYPE	HYDROLOGIC CONDITION	SOIL GROUP	CURVE** NUMBER	AREA (AC)	WEIGHTED CN VALUE	CURVE NUMBER USED
UD-1	OAK-ASPEN CURECANTI	FAIR	B	48	12.45	48	70
UD-2	OAK-ASPEN CURECANTI	FAIR	B	48	7.54	48	70
UD-3	OAK-ASPEN CURECANTI	FAIR	B	48	11.42	48	70
UD-4	PINYON-JUNIPER SENCHERT	FAIR	C	73	3.50	73	75
UD-5	OAK-ASPEN CURECANTI	FAIR	B	48	81.53	59	70
	PINYON-JUNIPER SENCHERT	FAIR	C	73	61.15		
NORTH FORK	OAK-ASPEN CURECANTI	FAIR	B	48	239.43	56	70
	PINYON-JUNIPER SENCHERT	FAIR	C	73	112.67		

* COVER TYPE

- OAK-ASPEN — MOUNTAIN BRUSH MIXTURE OF OAK BRUSH, ASPEN, MOUNTAIN MAHOGANY, BITTER BRUSH, MAPLE & OTHER BRUSH.
- PINYON-JUNIPER — PINYON, JUNIPER, OR BOTH WITH A GRASS UNDER STORY.

** CURVE NUMBER VALUES TAKEN FROM SCS-TR-55 2ND ED. (1986) TABLE 2.2d (ATTACHED)

Table 2-2d.—Runoff curve numbers for arid and semiarid rangelands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.

[2]*Poor:* <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: >70% ground cover.

[3]Curve numbers for group A have been developed only for desert shrub.

DETERMINATION OF AVERAGE WATERSHED SLOPES FOR UNDISTURBED WATERSHEDS.

$$Y = \frac{0.25(\text{MAX. EL.} - \text{MIN. EL.})(CL_{25} + CL_{50} + CL_{75})}{\text{AREA } (FT^2)}$$

WATESHED I.D.	MAX ELEV.	MIN. ELEV.	CL 25	CL 50	CL 75	AREA (AC)	Y (%)
UD-1	7905	7540	550	1050	875	12.45	41.6
UD-2	8105	7650	625	375	150	7.54	39.8
UD-3	8170	7690	450	400	375	11.42	29.6
UD-4	7875	7755	350	500	525	3.50	27.1
UD-5	8905	7750	5050	3375	1450	142.68	45.9
NORTH FORK	8900	7650	7900	8100	5300	352.10	43.4

DETERMINATION OF TIME OF CONCENTRATION FOR UNDISTURBED WATERSHEDS

WATERSHED I.D.	HYDRAULIC LENGTH	CURVE NUMBER	AVE. W.S SLOPE	TIME OF CONCENTRATION
UD-1	1950	70	41.6	0.19
UD-2	1550	70	39.8	0.16
UD-3	1750	70	29.6	0.20
UD-4	650	75	27.1	0.08
UD-5	4200	70	45.9	0.33
NORTH FORK	5800	70	43.4	0.44

PRECIPITATION DEPTHS FOR VARIOUS RETURN PERIODS @ BLUE BLAZE SITE AREA

RETURN PERIOD	PRECIP. DEPTH* (IN)
10yr - 24hr	1.8
10yr - 6 hr	1.5
25yr - 6 hr	1.6
100yr - 6 hr	1.8

* DEPTH VALUES DETERMINED FROM NOAA, "PRECIPITATION FREQUENCY ATLAS OF WESTERN UNITED STATES", VOLUME II - UTAH (1973).

EARTHFAX ENGINEERING, INC.
HYDROGRAPH GENERATION PROGRAM OUTPUT
BASED ON SCS CURVE NUMBER METHODOLOGY

INPUT FOR: UD-1 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 12.45 acres
Depth = 1.50 inches	CN = 70.00
Duration = 6.00 hrs	Time conc.= 0.190 hrs

OUTPUT SUMMARY

Runoff depth	0.08385	inches		
Initial abstr	0.85714	inches		
Peak flow =	0.36	cfs	(0.02868	iph)
at time	3.572	hrs		

INPUT FOR: UD-2 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 7.54 acres
Depth = 1.50 inches	CN = 70.00
Duration = 6.00 hrs	Time conc.= 0.160 hrs

OUTPUT SUMMARY

Runoff depth	0.08385	inches		
Initial abstr	0.85714	inches		
Peak flow =	0.22	cfs	(0.02913	iph)
at time	3.541	hrs		

EARTHFAX ENGINEERING, INC.
HYDROGRAPH GENERATION PROGRAM OUTPUT
BASED ON SCS CURVE NUMBER METHODOLOGY

INPUT FOR: UD-3 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 11.42 acres
Depth = 1.50 inches	CN = 70.00
Duration = 6.00 hrs	Time conc.= 0.200 hrs

OUTPUT SUMMARY

Runoff depth	0.08385	inches	
Initial abstr	0.85714	inches	
Peak flow =	0.33	cfs	(0.02857 iph)
at time	3.573	hrs	

INPUT FOR: UD-4 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 3.50 acres
Depth = 1.50 inches	CN = 75.00
Duration = 6.00 hrs	Time conc.= 0.080 hrs

OUTPUT SUMMARY

Runoff depth	0.16667	inches	
Initial abstr	0.66667	inches	
Peak flow =	0.38	cfs	(0.10698 iph)
at time	2.528	hrs	

EARTHFAX ENGINEERING, INC.
HYDROGRAPH GENERATION PROGRAM OUTPUT
BASED ON SCS CURVE NUMBER METHODOLOGY

INPUT FOR: UD-5 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 142.68 acres
Depth = 1.50 inches	CN = 70.00
Duration = 6.00 hrs	Time conc.= 0.330 hrs

OUTPUT SUMMARY

Runoff depth	0.08385	inches	
Initial abstr	0.85714	inches	
Peak flow =	3.91	cfs	(0.02715 iph)
at time	3.652	hrs	

INPUT FOR: North Fork of Gordon Creek - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 352.10 acres
Depth = 1.50 inches	CN = 70.00
Duration = 6.00 hrs	Time conc.= 0.440 hrs

OUTPUT SUMMARY

Runoff depth	0.08385	inches	
Initial abstr	0.85714	inches	
Peak flow =	9.33	cfs	(0.02629 iph)
at time	3.755	hrs	

DETERMINATION OF UNDISTURBED AREA DIVERSION DITCH SIZING

UD-1

BOTTOM WIDTH - 1 FT

LT & RIGHT SIDE SLOPE - 2H:1V

MANNING'S n - 0.030 (GRADED LOAM)

CHANNEL SLOPE - 0.08 FT/FT

DISCHARGE = - 0.36 CFS

MAX. DEPTH SECTION

DEPTH OF FLOW = 0.11 FT OK < 1 FT

FLOW AREA = 0.13 FT^2

VELOCITY = 2.77 FPS

MAX. VELOCITY SECTION

DEPTH 0.09 FT OK < 1 FT

FLOW AREA 0.11 FT^2

VELOCITY 3.42 FPS OK < MPV OF 5 FPS

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-1

Comment: Blue Blaze UD-1 - Maximum Depth Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0800 ft/ft
Discharge.....	0.36 cfs

Computed Results:

Depth.....	0.11 ft
Velocity.....	2.77 fps
Flow Area.....	0.13 sf
Flow Top Width...	1.43 ft
Wetted Perimeter.	1.48 ft
Critical Depth...	0.14 ft
Critical Slope...	0.0283 ft/ft
Froude Number....	1.62 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-1

Comment: Blue Blaze UD-1 - Maximum Velocity Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.1500 ft/ft
Discharge.....	0.36 cfs

Computed Results:

Depth.....	0.09 ft
Velocity.....	3.42 fps
Flow Area.....	0.11 sf
Flow Top Width...	1.36 ft
Wetted Perimeter.	1.40 ft
Critical Depth...	0.14 ft
Critical Slope...	0.0283 ft/ft
Froude Number....	2.16 (flow is Supercritical)

ND-2

BOTTOM WIDTH = 1 FT

SIDE SLOPE = 2H:1V

MANNING'S n = 0.03 (GRADED LOAM)

MIN. CHANNEL SLOPE = 0.05 FT/FT

MAX. CHANNEL SLOPE = 0.09 FT/FT

DISCHARGE = 0.22 CFS

MAXIMUM DEPTH SECTION

FLOW DEPTH = 0.09 FT < 1 FT OK

FLOW AREA = 0.11 FT^2

VELOCITY = 2.01 FPS

MAXIMUM VELOCITY SECTION

FLOW DEPTH = 0.08 FT < 1 FT OK

FLOW AREA = 0.09 FT^2

VELOCITY = 2.45 FPS < 5 FPS OK

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-2

Comment: Blue Blaze UD-2 - Maximum Depth Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0500 ft/ft
Discharge.....	0.22 cfs

Computed Results:

Depth.....	0.09 ft
Velocity.....	2.01 fps
Flow Area.....	0.11 sf
Flow Top Width...	1.37 ft
Wetted Perimeter.	1.41 ft
Critical Depth...	0.11 ft
Critical Slope...	0.0306 ft/ft
Froude Number....	1.25 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-2

Comment: Blue Blaze UD-2 - Maximum Velocity Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0900 ft/ft
Discharge.....	0.22 cfs

Computed Results:

Depth.....	0.08 ft
Velocity.....	2.45 fps
Flow Area.....	0.09 sf
Flow Top Width...	1.31 ft
Wetted Perimeter.	1.35 ft
Critical Depth...	0.11 ft
Critical Slope...	0.0306 ft/ft
Froude Number....	1.64 (flow is Supercritical)

UD-3

BOTTOM WIDTH = 1 FT
SIDE SLOPE = 2H:1V
MANNING'S n = 0.03 (GRADED LOAM)
MIN. CHANNEL SLOPE = 0.07 FT/FT
MAX. CHANNEL SLOPE = 0.10 FT/FT
DISCHARGE = 0.33 CFS

MAXIMUM DEPTH SECTION

FLOW DEPTH = 0.11 FT < 1 FT OK
FLOW AREA = 0.13 FT^2
VELOCITY = 2.57 FPS

MAXIMUM VELOCITY SECTION

FLOW DEPTH = 0.10 FT
FLOW AREA = 0.11 FT^2
VELOCITY = 2.90 FPS < 5 FPS OK

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-3

Comment: Blue Blaze UD-3 - Maximum Velocity Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.1000 ft/ft
Discharge.....	0.33 cfs

Computed Results:

Depth.....	0.10 ft
Velocity.....	2.90 fps
Flow Area.....	0.11 sf
Flow Top Width...	1.38 ft
Wetted Perimeter.	1.43 ft
Critical Depth...	0.14 ft
Critical Slope...	0.0287 ft/ft
Froude Number....	1.78 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-3

Comment: Blue Blaze UD-3 - Maximum Depth Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0700 ft/ft
Discharge.....	0.33 cfs

Computed Results:

Depth.....	0.11 ft
Velocity.....	2.57 fps
Flow Area.....	0.13 sf
Flow Top Width...	1.42 ft
Wetted Perimeter.	1.47 ft
Critical Depth...	0.14 ft
Critical Slope...	0.0287 ft/ft
Froude Number....	1.51 (flow is Supercritical)

UD-4

BOTTOM WIDTH = 1 FT
SIDE SLOPE = 2H:1V
MANNING'S n = 0.03 (GRADED LOAM)
MIN. CHANNEL SLOPE = 0.05 FT/FT
MAX. CHANNEL SLOPE = 0.10 FT/FT
DISCHARGE = 0.38 CFS

MAXIMUM DEPTH SECTION

FLOW DEPTH = 0.13 FT < 1 FT OK
FLOW AREA = 0.16 FT^2
VELOCITY = 2.40 FT/SEC

MAXIMUM VELOCITY SECTION

FLOW DEPTH = 0.10 FT
FLOW AREA = 0.13 FT^2
VELOCITY = 3.04 FT/SEC < 5 FPS OK

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-4

Comment: Blue Blaze UD-4 - Maximum Depth Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0500 ft/ft
Discharge.....	0.38 cfs

Computed Results:

Depth.....	0.13 ft
Velocity.....	2.40 fps
Flow Area.....	0.16 sf
Flow Top Width...	1.50 ft
Wetted Perimeter.	1.56 ft
Critical Depth...	0.15 ft
Critical Slope...	0.0281 ft/ft
Froude Number....	1.31 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-4

Comment: Blue Blaze UD-4 - Maximum Velocity Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.1000 ft/ft
Discharge.....	0.38 cfs

Computed Results:

