PRICE RIVER COAL COMPANY
P.O. BOX 629 HELPER, UTAH 84526 (801) 472-3411

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August 18, 1980

Ms. Veronica Rovero
Office of Surface Mining
Reclamation & Enforcement
Brooks Towers
1020-15th Street
Denver, Colorado 80202

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Dear Ms. Rovero:

Reference the telephone discussion on July 23, 1980, between you and our Mr. Joe Davidson, we offer the following:

We apologize for the confusion caused by sending the maps without the Golder Conceptual Report.

Per your request of June 2, 1980, we submit the following:

1. Revised drawings, which include boundaries of disturbed areas and identification of surface facilities, are attached (Exhibits 1, 2 and 3).

2-7. Pond design criteria and respective pond capacities are indicated on attached design criteria discussion (Exhibit 4). Because all ponds are incised, detailed discussion of spillways and dewatering devices are not applicable.

8. Culvert sizing criteria attached (Exhibit 5).

9-10. NA

11. Natural drainage will be diverted away from sediment ponds by berms and ditches as shown on the drawings.

12. Nothing disturbed outside of pond area.

13. Canyon is less than 100' wide over entire operation. Stream is ephemeral.

14. NA

15. Excavate as required, and spread on disturbed surface areas requiring reclamation. Add soil amendments as necessary, and seed with an approved seeding mixture.

SEDIMENT POND DESIGN CRITERIA

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Objective:

Each pond should be of sufficient volume to:

a. Contain the runoff volume from the disturbed area(s) in question which results from the 10 year 24-hour precipitation event; and

b. Provide additional sediment storage volume equal to three (3) years average sediment loss from the disturbed area.

Design Criteria:

a. Determination of 10 year 24-hour storm runoff.

1. 10 year 24-hour rainfall for the mine site areas = 1.93 inches.

   (Utah State University, 1971; NOAA 1974)

2. Runoff volume (SCS Curve #93 Steep) = 1.25 A in./A or 0.104 acre/ft./A

b. Sediment storage requirements:

1. The USGS reported in the Central Utah E.I.S. (1978) that the maximum sediment yield from disturbed surface area is at its maximum (57 cu. yd/acre disturbed) during the year of disturbance and further that this yield decreases substantially during succeeding years.

2. Assuming that the average annual sediment yield over the design life of three years will be one half of this maximum (or 28.5 cu.yd./acre/yr.). The estimated sediment yield over the three (3) year design life would be 85.5 cu.yds/disturbed acre. Since the areas served by these ponds have been "disturbed" for a number of years prior to pond construction, the above assumption is viable. The values have also been corroborated by Peterson's (1959) measured values for sediment yields in the Price River Basin. This three year sediment yield converts to 0.052 Ac.ft./A.

3. Pond Sizing:

a. Pond sizing factor:

This is the sum of the runoff storage and sediment storage requirements: + 1 ft. of freeboard below level of emergency spillway.

0.104 Ac/ft./A + 0.052 Ac.ft./A = 0.156 Ac./ft./A

b. Pond size required:

Pond Size = Sizing Factor x Disturbed Area

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CHANNEL DESIGN

Diversion channels were conceptually designed using the Chezy-Manning equation:

$$Q = \frac{1.49}{n} A R_h^{2/3} S^{1/2}$$

where:

- Q = flow, cfs
- n = Manning roughness coefficient
- A = cross-section area
- R_h = hydraulic radius equal to A/P
- S = slope

The roughness coefficient ranges between 0.035 for channels with earth and rubble sides and 0.050 for channels with jagged rock sides (Gray 1973). A coefficient of 0.050 is used.

Channels were designed, where possible, to cause no increase in the sediment contribution to the hydrologic system over that of natural channels. This was accomplished by keeping the velocity below 15 feet per second through the use of wide shallow channels. Where it was not possible to reduce velocities sufficiently, riprap will be provided to prevent erosion.

5 ft

CULVERT DESIGN

Culverts are needed at some major road/stream intersections and to relieve road drainage ditches. They are designed to accommodate at least the 10-year storm as required by the regulations. The culverts are to be corrugated metal pipe with headwall entrances and are to be buried to a depth of 1/2 of their diameter or one foot, whichever is greater. Culvert dimensions were determined using nomographs for inlet controlled culverts provided in the U.S. Soil Conservation Service National Engineering Handbook, Section 4, Hydrology, 1969.

