3.0 RESULTS AND DISCUSSION

3.1 Sedimentation Pond

3.1.1 Design. Results of analyses to determine the required size and hydraulics of the sedimentation pond are included in Appendix A. In sizing the pond, plans for future expansion of the surface facilities at the Crandall Canyon Mine were accounted for.

Runoff to the sedimentation pond from the 10-year, 24-hour storm was determined to be 0.77 acre-foot. Based on a disturbed drainage area to the pond of 5.7 acres (see Plate 1) and a required sediment storage volume of 0.1 acre-foot per acre of disturbed area (UMC 817.46(b)(1)), 0.57 acre-foot of sediment storage volume was provided in the pond.

Plate 2 presents details of the design of the proposed sedimentation pond. Based on the topographic map of the pond, the stage-capacity curve provided in Figure 5 was developed. As noted in this figure, the new pond will provide sediment storage to an elevation of 7777.9 feet and total storage (sediment plus runoff) to an elevation of 7783.2 feet. Sediment will be cleaned out of the pond when it reaches and elevation of 7775.7 feet at the riser (the elevation correponding to a volume of 60 percent of the required sediment storage volume).

The existing riser in the sedimentation pond has an overflow elevation of 7779.4 feet and a decant elevation of 7776.4 feet. Based on data presented in Figure 5, it will be necessary to raise the elevation of the bottom of the decant pipe 1.5 feet to an elevation of 7777.9 feet (i.e., above the top of the sediment storage level). Furthermore, the outflow point on the riser should be raised 3.8 feet to an elevation of 7783.2 feet (the top of the total storage pool). This can be accomplished with section of 24-inch CMP welded to the existing riser.

Results of inflow-outlflow analyses from the 25-year, 24-hour storm are also presented in Appendix A. Utilizing the combined hydraulics of the primary and proposed emergency spillways, the peak outflow stage during the 25-year, 24-hour storm was calculated by SEDIMOT II as 6.0 feet above the sediment storage level. Thus, the outflow elevation during the design flow event was determined to be 7783.9 feet.

UMC 817.46(i) requires that the crest of the emergency spillway be located at least 1.0 foot above the crest of the principal spillway. Hence, the emergency spillway crest will be placed at an elevation of 7784.2. As a result, all water will be passed through the primary spillway during the design event (with a design elevation of 7783.9 feet). The emergency spillway