Depth.....	0.10 ft
Velocity.....	3.04 fps
Flow Area.....	0.13 sf
Flow Top Width...	1.41 ft
Wetted Perimeter.	1.46 ft
Critical Depth...	0.15 ft
Critical Slope...	0.0281 ft/ft
Froude Number....	1.80 (flow is Supercritical)

UD-5

BOTTOM WIDTH = 3 FT

SIDE SLOPES = 1.5H:1V

MANNING'S n = 0.03 (GRADED LOAM)

MIN. CHANNEL SLOPE = 0.04 FT/FT

MAX. CHANNEL SLOPE = 0.06 FT/FT

DISCHARGE = 3.91 CFS

MAXIMUM DEPTH SECTION

FLOW DEPTH = 0.29 FT < 2 FT OK

FLOW AREA = 1.00 FT^2

VELOCITY = 3.90 FPS

MAXIMUM VELOCITY SECTION

FLOW DEPTH = 0.26 FT

FLOW AREA = 0.88 FT^2

VELOCITY = 4.46 FPS < 5.0 FPS GOOD

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-5

Comment: Blue Blaze UD-5 - Maximum Depth Section

Solve For Depth

Given Input Data:

Bottom Width.....	3.00 ft
Left Side Slope..	1.50:1 (H:V)
Right Side Slope.	1.50:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0400 ft/ft
Discharge.....	3.91 cfs

Computed Results:

Depth.....	0.29 ft
Velocity.....	3.90 fps
Flow Area.....	1.00 sf
Flow Top Width...	3.87 ft
Wetted Perimeter.	4.05 ft
Critical Depth...	0.35 ft
Critical Slope...	0.0208 ft/ft
Froude Number....	1.35 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UD-5

Comment: Blue Blaze UD-5 - Maximum Velocity Section

Solve For Depth

Given Input Data:

Bottom Width.....	3.00 ft
Left Side Slope..	1.50:1 (H:V)
Right Side Slope.	1.50:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0600 ft/ft
Discharge.....	3.91 cfs

Computed Results:

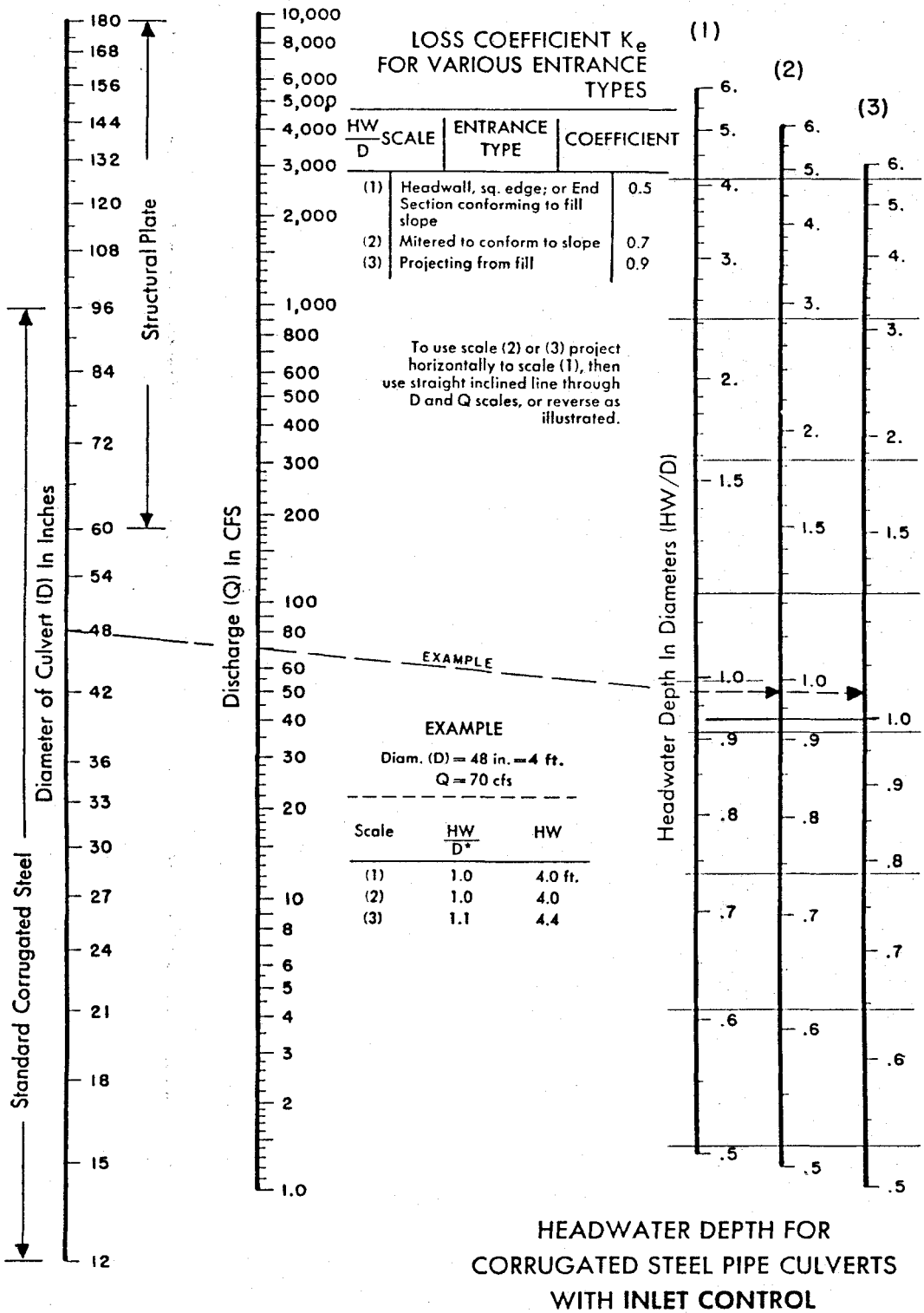
Depth.....	0.26 ft
Velocity.....	4.46 fps
Flow Area.....	0.88 sf
Flow Top Width...	3.78 ft
Wetted Perimeter.	3.93 ft
Critical Depth...	0.35 ft
Critical Slope...	0.0208 ft/ft
Froude Number....	1.63 (flow is Supercritical)

DETERMINATION OF CULVERT SIZING TO BYPASS UNDISTURBED AREA RUNOFF.

CULVERT I.D.	WATERSHEDS BY PASSED THRU CULVERT	PEAK FLOW (CFS)	REQUIRED CULVERT SIZE (FT)
UC-1	UD-4	0.38	
	UD-5	3.91	
		4.29	1.5 *
UC-2	UD-3	0.33	1.0 *
UC-3	UC-1	4.29	
	UC-2	0.33	
		4.62	1.5 **
UC-4	UD-2	0.22	
	NORTH FORK	9.33	
		9.55	2.0 * USE 3.0
UC-5	UC-3	4.62	
	UC-4	9.55	
		14.17	2.0 ** USE 3.0

* BASED ON INLET CONTROL FOR PROJECTING INLET CMP CULVERT. NOMOGRAPH ATTACHED.

** BASED ON OPEN CHANNEL FLOW IN CLOSED CONDUIT. CALCULATIONS DETERMINED USING FLOW MASTER PROGRAM FROM HAESTED METHODS (1991). OUTPUT ATTACHED.



HEADWATER DEPTH FOR CORRUGATED STEEL PIPE CULVERTS WITH **INLET CONTROL**

Fig. 4-18. *Inlet control* nomograph for corrugated steel *pipe* culverts. The manufacturers recommend keeping *HW/D* to a maximum of 1.5 and preferably to no more than 1.0.

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Blue Blaze UC-3

Comment: Blue Blaze UC-3 - Bypass Culvert

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0900 ft/ft
Manning's n.....	0.024
Discharge.....	4.62 cfs

Computed Results:

Depth.....	0.53 ft
Velocity.....	8.21 fps
Flow Area.....	0.56 sf
Critical Depth....	0.83 ft
Critical Slope....	0.0192 ft/ft
Percent Full.....	35.54 %
Full Capacity.....	17.07 cfs
QMAX @.94D.....	18.36 cfs
Froude Number.....	2.31 (flow is Supercritical)

Open Channel Flow Module, Version 3.2 (c) 1990
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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Blue Blaze UC-5

Comment: Blue Blaze UC-5 - Bypass Culvert

Solve For Actual Depth

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.0500 ft/ft
Manning's n.....	0.024
Discharge.....	14.17 cfs

Computed Results:

Depth.....	1.02 ft
Velocity.....	8.80 fps
Flow Area.....	1.61 sf
Critical Depth....	1.36 ft
Critical Slope....	0.0208 ft/ft
Percent Full.....	51.01 %
Full Capacity.....	27.40 cfs
QMAX @.94D.....	29.47 cfs
Froude Number.....	1.73 (flow is Supercritical)

Open Channel Flow Module, Version 3.2 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

DETERMINATION OF RIPRAP PROTECTION REQUIRED AT DISCHARGE END OF UC-5 CULVERT & SED. POND SPILLWAY.

VELOCITY AT OUTLET = 8.80 FPS

CHANNEL SHAPE:

BOTTOM WIDTH = 5'

SIDESLOPE = 1.5H:1V

MANNING'S n = 0.0381 = 0.8 FT D_{50}*

CHANNEL SLOPE = 0.05 FT/FT

DEPTH OF FLOW = 0.52 FT

FLOW AREA = 2.98 FT^2

VELOCITY = 5.01 FPS

* BASED ON U.S. A.C.E. (1970), PLATE 29 - D_{50} REQUIRED TO RESIST FLOW. MANNING'S n DETERMINED:

$$n = 0.0395 (D_{50})^{1/6}$$
$$= 0.0395 (0.8)^{1/6}$$
$$= 0.0381$$

RIP RAP GRADATION

D_{100} = D_{50} x 1.5 = 1.2 FT ≈ 1.2 FT

D_{85} = D_{50} x 1.25 = 1.0 FT ≈ 1.0 FT

D_{50} = D_{50} x 1.0 = 0.8 FT ≈ 0.8 FT

D_{15} = D_{50} x 0.1 = 0.08 FT ≈ 0.1 FT

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze UC-5 OL

Comment: Blue Blaze UC-5 Outlet Channel

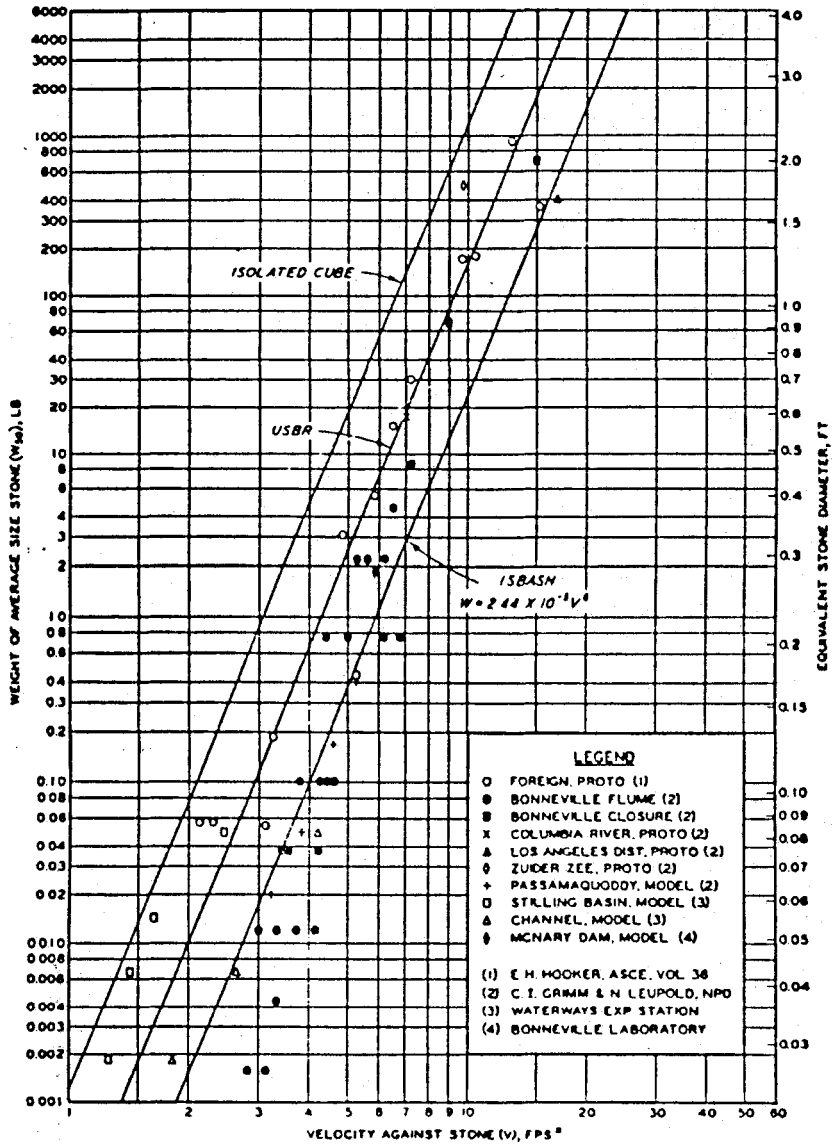
Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	1.50:1 (H:V)
Right Side Slope.	1.50:1 (H:V)
Manning's n.....	0.038
Channel Slope....	0.0500 ft/ft
Discharge.....	14.91 cfs