Columns I - inlet control
II - outlet
III - projecting

Exhibit 4

SIZING CRITERIA

Area	Disturbed Acres	Area Paved, Acres	Area Not Paved Requiring Sediment Control	(State)	Actual	
Hardscrabble:						
I	9.61	-	9.61 x 0.156 = 1.50 Ac/Ft Required	(1.804)	2.6	✓
II	10.21	-	10.21 x 0.156 = 1.59 Ac/Ft Required	(2.025)	1.15	no
III	7.32	1100 x 20 ÷ 43560 = 0.50	7.32 - 0.50 = 682 x 0.156 = 1.06 Ac/Ft Required	(1.187)	2.2	✓
IV	4.49	1000 x 20 ÷ 43560 = 0.45 350 x 20 ÷ 43560 = 0.51 450 x 50 ÷ 43560 = 0.51 1.12	4.49-1.12 = 3.37 x 0.156 = 0.53 Ac/Ft Required	(0.817)	Proposed	no
Sowbelly: All Ponds Connected W/Culverts						
I	5.78	-	5.78 x 0.156 = 0.90 Ac/Ft Required	(1.087)	0.25	no
II	5.34	-	5.34 x 0.156 = 0.84 Ac/Ft Required	(1.042)	1.92	✓
III	2.92	-	2.92 x 0.156 = 0.46 Ac/Ft Required	(0.586)	0.85	✓
			2.20		3.02	
Castle Gate:						
I	7.7	2400 x 20 ÷ 43560 = 1.1	6.6 x 0.156 = 1.03 Ac/Ft Required	(1.644)	Proposed	no

FLOW CALCULATIONS

Peak flows on the small watersheds in the study area were estimated using the Rational Method (Gray, 1973). This method is based on the criteria that for storms of uniform intensity, evenly distributed over the watershed, the maximum rate of runoff occurs when the entire watershed is contributing at the outlet and that this rate of runoff, or flow, is proportional to the rainfall intensity. The equation is:

$$Q = ciA \qquad (1)$$

where:

- c = runoff coefficient
- i = maximum rainfall intensity, in./hr, whose duration is equal to the time of concentration of the watershed.
- A = area of watershed, acres
- Q = peak flow, cfs

Maximum rainfall intensities for specified return periods were calculated using precipitation data from a gaging station at Price, Utah, (Table I) with the duration equal to the time of concentration. No gaging stations are located closer to the Castle Gate area. However, regional precipitation data for six-hour and 24-hour events are available and are tabulated in Table II (NOAA Rainfall Frequency Atlas for Utah, 1974). Generally, the precipitation at the Price station is about 94 percent of that in the Castle Gate area; thus, the Price Data was considered applicable to the study area when increased by about six percent.

The time of concentration can be determined from (Gray, 1973):

$$t_c = 0.0078\ L^{0.77} . S^{-0.385}$$

where:

- t_c = time of concentration, minutes
- L = maximum length of travel of water, feet
- S = slope, equal to H/L where H is the difference in elevation between the most remote point on the main and the outlet (feet).

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TABLE I

ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION (INCHES) - PRICE, UTAH*

Return Period (yrs)	Duration 5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
1	.08	.13	.17	.23	.29	.37	.44	.62	.78	.95
2	.12	.18	.23	.32	.40	.49	.58	.80	1.00	1.20
5	.16	.25	.32	.44	.56	.68	.79	1.07	1.32	1.58
10	.20	.31	.39	.54	.68	.81	.94	1.25	1.53	1.82
25	.24	.37	.47	.65	.82	.98	1.13	1.50	1.83	2.18
50	.28	.43	.54	.75	.95	1.12	1.29	1.71	2.18	2.47
100	.31	.49	.62	.85	1.08	1.27	1.45	1.91	2.32	2.74

*Ref: Utah State University, 1971, Department of Soils and Biometeorology, Bulletin No. 1.

TABLE II

PRECIPITATION FOR CASTLE GATE AREA**

Storm	Precip (in)	Storm	Precip (in)
2 yr-6 hr	.92	2 yr-24 hr	1.30
5 yr-6 hr	1.20	5 yr-24 hr	1.65
10 yr-6 hr	1.32	10 yr-24 hr	1.90
25 yr-6 hr	1.65	25 yr-24 hr	2.30
50 yr-6 hr	1.85	50 yr-24 hr	2.70
100 yr-6 hr	2.05	100 yr-24 hr	2.90

**Ref: National Oceanic and Atmospheric Administration, 1974, NOAA Atlas 2, Vol. VI, Rainfall Frequency Maps of Utah

For very small watersheds, the Rational Method can result in unrealistically high intensities. Therefore, when the 100-year storm intensity was greater than half of the probable maximum thunderstorm, the 1/2 PMTS value was used (i = 3.25 hr./inches per hour from USBR "Design of Small Dams, " Figure 20).

The runoff coefficient in the Rational Method is dependent on the topography, soil type and vegetation of the watershed. Values for runoff coefficients can be found in Gray (1973), Table VIII.2. A conservative value of 0.80 was used for all flow calculations.

16. Application for NPDES Permit attached.

We trust that the above will enable you to approve our sediment pond installation.

Very truly yours,

PRICE RIVER COAL COMPANY

K. B. Hutchinson
Chief Engineer

KBH:ga
Encl. - Exhibit 1 - Map, Hardscrabble Area
Exhibit 2 - Map, Sowbelly Area
Exhibit 3 - Map, Castle Gate Area
Exhibit 4 - Sediment Pond Design Criteria
Exhibit 5 - Culvert Design Discussion
Exhibit 6 - NPDES Permit Application

cc: Utah - DOGM
Joe Davidson - Lancaster

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