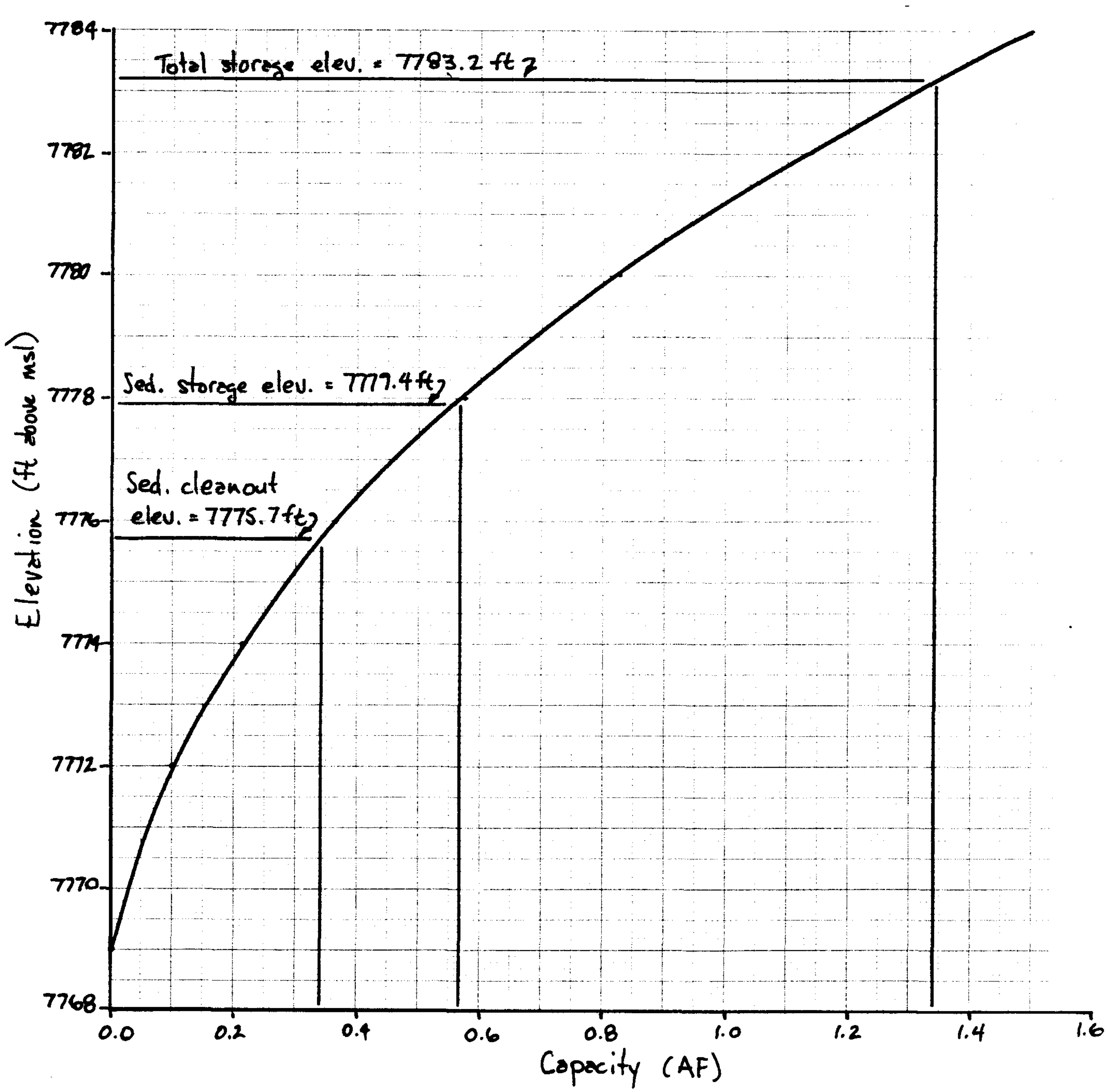

Figure 5. Stage-capacity curve for proposed sedimentation pond.

will be retained in the design, however, due to requirements of the U.S. Forest Service. As designed, the emergency spillway has a bottom width of 4.0 feet and side slopes of 2h:1v.

Since the emergency spillway will not be flowing during the design event, UMC 817.46(j) requires only that the top of the settled embankment be 1.0 foot above the crest of the emergency spillway. This will result in an embankment crest elevation of 7785.2 feet. Since the crest of the existing embankment is at an elevation of 7783.0 feet, the proposed design will require the addition of 2.2 feet of settled embankment to the top of the existing embankment. UMC 817.46(k) requires that this height be increased five percent to account for settling. Thus, 2.3 feet of material will be added to the existing embankment.

With a crest elevation of 7785.2 feet and a base elevation of 7769.0 feet, the embankment will have a height of 16.2 feet. Using the equation provided in UMC 817.46(l), the required top width of the embankment is 10.2 feet.

The design presented herein assumes that the existing pond will be enlarged to meet the volume requirements of this plan by removing excess fill from the interior of the pond and placing it on the exterior slope. Prior to placing fill on the exterior slope, all large rock fragments should be removed. The fill can then be placed in 6-inch lifts down the side of the existing embankment to decrease its outslope to 2h:1v. This new fill should be compacted in place prior to placing the next lift.

Because of the location of the sedimentation pond (on a hillside between the access road and Crandall Creek), insufficient space is available to permit construction of side alopes with a combined upstream and downstream slope of 5h:1v and still provide the required storage capacity. Hence, the pond has been designed with 2h:1v sideslopes on both the upstream and downstream sides. As included in the original design, the interior of the pond should be lined with a local, compacted clay to reduce seepage from the pond and, thereby, increase the stability of the embankment.

R&M Consultants (1981) conducted a stability investigation of a proposed sedimentation pond at the site with 2h:1v sideslopes on both the up- and downstream embankments and found that the static factor of safety for such an embankment is 1.4. To increase this safety factor in the new design, the downstream east-facing toe of the embankment should be loaded with the large rock fragments that currently lie on and adjacent to the outer embankment slope.

The emergency spillway should be lined with riprap and a filter blanket as noted in Appendix A to reduce erosion potential. Grading of the riprap, filter blanket, and embankment materials are shown in Figure 6.