Computed Results:

Depth.....	0.52 ft
Velocity.....	5.01 fps
Flow Area.....	2.98 sf
Flow Top Width...	6.55 ft
Wetted Perimeter.	6.86 ft
Critical Depth...	0.61 ft
Critical Slope...	0.0279 ft/ft
Froude Number....	1.31 (flow is Supercritical)



NOTE: SPECIFIC WEIGHT OF ROCK = 165 LB/CU FT
*FOR STONE PROTECTION BELOW ENERGY DISSIPATORS USE AS AVERAGE VELOCITY ACROSS END SILL

VELOCITY VS STONE WEIGHT

SEE TEXT PAGE 36

Plate 29

DETERMINATION OF PEAK FLOWS
FOR DISTURBED DRAINAGES

DETERMINATION OF DRAINAGE AREA FOR DISTURBED AREA WATERSHEDS

WATERSHED I.D.	DRAINAGE AREA (IN^2)	DRAINAGE AREA (AC)
D-1	347.92	19.97*
D-2	33.15	1.90
D-3	37.35	2.14
DIRECT SED POND + ADJACENT AREAS	67.09	3.85
SEDIMENT POND	452.33	25.96

* D-1 INCLUDES D-2 AREA

WATERSHED I.D.	HYDRAULIC LENGTH (IN)	HYDRAULIC LENGTH (FT)
D-1	36.7	1835
D-2	10.8	540
D-3	22.5	1125
SEDIMENT POND	36.7	1835

DETERMINATION OF CURVE NUMBERS FOR DISTURBED AREA WATERSHEDS

WATERSHED I.D.	COVER TYPE	HYDROLOGIC SOIL GROUP	CURVE NUMBER	AREA (AC)
D-1	BARE SOIL	B + C	89	7.43*
	CURECANTI	B	70	12.54
D-2	BARE SOIL	B + C	89	1.90
D-3	BARE SOIL	B + C	89	2.14
SED POND +	DIRECT PRECIP		100	0.73
ADJACENT AREA	CURECANTI	B	70	3.07

DETERMINATION OF RUNOFF VOLUME TO SEDIMENT POND.

WATERSHED I.D.	CN	PRECIP (IN)	AREA (AC)	Q (IN)	VOL (AC-FT)
D-1	70	1.8	12.54	0.17	0.18
	89	1.8	5.53*	0.86	0.40
D-2*	89	1.8	1.90	0.86	0.14
D-3	89	1.8	2.14	0.86	0.15
SED. POND	100	1.8	0.78	1.80	0.12
ADJACENT AREA	70	1.8	3.07	0.17	0.04
			TOTAL =		1.03 AC-FT

D-2 DRAINAGE AREA INCLUDED IN D-1 DISTURBED DRAINAGE AREA

DETERMINATION OF AVERAGE WATERSHED SLOPES FOR DISTURBED AREA WATERSHEDS.

$$y = \frac{0.25(\text{MAX. EL.} - \text{MIN. EL.})(CL_{25} + CL_{50} + CL_{75})}{\text{AREA } (FT^2)}$$

WATERSHED I.D.	MAX. EL.	MIN. EL.	CL 25	CL 50	CL 75	AREA (AC)	Y (%)
D-1	7860	7580	1365	1625	970	19.97	31.87
D-2	7630	7590	430	375	360	1.90	14.08
D-3	7590	7580	1800	1550	1300	2.14	12.47
SEDIMENT POND	7860	7580	1365	1625	970	25.96	24.51

DISTURBED AREA WATERSHEDS.

WATERSHED I.D.	HYDRAULIC LENGTH	WEIGHTED* AVE. CURVE NUMBER	AVE. W.S. SLOPE	TIME OF CONCENTRATION
D-1	1835	76	31.87	0.17 hr
D-2	540	89	14.08	0.06 hr
D-3	1125	89	12.47	0.12 hr
SEDIMENT POND	1835	78	24.51	0.18 hr

* CN WEIGHTED BY AREA

EARTHFAX ENGINEERING, INC.
HYDROGRAPH GENERATION PROGRAM OUTPUT
BASED ON SCS CURVE NUMBER METHODOLOGY

INPUT FOR: D-1 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 19.97 acres
Depth = 1.50 inches	CN = 76.00
Duration = 6.00 hrs	Time conc.= 0.170 hrs

OUTPUT SUMMARY

Runoff depth	0.18731	inches		
Initial abstr	0.63158	inches		
Peak flow =	2.09	cfs	(0.10355	iph)
at time	2.584	hrs		

INPUT FOR: D-2 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 1.90 acres
Depth = 1.50 inches	CN = 89.00
Duration = 6.00 hrs	Time conc.= 0.060 hrs

OUTPUT SUMMARY

Runoff depth	0.63065	inches		
Initial abstr	0.24719	inches		
Peak flow =	1.16	cfs	(0.60696	iph)
at time	2.504	hrs		

EARTHFAX ENGINEERING, INC.
HYDROGRAPH GENERATION PROGRAM OUTPUT
BASED ON SCS CURVE NUMBER METHODOLOGY

INPUT FOR: D-3 - 10 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type `b' - 6 Hr	Area = 2.14 acres
Depth = 1.50 inches	CN = 89.00
Duration = 6.00 hrs	Time conc.= 0.120 hrs

OUTPUT SUMMARY

Runoff depth	0.63065	inches	
Initial abstr	0.24719	inches	
Peak flow =	1.25	cfs	(0.57740 iph)
at time	2.528	hrs	

INPUT FOR: Sediment Pond - 25 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type `b' - 6 Hr	Area = 25.96 acres
Depth = 1.60 inches	CN = 78.00
Duration = 6.00 hrs	Time conc.= 0.180 hrs

OUTPUT SUMMARY

Runoff depth	0.27826	inches	
Initial abstr	0.56410	inches	
Peak flow =	5.00	cfs	(0.19098 iph)
at time	2.568	hrs	

DETERMINATION OF DISTURBED AREA DIVERSION DITCH SIZING

D-1

BOTTOM WIDTH = 1 FT

LT + RT SIDESLOPES = 2H:1V

CHANNEL SLOPE (MIN) = 0.05 FT/FT

CHANNEL SLOPE (MAX) = 0.17 FT/FT

DISCHARGE = 2.09 CFS

MAX. DEPTH SECTION

FLOW DEPTH = 0.32 FT

FLOW AREA = 0.52 FT^2

VELOCITY = 3.98 FPS

MAX. VELOCITY SECTION

FLOW DEPTH = 0.23 FT

FLOW AREA = 0.34 FT^2

VELOCITY = 6.18 FPS

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze D-1

Comment: Blue Blaze D-1 - Maximum Depth Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0500 ft/ft
Discharge.....	2.09 cfs

Computed Results:

Depth.....	0.32 ft
Velocity.....	3.98 fps
Flow Area.....	0.52 sf
Flow Top Width...	2.28 ft
Wetted Perimeter.	2.43 ft
Critical Depth...	0.39 ft
Critical Slope...	0.0222 ft/ft
Froude Number....	1.46 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze D-1

Comment: Blue Blaze D-1 - Maximum Velocity Section

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.1700 ft/ft
Discharge.....	2.09 cfs

Computed Results:

Depth.....	0.23 ft
Velocity.....	6.18 fps
Flow Area.....	0.34 sf
Flow Top Width...	1.93 ft
Wetted Perimeter.	2.03 ft
Critical Depth...	0.39 ft
Critical Slope...	0.0222 ft/ft
Froude Number....	2.60 (flow is Supercritical)

Open Channel Flow Module, Version 3.16 (c) 1990
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DETERMINATION OF CULVERT SIZING FOR DISTURBED AREA CULVERTS.

WATERSHED I.D.	CULVERT I.D.	PEAK FLOW	REQUIRED CULVERT SIZE (FT)
D-2	DC-1	1.16 CFS	1.0 *
D-3	DC-2	1.25 CFS	1.0 *

* BASED ON INLET CONTROL FOR PROJECTING INLET CMP CULVERTS. NOMOGRAPH ATTACHED.

DETERMINATION OF SPILLWAY SIZING

BASED ON BROAD CRESTED WEIR FORMULA FOR OPEN CHANNEL SPILLWAY CONSTRUCTED THRU POND EMBANKMENT.

$$Q = B \times C \times H^{1.5}$$

B = BOTTOM WIDTH (FT) = 10 FT

C = 3.087 - WEIR COEFF.

H = DEPTH OF FLOW (FT) WITH WEIR SECTION

Q = DISCHARGE = 5.0 CFS

$$H = \sqrt[1.5]{\frac{Q}{B \times C}} = 0.30 \text{ FT}$$

VELOCITY OF FLOW FROM WEIR SECTION = 2.43

" " " " OUTSLOPE SECTION = 4.65

GROUTED RIPRAP REQ'D

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Sed Pond Spillway

Comment: Blue Blaze - Sediment Pond Spillway - CREST

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0300 ft/ft
Discharge.....	5.00 cfs

Computed Results:

Depth.....	0.20 ft
Velocity.....	2.43 fps
Flow Area.....	2.06 sf
Flow Top Width...	10.79 ft
Wetted Perimeter.	10.89 ft
Critical Depth...	0.20 ft
Critical Slope...	0.0315 ft/ft
Froude Number....	0.98 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Sed Pond Spillway

Comment: Blue Blaze - Sediment Pond Spillway - Outlet

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.2500 ft/ft
Discharge.....	5.00 cfs

Computed Results:

Depth.....	0.11 ft
Velocity.....	4.65 fps
Flow Area.....	1.07 sf
Flow Top Width...	10.42 ft
Wetted Perimeter.	10.47 ft
Critical Depth...	0.20 ft
Critical Slope...	0.0315 ft/ft
Froude Number....	2.55 (flow is Supercritical)

DETERMINATION OF SEDIMENT VOLUME TO SED. POND.

SEDIMENT PRODUCTION IS ESTIMATED TO BE:

0.05 AC-FT/AC DISTURBED.

BASED ON LAYOUT OF FACILITIES 10.35 AC OF THE BLUE BLAZE MINE WILL BE DISTURBED GROUND.

THEREFORE, SEDIMENT VOLUME IS ANTICIPATED

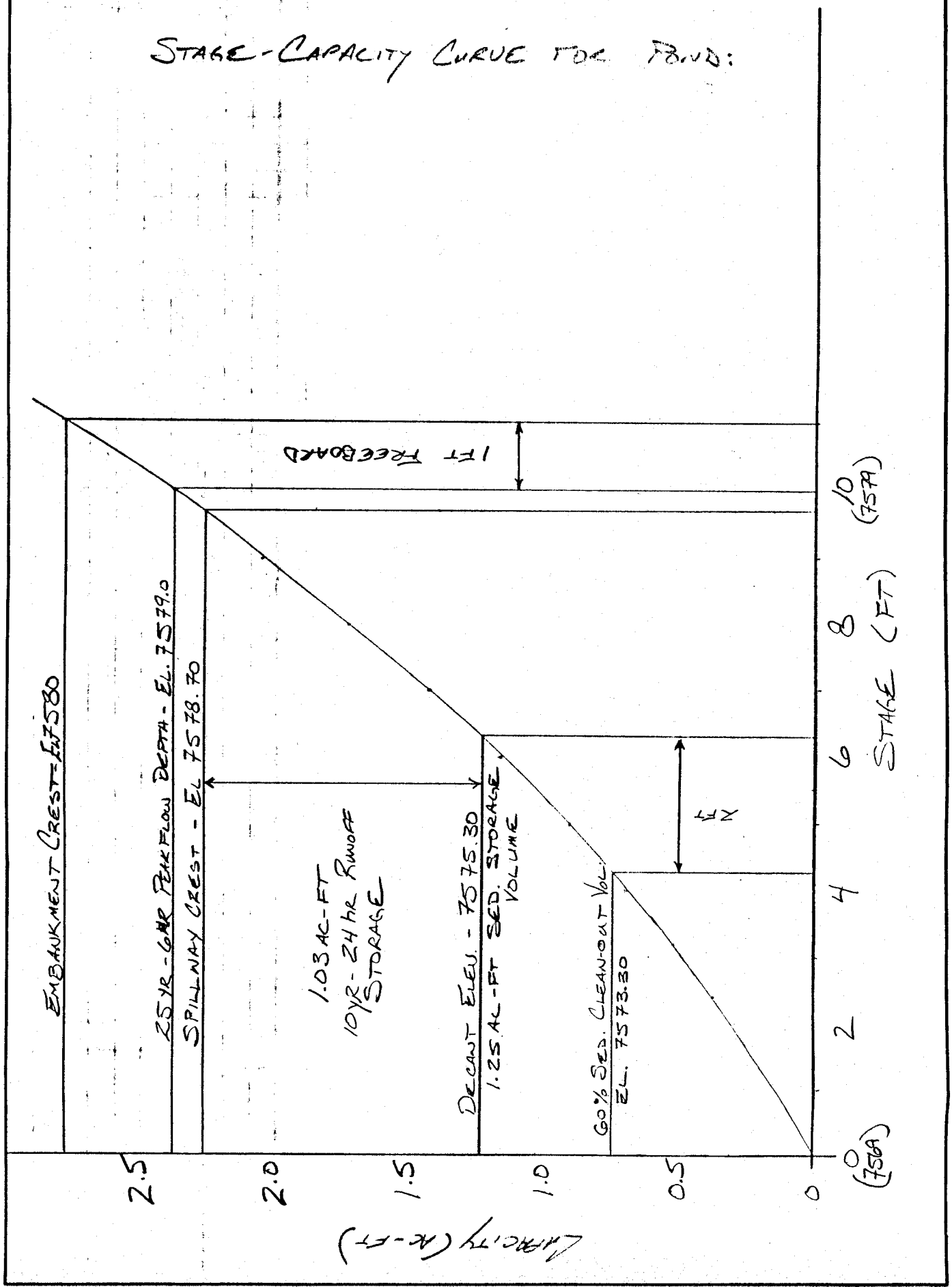
10.35 AC X 0.05 AC-FT/AC = 0.52 AC-FT

SEDIMENTATION POND DEPTH-CAPACITY TABLE

DEPTH (feet)	(cu.ft.)	STORAGE CAPACITY (acre-feet)
0	0	0
2.4	16,628.5	.377
3	21,704	.49
3.2	22,651.2	.52
4	30,680	.70
5	40,550	.92
6	51,406	1.17
6.7	58,806	.83
7	63,250	1.43
8	76,114	1.73
9	90,030	2.04
10	105,030	2.38

Measurements for Rectangular Sedimentation Pond at the bottom of the spillway are 200' x 75'.

STAGE-CAPACITY CURVE FOR POND:



SIZING OF CULVERT UC-6

DISCHARGE FROM:

UC-5 14.91 CFS

SPILLWAY OVER FLOW 5.00 CFS

ADDITIONAL CONTRIB. AREA ~ 6.0 CFS

25.91 CFS

REQUIRED CULVERT SIZE: BASED ON INLET CONTROL FOR PROJECTING INLET CMP CULVERT

FROM ATTACHED NOMOGRAPH:

DIAMETER = 36 in w/ HW/D = 1.0

BLUE BLAZE WILL UTILIZE A 42-INCH CULVERT TO BE CONSISTANT W/ CULVERT UNDER STATE HIGHWAY.

DETERMINATION OF PEAK FLOWS
FOR RECLAIMED DRAINAGES

DETERMINATION OF DRAINAGE AREA FOR RECLAIMED WATERSHEDS.

WATERSHED I.D.	DRAINAGE AREA (IN²)	(AC)
RIGHT FORK OF NORTH FORK GORDON CREEK	29.88	171.5
LEFT FORK OF NORTH FORK GORDON CREEK	60.69	348.3
NORTH FORK GORDON CREEK	94.87	544.5

DETERMINATION OF HYDRAULIC LENGTH FOR RECLAIMED WATERSHEDS

WATERSHED I.D.	HYDRAULIC LENGTH (IN)	(FT)
RIGHT FORK	11.3	5,650
LEFT FORK	12.4	6,200
NORTH FORK	14.7	7,350

DETERMINATION OF CURVE NUMBERS FOR RECLAIMED WATERSHEDS

WATERSHED I.D.	CURVE NUMBER *
RIGHT FORK	70
LEFT FORK	70
NORTH FORK	75

* DETERMINED BASED AREA WEIGHTED AVE. VALUES.

DETERMINATION OF AVERAGE WATERSHED SLOPE.

WATERSHED I.D.	MAX. ELEV.	MIN. ELEV.	CL 25	CL 50	CL 75	AREA (AC)	Y (%)
RIGHT FORK	8905	7610	5050	3375	1450	171.5	42.8
LEFT FORK	8900	7600	7900	8100	5300	348.3	45.6
NORTH FORK	8905	7530	12150	12550	7500	544.5	46.7

DETERMINATION OF TIME OF CONCENTRATION

WATERSHED I.D.	HYDRAULIC LENGTH	CURVE NUMBER	AVE. W.S. SLOPE	TIME OF CONCENTRATION
RIGHT FORK	5650	70	42.8	0.43 hr
LEFT FORK	6200	70	45.6	0.45 hr
NORTH FORK	7350	75	46.7	0.44 hr

EARTHFAX ENGINEERING, INC.
HYDROGRAPH GENERATION PROGRAM OUTPUT
BASED ON SCS CURVE NUMBER METHODOLOGY

INPUT FOR: Right Fork North Fork Gordon Creek - 100 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 171.50 acres
Depth = 1.80 inches	CN = 70.00
Duration = 6.00 hrs	Time conc.= 0.430 hrs

OUTPUT SUMMARY

Runoff depth	0.17002	inches	
Initial abstr	0.85714	inches	
Peak flow =	9.43	cfs	(0.05456 iph)
at time	3.612	hrs	

INPUT FOR: Left Fork North Fork Gordon Creek - 100 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 348.30 acres
Depth = 1.80 inches	CN = 70.00
Duration = 6.00 hrs	Time conc.= 0.450 hrs

OUTPUT SUMMARY

Runoff depth	0.17002	inches	
Initial abstr	0.85714	inches	
Peak flow =	19.10	cfs	(0.05438 iph)
at time	3.660	hrs	

EARTHFAX ENGINEERING, INC.
HYDROGRAPH GENERATION PROGRAM OUTPUT
BASED ON SCS CURVE NUMBER METHODOLOGY

INPUT FOR: North Fork Gordon Creek - 100 yr - 6 hr event

STORM :	WATERSHED :
Dist.=SCS Type 'b' - 6 Hr	Area = 544.50 acres
Depth = 1.80 inches	CN = 75.00
Duration = 6.00 hrs	Time conc.= 0.440 hrs

OUTPUT SUMMARY

Runoff depth	0.28756	inches	
Initial abstr	0.66667	inches	
Peak flow =	66.79	cfs	(0.12164 iph)
at time	2.816	hrs	

DETERMINATION OF PROPOSED CHANNEL SIZING

RIGHT FORK - RD-1

CHANNEL SHAPE: TRAPEZOIDAL

BOTTOM WIDTH = 5.0

SIDESLOPE = 2H:1V

MANNING'S n = 0.035

MIN. CHANNEL SLOPE = 0.06 FT/FT

MAX. CHANNEL SLOPE = 0.12 FT/FT

DISCHARGE = 9.43 CFS

MAX. DEPTH SECTION

FLOW DEPTH = 0.35 FT

FLOW AREA = 2.0 FT^2

VELOCITY = 4.71 FPS < 5.0 FPS

MAX. VELOCITY SECTION

FLOW DEPTH = 0.29 FT

FLOW AREA = 1.60 FT^2

VELOCITY = 5.90 FPS < 6.5 FPS OK

RIPRAPPED SECTION OF CHANNEL W/ D_{50} = 0.5 FT
BASED ON PLATE 29.

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze RD-1

Comment: Blue Blaze RD-1 - Right Fork - Max. Depth

Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0600 ft/ft
Discharge.....	9.43 cfs

Computed Results:

Depth.....	0.35 ft
Velocity.....	4.71 fps
Flow Area.....	2.00 sf
Flow Top Width...	6.40 ft
Wetted Perimeter.	6.57 ft
Critical Depth...	0.45 ft
Critical Slope...	0.0255 ft/ft
Froude Number....	1.48 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze RD-1

Comment: Blue Blaze RD-1 - Right Fork - Max. Velocity

Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.1200 ft/ft
Discharge.....	9.43 cfs

Computed Results:

Depth.....	0.29 ft
Velocity.....	5.90 fps
Flow Area.....	1.60 sf
Flow Top Width...	6.15 ft
Wetted Perimeter.	6.28 ft
Critical Depth...	0.45 ft
Critical Slope...	0.0255 ft/ft
Froude Number....	2.04 (flow is Supercritical)

LEFT FORK - RD-2

CHANNEL SHAPE: TRAPEZOIDAL

BOTTOM WIDTH = 5.0 FT

SIDE SLOPES = 2H:1V

MANNING'S n = 0.036

MIN. CHANNEL SLOPE: 0.04 FT/FT

MAX. CHANNEL SLOPE: 0.10 FT/FT

DISCHARGE = 19.10 CFS

MAX. DEPTH SECTION

FLOW DEPTH = 0.60 FT

FLOW AREA = 3.74 FT^2

VELOCITY = 5.10 FTS

MAX. VELOCITY SECTION

FLOW DEPTH = 0.46 FT

FLOW AREA = 2.75 FT^2

VELOCITY = 6.95 FPS < 7.0 FPS

RIPRAPPED CHANNEL w/ D_{50} = 0.6 FT
BASED ON PLATE 29

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze RD-2

Comment: Blue Blaze RD-2 - Left Fork - Max. Depth

Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.036
Channel Slope....	0.0400 ft/ft
Discharge.....	19.10 cfs

Computed Results:

Depth.....	0.60 ft
Velocity.....	5.10 fps
Flow Area.....	3.74 sf
Flow Top Width...	7.41 ft
Wetted Perimeter.	7.70 ft
Critical Depth...	0.70 ft
Critical Slope...	0.0241 ft/ft
Froude Number....	1.27 (flow is Supercritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze RD-2

Comment: Blue Blaze RD-2 - Left Fork - Max. Velocity

Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.036
Channel Slope....	0.1000 ft/ft
Discharge.....	19.10 cfs

Computed Results:

Depth.....	0.46 ft
Velocity.....	6.95 fps
Flow Area.....	2.75 sf
Flow Top Width...	6.85 ft
Wetted Perimeter.	7.07 ft
Critical Depth...	0.70 ft
Critical Slope...	0.0241 ft/ft
Froude Number....	1.93 (flow is Supercritical)

NORTH FORK - RD-3

CHANNEL SHAPE: TRAPEZOIDAL

BOTTOM WIDTH = 5.0 FT

SIDE SLOPES = 2H:1V

MANNING'S n = 0.039

MIN. CHANNEL SLOPE = 0.05 FT/FT

MAX. CHANNEL SLOPE = 0.07 FT/FT

DISCHARGE = 66.79 CFS

MAX. DEPTH SECTION

FLOW DEPTH = 1.19 FT

FLOW AREA = 8.75 FT^2

VELOCITY = 7.64 FPS

MAX. VELOCITY SECTION

FLOW DEPTH = 1.08 FT

FLOW AREA = 7.76 FT^2

VELOCITY = 8.60 FPS < 9 FPS OK

RIPRAPPED CHANNEL w/ D_{50} 1.0 FT
BASED ON PLATE 29.

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze RD-3

Comment: Blue Blaze RD-3 - North Fork - Max. Depth

Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.039
Channel Slope....	0.0500 ft/ft
Discharge.....	66.79 cfs

Computed Results:

Depth.....	1.19 ft
Velocity.....	7.64 fps
Flow Area.....	8.75 sf
Flow Top Width...	9.74 ft
Wetted Perimeter.	10.30 ft
Critical Depth...	1.45 ft
Critical Slope...	0.0236 ft/ft
Froude Number....	1.42 (flow is Supercritical)

Open Channel Flow Module, Version 3.2 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Blue Blaze RD-3

Comment: Blue Blaze RD-3 - North Fork - Max. Velocity

Solve For Depth

Given Input Data:

Bottom Width.....	5.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.039
Channel Slope....	0.0700 ft/ft
Discharge.....	66.79 cfs

Computed Results:

Depth.....	1.08 ft
Velocity.....	8.60 fps
Flow Area.....	7.76 sf
Flow Top Width...	9.33 ft
Wetted Perimeter.	9.84 ft
Critical Depth...	1.45 ft
Critical Slope...	0.0236 ft/ft
Froude Number....	1.66 (flow is Supercritical)

Open Channel Flow Module, Version 3.2 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

RIPRAP GRADATIONS

RD-1 - PORTIONS OF CHANNEL ONLY (SEE PLATE 3-7).

D_{100} = 0.75 FT

D_{85} = 0.63 FT

D_{50} = 0.5 FT

D_{15} = 0.05 FT

RD-2

D_{100} = 0.9 FT

D_{85} = 0.75 FT

D_{50} = 0.6 FT

D_{15} = 0.06 FT

RD-3

D_{100} = 1.5 FT

D_{85} = 1.25 FT

D_{50} = 1.0 FT

D_{15} = 0.1 FT

EARTHFAX ENGINEERING, INC.
ENGINEERS / SCIENTISTS

PROJECT UC0244-03 PAGE ____ OF ____
COMPUTED TJS DATE 5/22/92
CHECKED ____ DATE ____

EVALUATION OF SEDIMENT YIELD
FROM RECLAIMED SURFACE

COMPARISON OF TREATMENTS

EVALUATION OF SEDIMENT YIELD FROM RECLAIMED SITE.

DETERMINATION BASED ON UNIVERSAL SOIL LOSS EQUATION

- CALCULATE EXPECTED EROSION FROM:
  - DISTURBED SURFACE (BARE GROUND)
  - RIPPED SURFACE
  - MULCHED & RIPPED SURFACE
  - MULCHED + RIPPED SURFACE W/ SILT FENCE
  - RECLAIMED SURFACE W/ SHRUB-GRASS VEG. TYPE FOR COVER + DENSITY REQUIRED FOR BOND RELEASE

EQUATION:

$$A = R\ LS\ K\ C\ P$$

WHERE:

A = COMPUTED SOIL LOSS PER UNIT AREA (TONS/AC/yr)

R = RAIN FALL FACTOR (ANNUAL)

LS = LAND SLOPE FACTOR

K = SOIL ERODIBILITY FACTOR

C = COVER FACTOR

P = PRACTICE FACTOR

RAINFALL FACTOR = 15 (FROM ISRAELSEN, ET.AL., 1984)
(FIG. ATTACHED)

LS FACTOR BASED ON

$$LS = \left(\frac{\lambda}{72.6}\right)^{M}\left(\frac{430X^2 + 30X + 0.43}{6.613}\right)$$

WHERE:

λ = SLOPE LENGTH (FT)

X = SIN θ

θ = SLOPE ANGLE (DEG) = ATAN $\left(\frac{RISE}{RUN}\right)$

M = SLOPE EXPONENT

SLOPE $\leq$ 3% $M = 0.3$

SLOPE $\geq$ 5% $M = 0.5$

SLOPE $>$ 3% & $<$ 5% $M = 0.4$

K FACTOR = 0.31 (FROM ISRAELSEN, ET.AL., 1984)

C FACTOR:	VALUE*
FOR BARE SOIL:	0.94
FOR RIPPED SOIL:	0.8
FOR MULCHED + RIPPED SOIL (2 TONS PER AC):	0.06
FOR EROSION MATTING:	0.10
FOR RECLAIMED WATERSHED W/ 50% COVER NO APPRECIABLE CANOPY	0.11

* VALUES DETERMINED FROM: BARFIELD, ET. AL. (1981)

MEAN ANNUAL ISO-ERODENT (R) VALUES

Note:
R values shown are for rain and snowmelt together. R value for snowmelt alone = $R_s = 0.23881 R + 1.[illegible]28$.

Units of R
English R = foot tons/acre/hour
Metric Rm = meter tonnes/hectare/hour
Rm = 1.735 x R

UTAH WATER RESEARCH LABORATORY UTAH STATE UNIVERSITY LOGAN, UTAH 1983

EROSION FROM MULCHED + RIPPED SURFACE W/ SILT FENCE:

BASED ON MIRAFI TECHNICAL NOTE, R.G. CARROLL, JR. "SILT FENCES FOR SEDIMENTATION CONTROL IN MINING" PUB NO. 81-17.

&

WYANT, D.C. 1980. EVALUATION OF FILTER FABRIC FOR USE AS SILT FENCES. VHTRC 80-R49. VIRGINIA HIGHWAY AND TRANSPORTATION RESEARCH COUNCIL. CHARLOTTESVILLE, VIRGINIA.

SILT FENCES RETAIN APPROXIMATELY 75% OF SEDIMENT.

THEREFORE:

SED. PRODUCTION = (MULCHED + RIPPED PROD. X 0.25)

ALTERNATIVE SEDIMENT CONTROL SUMMARY – Blue Blaze

WATERSHED I.D.	Area (Ac)	Rainfall Factor	Height of Rise	Field Slope Length (ft)	Slope Angle (%)	Slope Angle (deg)	Slope Factor m	LS FACTOR	K FACTOR	Undisturbed Sed. Prod.	SILT TO STREAM BARE (TONS)	SILT TO STREAM RIPPED (TONS)	SILT TO STREAM MULCHED (TONS)	SILT TO STREAM SILT FENCE (TONS)	SILT TRAPPED BY SILT FENCE (TONS)	SILT TRAPPED BY SILT FENCE (CU FT)
Right Fork North Fork Gordon Creek																
NORTH SIDE																
RECLAIMED AREA	3.0	15.0	40.0	500.0	8.0	4.6	0.5	2.2	0.3	3.4	29.1	24.8	1.9	0.0	1.0	22.2
UNDISTURBED AREA	19.0	15.0	570.0	1642.0	34.7	19.1	0.5	40.6	0.3	394.1	3368.1	2866.5	215.0	54.0	161.0	3577.8
SUBTOTAL:										397.5	3397.2	2891.2	216.8	54.0	162.0	3600.0
SOUTH SIDE																
RECLAIMED AREA	1.3	15.0	15.0	100.0	15.0	8.5	0.5	2.5	0.3	1.7	14.8	12.6	0.9	0.0	1.0	22.2
UNDISTURBED AREA	12.7	15.0	260.0	1060.0	24.5	13.8	0.5	18.5	0.3	119.7	1023.3	870.9	65.3	16.0	49.0	1088.9
SUBTOTAL:										121.5	1038.1	883.5	66.3	16.0	50.0	1111.1
TOTAL SEDMENT TO STREAM										519.0	4435.3	3774.7	283.1	70.0		
North Fork Gordon Creek																
EAST SIDE																
RECLAIMED AREA	1.4	15.0	20.0	150.0	13.3	7.6	0.5	2.6	0.3	1.8	15.5	13.2	1.0	0.0	1.0	22.2
UNDISTURBED AREA	5.0	15.0	255.0	1050.0	24.3	13.7	0.5	18.1	0.3	46.3	395.4	336.5	25.2	6.0	19.0	422.2
SUBTOTAL:										48.1	410.9	349.7	26.2	6.0	20.0	444.4
WEST SIDE																
RECLAIMED AREA	5.5	15.0	35.0	600.0	5.8	3.3	0.5	1.6	0.3	4.4	37.7	32.1	2.4	1.0	2.0	44.4
UNDISTURBED AREA	12.5	15.0	305.0	733.0	41.6	22.6	0.5	36.2	0.3	230.8	1972.0	1678.3	125.9	31.0	94.0	2088.9
SUBTOTAL:										235.2	2009.7	1710.4	128.3	32.0	96.0	2133.3
TOTAL SEDMENT TO STREAM										283.3	2420.6	2060.1	154.5	38.0		

SOIL CONDITION	CP FACTORS
BARE	0.94
RIPPED	0.8
MULCHED	0.06
UNDISTURBED	0.11

ERODIBILITY FACTOR	0.31
ANNUAL R FACTOR	15

REFERENCES:

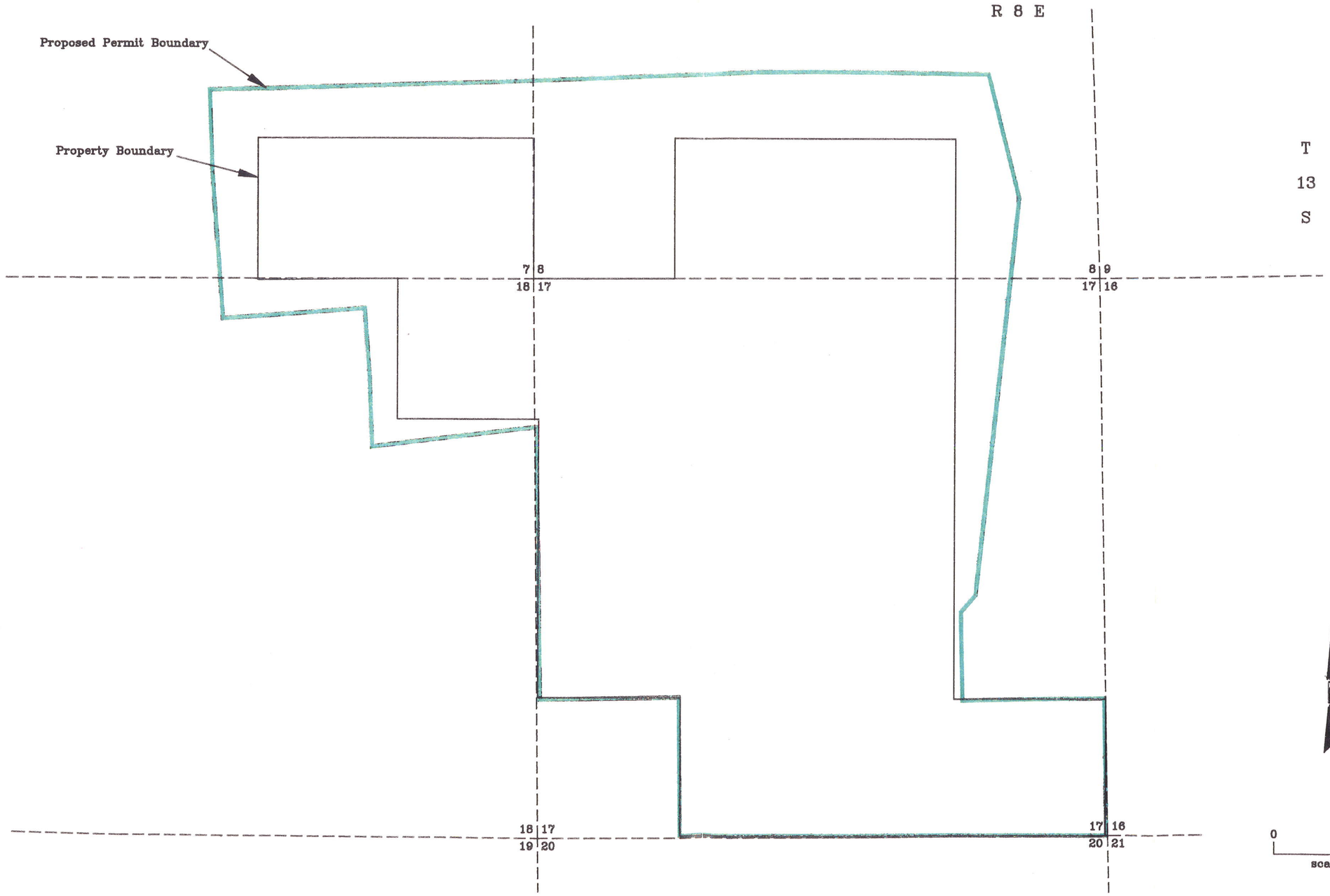
ISRAELSEN, C.E, J.E. FLETCHER, F.W. HAWS, E.K. ISRAELSEN, 1984. EROSION & SEDIMENTATION IN UTAH: A GUIDE FOR CONTROL. UTAH WATER RESEARCH LABORATORY, USU. UWRL/H-84/03. LOGAN, UTAH.

BARFIELD, B.J., R.C. WARNER, & C.T. HAAN. 1981. APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS. OKLAHOMA TECHNICAL PRESS. STILLWATER, OKLAHOMA.

APPENDIX 6F

MAPS 1 - 10

MAP 1 : PROPOSED PERMIT AREA
BLUE BLAZE COAL

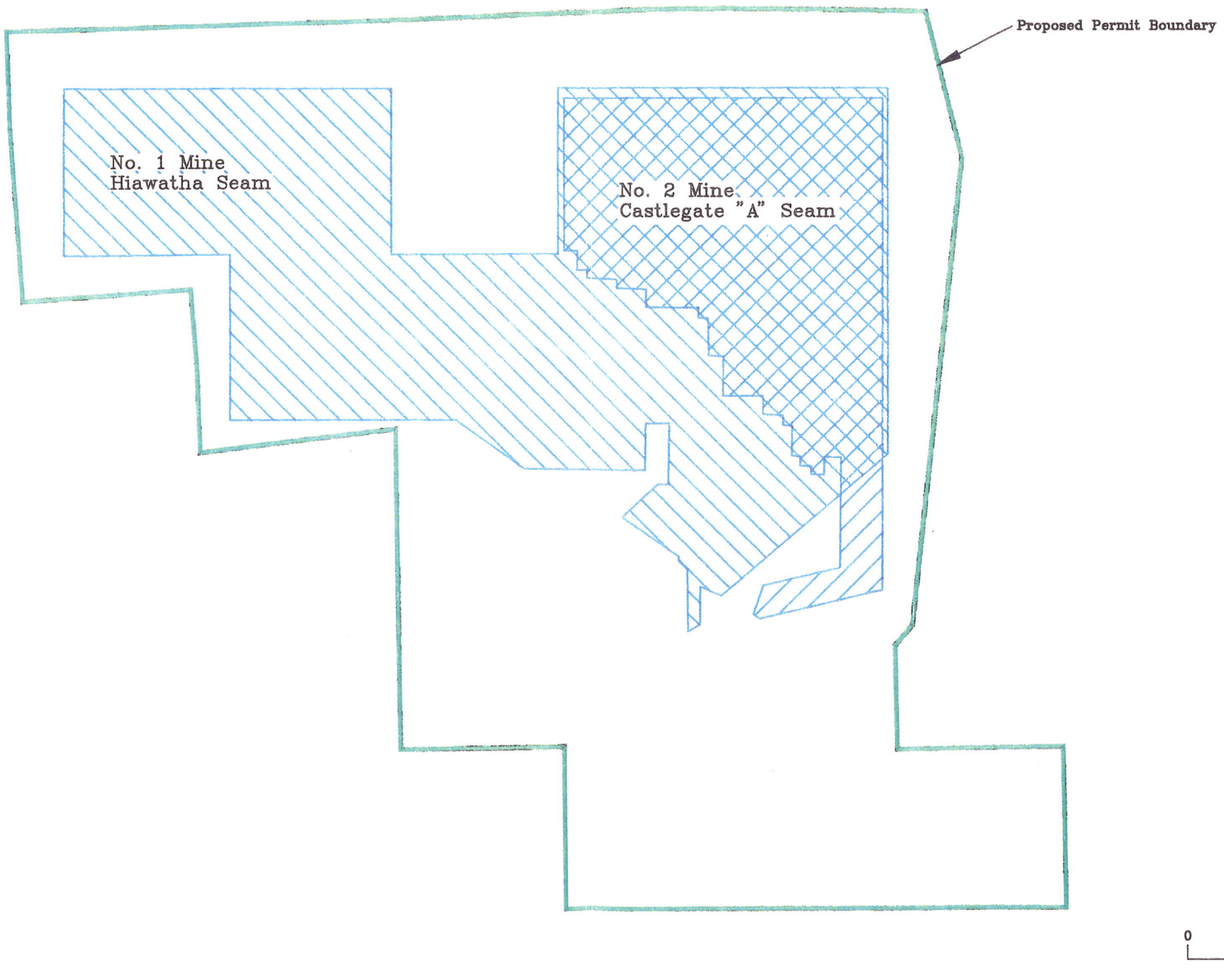


(HP)

1/10/92

7-65g

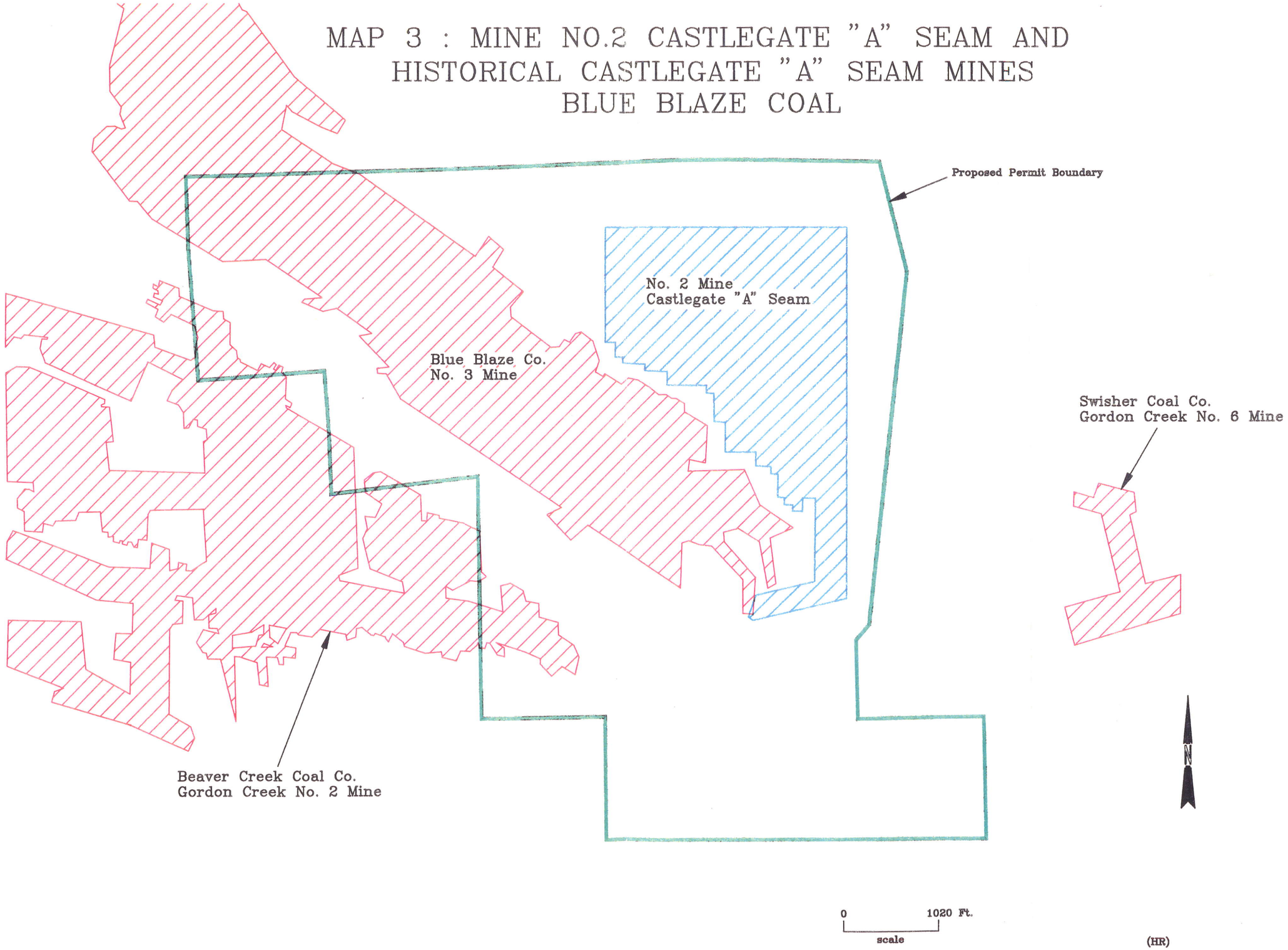
MAP 2 : BLUE BLAZE No. 1 and No. 2 MINE AREAS
BLUE BLAZE COAL



(HQ)

1/10/92 7-65h

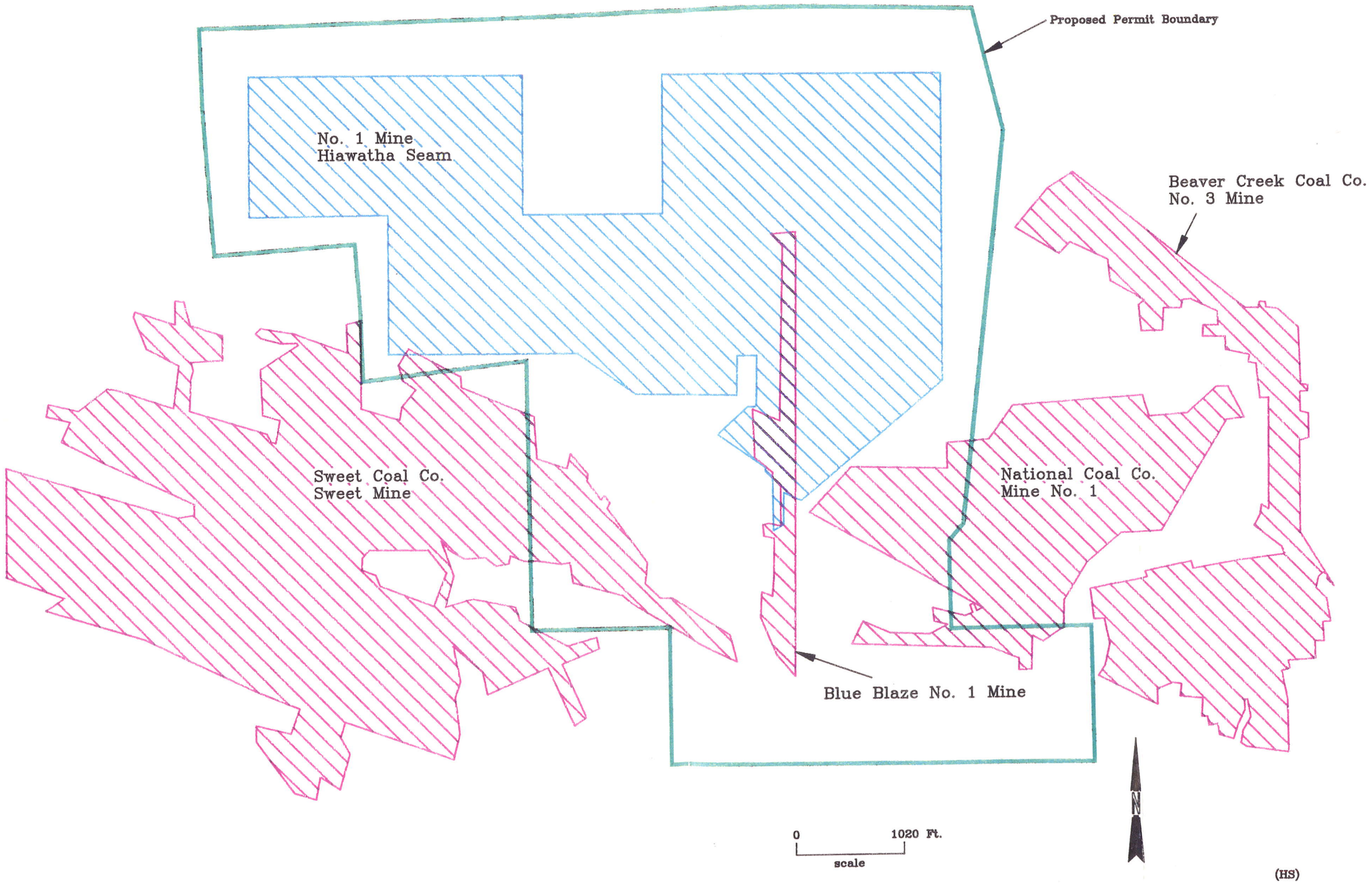
MAP 3 : MINE NO.2 CASTLEGATE "A" SEAM AND HISTORICAL CASTLEGATE "A" SEAM MINES BLUE BLAZE COAL



(HR)

1/10/92 7-65i

MAP 4 : MINE NO. 1 HIAWATHA SEAM AND HISTORICAL HIAWATHA SEAM MINES BLUE BLAZE COAL

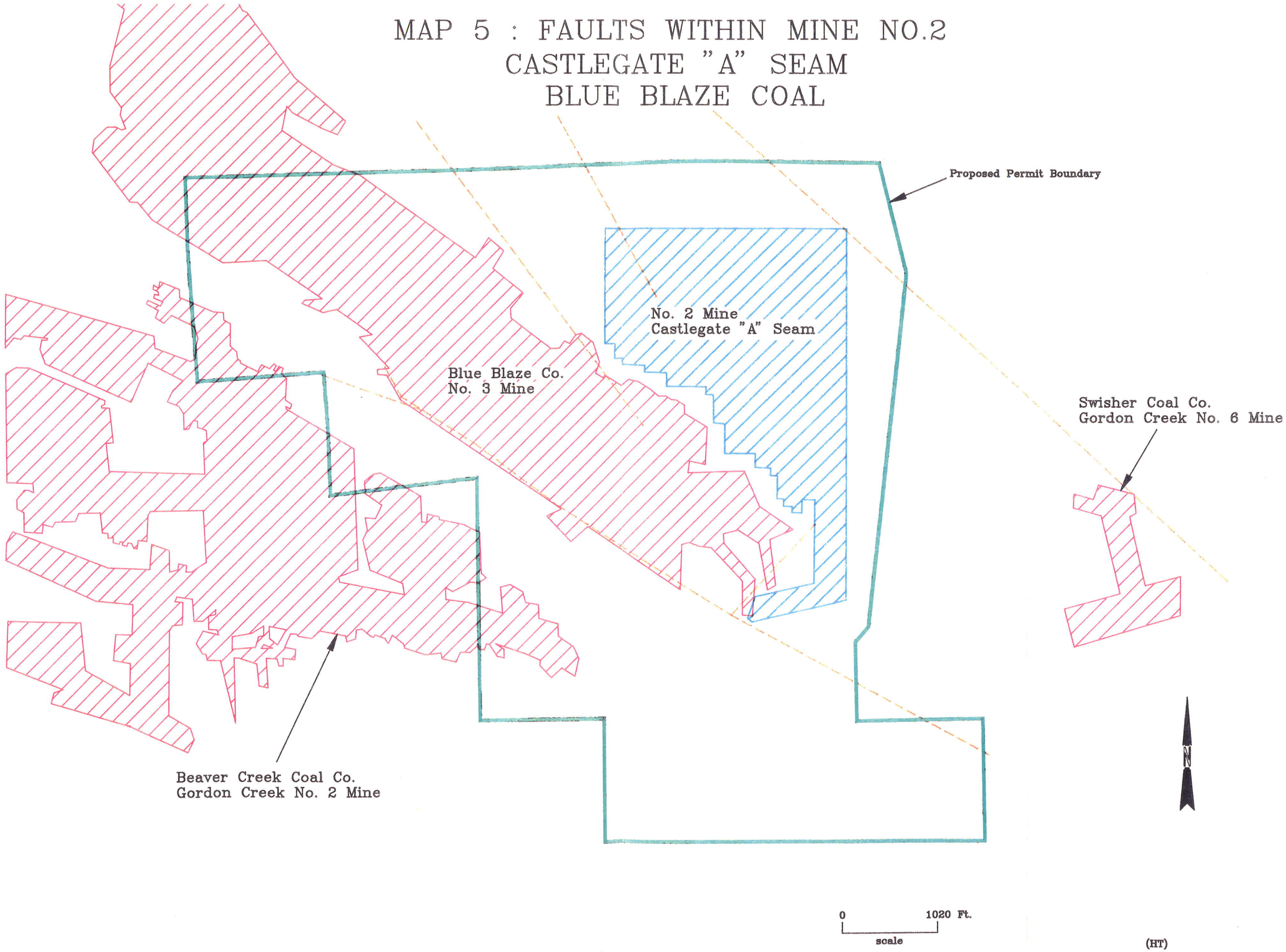


(HS)

1/10/92

7-65k

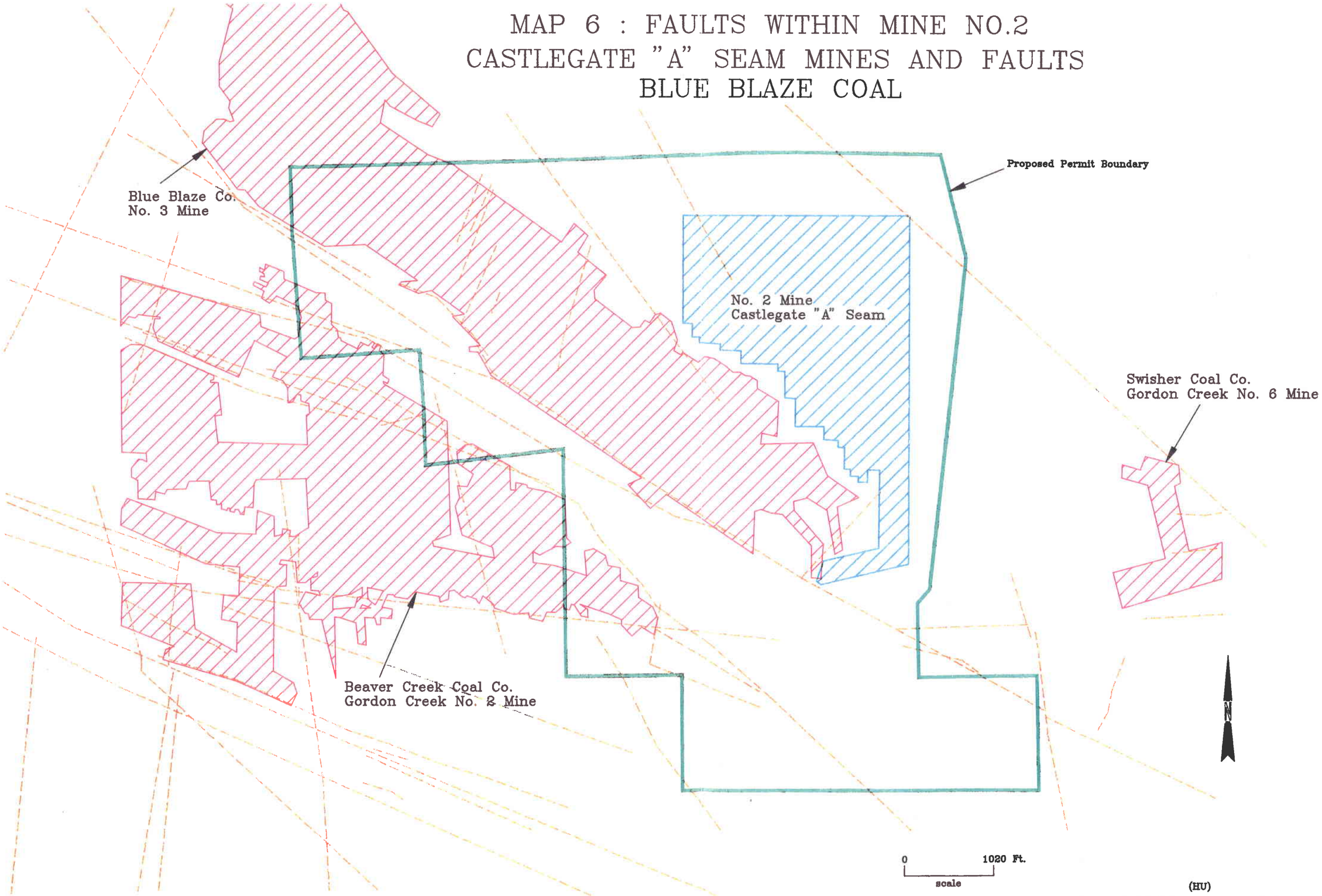
MAP 5 : FAULTS WITHIN MINE NO.2
CASTLEGATE "A" SEAM
BLUE BLAZE COAL



(HT)

1/10/92 7-65p

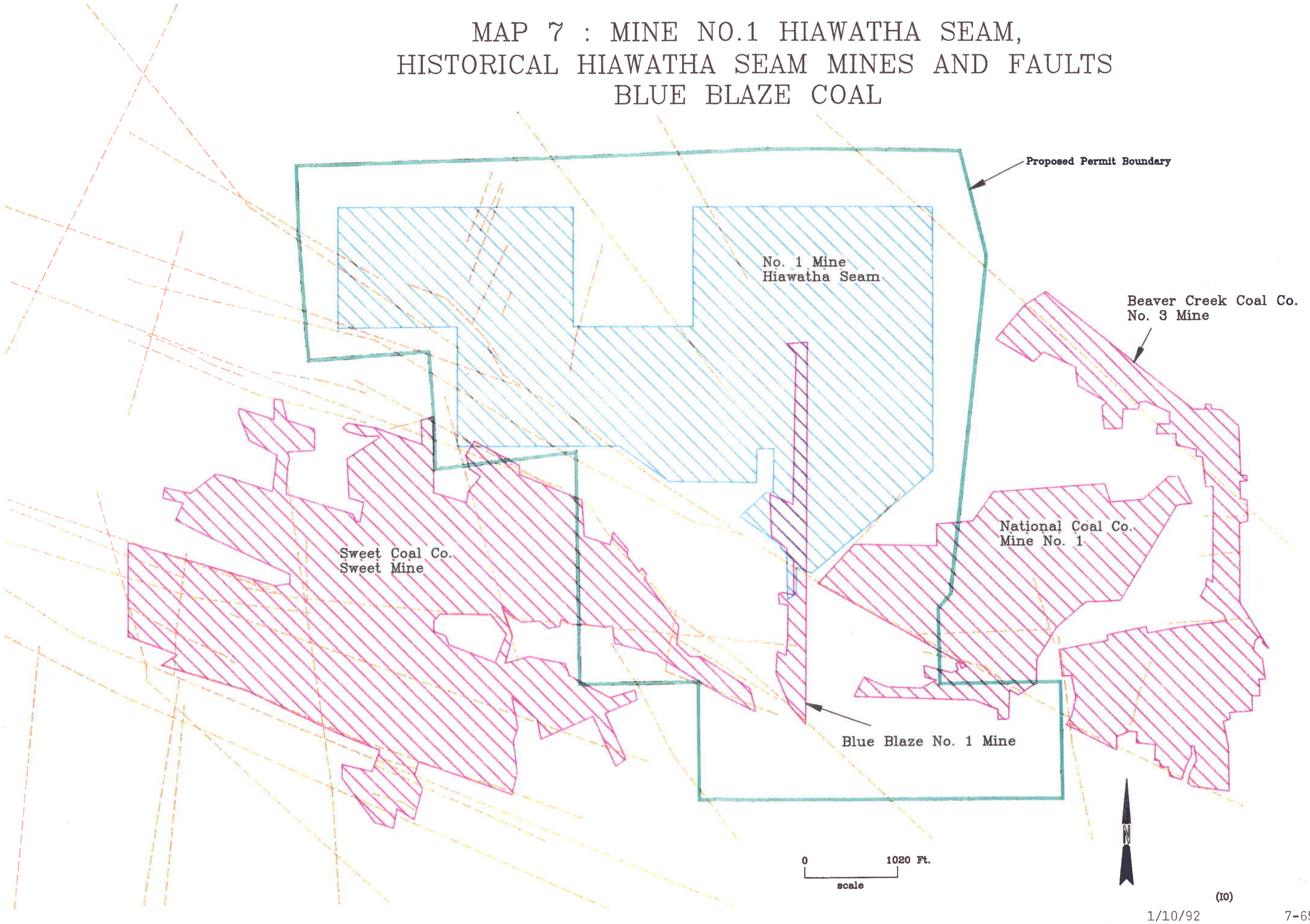
MAP 6 : FAULTS WITHIN MINE NO.2
CASTLEGATE "A" SEAM MINES AND FAULTS
BLUE BLAZE COAL



(HU)

1/10/92

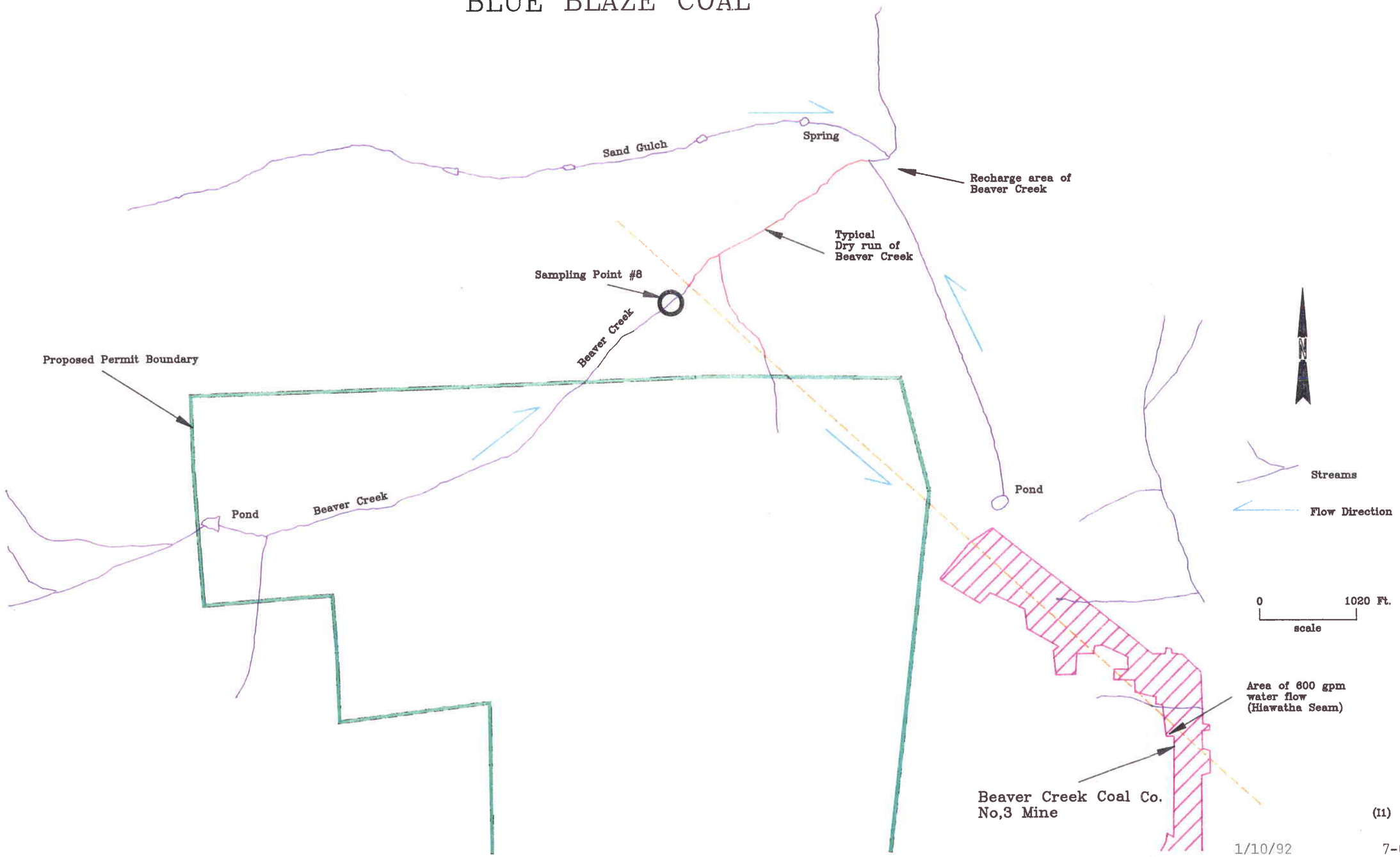
MAP 7 : MINE NO.1 HIAWATHA SEAM, HISTORICAL HIAWATHA SEAM MINES AND FAULTS BLUE BLAZE COAL



(I0)

1/10/92 7-65r

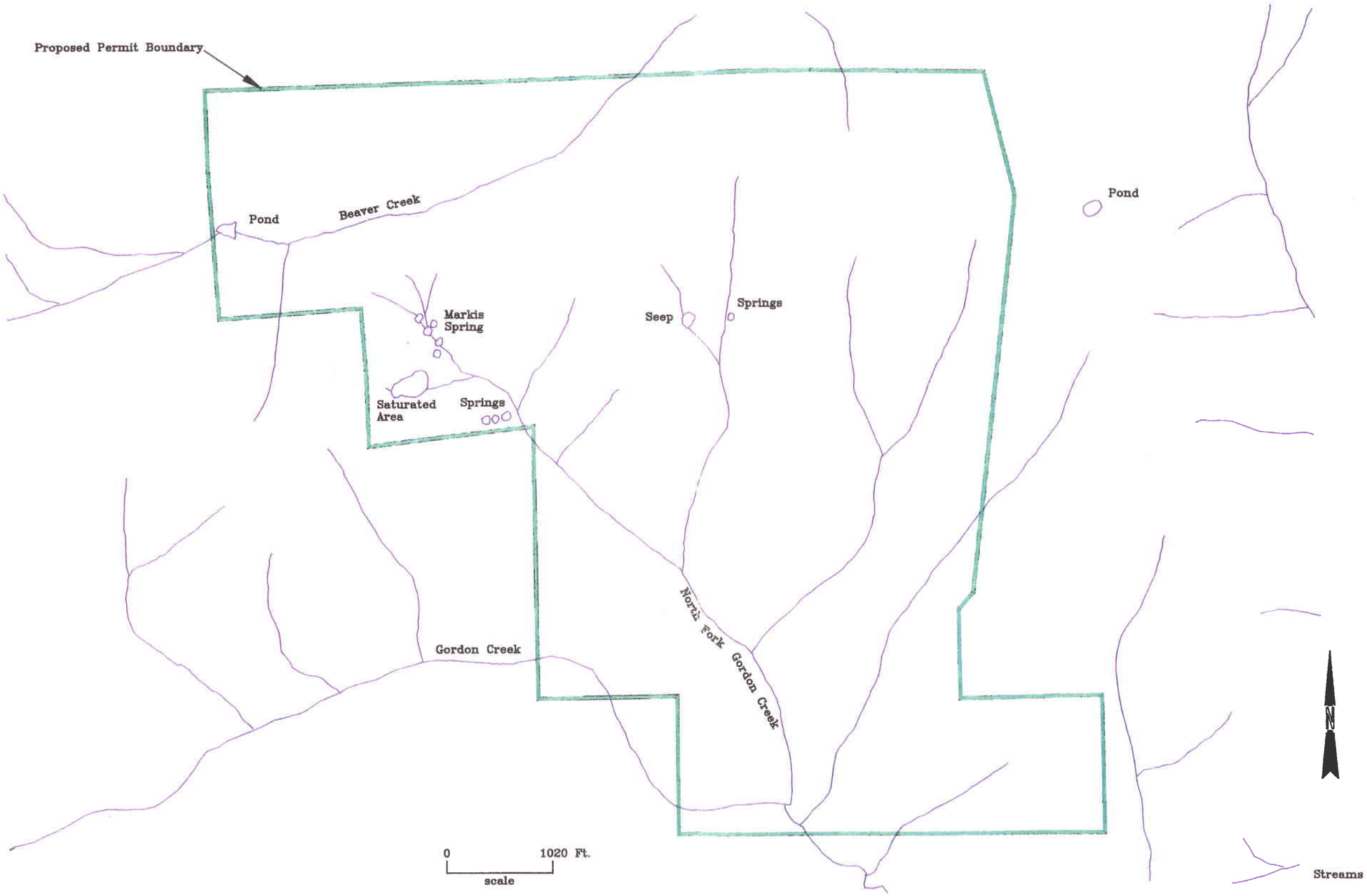
MAP 8 : EFFECT OF FAULT ON BEAVER CREEK AND BEAVER CREEK No.3 MINE
BLUE BLAZE COAL



(I1)

1/10/92

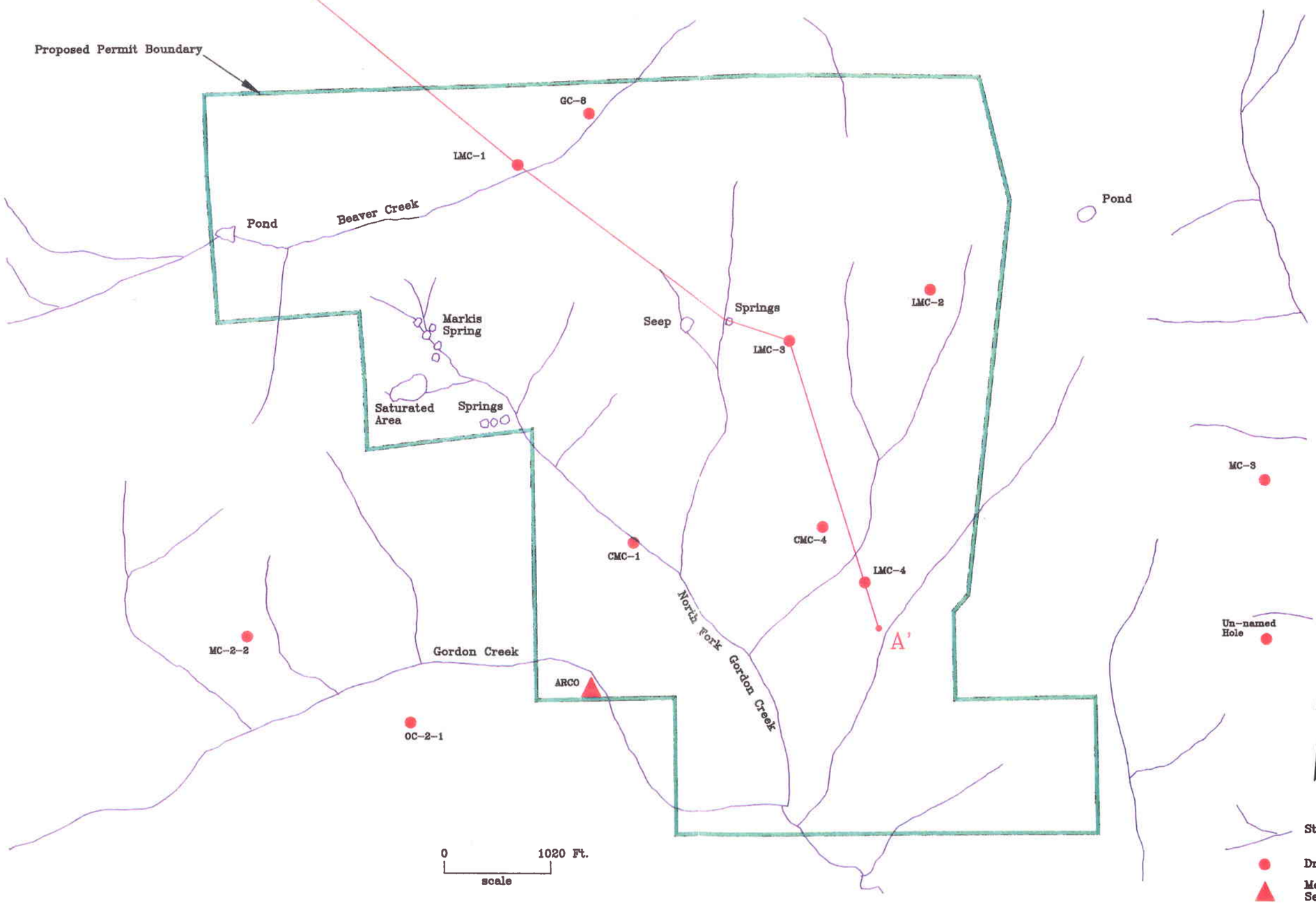
MAP 9 : SURFACE WATER AND SPRINGS
BLUE BLAZE COAL



(12)

1/10/92 7-65w

MAP 10 : POSITION OF CROSS-SECTION A-A'
BLUE BLAZE COAL



(13)

1/10/92 7-65x

APPENDIX 7

Blue Blaze Coal Co.
P.O. Box 784
Price, Utah 84501
Ph. (801) 472-3786

April 30, 1992

Division of Wildlife Resources
455 West Railroad Avenue
Price, Utah 84501

Dear Mr. Bates

As per our conversation on April 27, 1992. It was the interest of the Division of Wildlife Resources of bats that might inhabit the old mine workings of the permit area. As I indicated to you that there are no bats in the old mine workings. This was observed during entering the mine at different seasonal periods throughout the year. As we discussed we were willing to obtain the proper safety equipment so you could enter the mine to make an on-site observation. You indicated that this was not necessary. You also indicated that the time bats could be found in the mine were in the months from May till fall, during these periods no bats or any other animals were observed.

I also indicated that the old fenced mine portals would be used as our mine openings and if the mine was not permitted these portals would be sealed under the abandoned mines reclamation.

Sincerely,

William R. Skaggs

RECEIVED
MAY 11 1992
DIVISION OF
OIL GAS & MINING

APPENDIX 5

AQUATIC BASELINE STUDY

BEAVER CREEK

SELECTED RESOURCE PARAMETERS

FOR BEAVER CREEK (CARBON COUNTY), UTAH

Beaver Creek is divided into two stream sections.

- Section 1 is located from the Price River confluence upstream to the Carbon County line. Distance equals two miles.
- Section 2 is located from the Carbon County line upstream to the headwaters. Distance equals 7.75 miles.

Parameter	Section 1	Section 2
1. Density of Aquatic Macroinvertebrates		
- Ephemeroptera (mayflies)	6/sq. ft.	0.1/sq. ft.
- Plecoptera (stoneflies)	2/sq. ft.	0/sq. ft.
- Tricoptera (caddis flies)	1/sq. ft.	0.4/sq. ft.
- Diptera (black and crane flies)	1/sq. ft.	0.04/sq. ft.
- Mollusca (clams, snails)	0/sq. ft.	0.19/sq. ft.
- Annelida (worms, leaches)	$<$ 1/sq. ft.	$<$ 0.01/sq. ft.
- Coleoptera (beetles)	$<$ 1/sq. ft.	$<$ 0.01/sq. ft.
2. Relative Abundance of Fishes (No. and % sampled per 0.1 mile electro-fishing run)		
- Cutthroat trout	53 - 66%	0 - 0%
- Mottled sculpin	22 - 28%	41 - 100%
- Bluehead sucker	5 - 6%	0 - 0%
- Speckled dace (1953)	12 - 36%	0 - 0%
3. Game Fish Statistics (Cutthroat trout - 1967)		
- Mean total length (mm)	125	--
- Population Estimate (Fish/mile)	at least 530	--