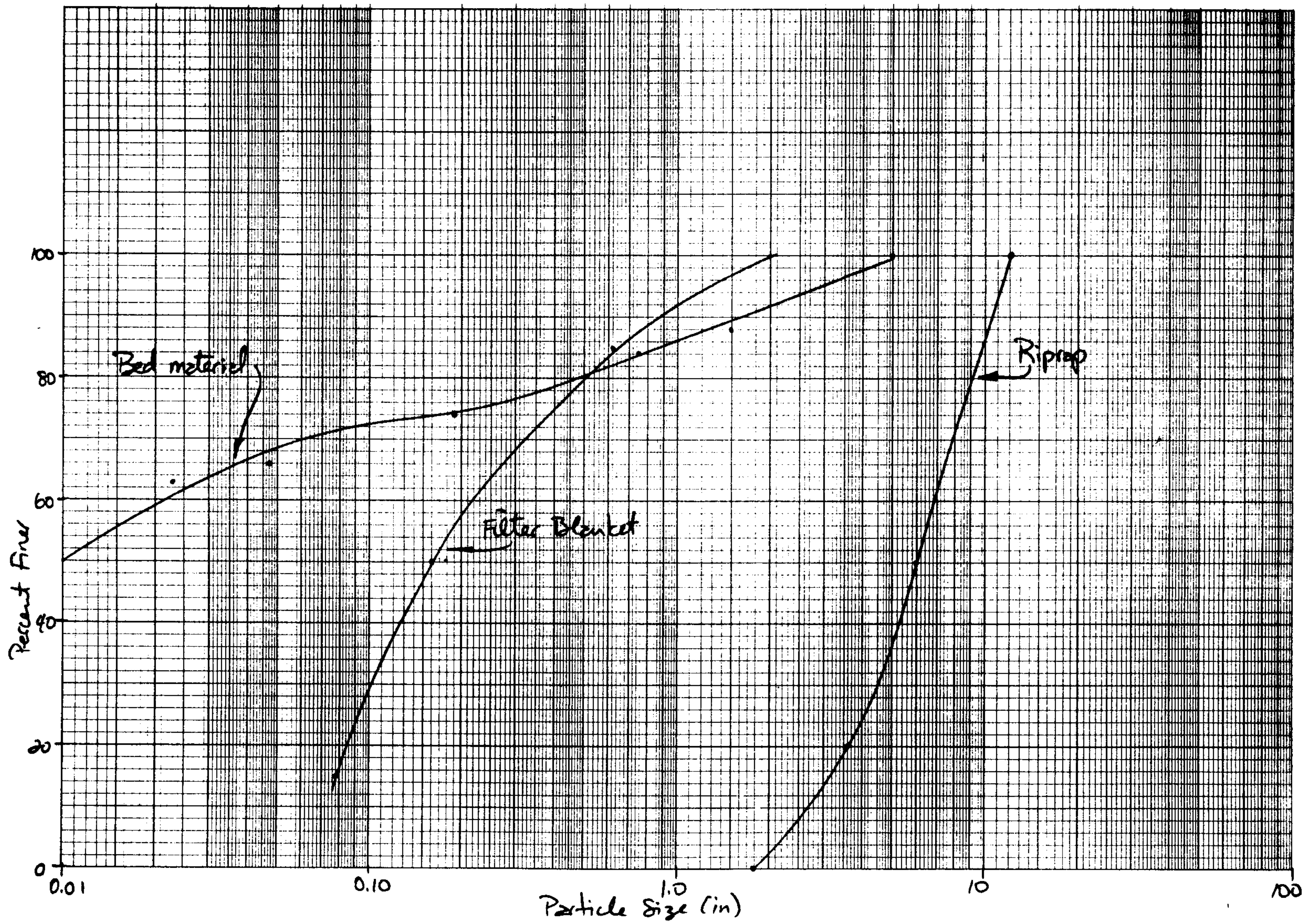

Figure 6. Gradation of embankment, filter, and riprap materials.

3.1.2 Embankment Revegetation. UMC 817.46(s) requires that areas disturbed by pond construction (including the embankment) be stabilized with an effective vegetative cover as soon as possible after disturbance. As a result, the final lift placed on the downstream of the embankment should not be compacted above the upper elevation to which rock stabilization is added. This upper area should be planted with the grasses provided in Table 1 for temporary reclamation.

Plant attributes in Table 1 were obtained from Plummer et al. (1968) and seeding rates were suggested by the U.S. Soil Conservation Service (1975). This mixture provides rapid growth species, sod-forming species, and species that are compatible with other plants.

All disturbed areas should be seeded with the exception of the interior of the pond below the sediment storage level. Seeding should be done in the late fall, just prior to the first heavy snowfall of the year (Plummer et al., 1968). Prior to seeding, two tons of straw or grass ahy per acre of disturbed area should be spread over the area to be planted and crimped into the soil with a roto tiller or shovel to aid in moisture retention (U.S. Soil Conservation Service, 1975). The seed mixture can then be broadcast onto the area through the use of a cyclone seeder.

3.2 Diversions and Runoff Control

A diversion will be placed along the western edge of the site at the location shown in Plate 3 to divert water from a 95-acre undusturbed watershed around the yard area. Analyses and design information associated with this diversion are contained in Appendix B.

The diversion was designed to safely pass the peak flow from the 10-year, 24-hour precipitation event. The resulting peak flow from this event (as noted in Appendix B) was determined to be 0.50 cubic feet per second.

The channel has a maximum slope of 20 percent as noted on Plate 3. To minimize distubances to adjacent areas, it was designed with a V-shape. With this configuration, calculations contained in Appendix B indicate that the flow velocity would reach 5.5 feet per second in an unlined channel, a value that exceeds the maximum permissible velocity for unlined earthen channels by about 0.5 feet per second. As a result, the channel was designed to be lined with riprapped to protect it against erosion. Calculations contained in Appendix B indicate that the gradation required for the emergency spillway will also suffice for the diversion channel, including the filter blanket.

Table 1. Suggested plant species for revegetation.

Species	Attribute Rating*: Initial Establishment	Growth Rate	Final Establishment	Natural Spread	Soil Stability	Species compatibility	Planting Rate, in pounds/acre
Beardless bluebunch Wheatgrass (Agropyron spictum inerme)	4	3	4	5	3	4	4
Mountain brome (Bromus carinatus)	5	5	3	4	4	5	4
Range-type alfalfa (Medicago sative)	5	5	4	2	4	5	4
Western (bluestem) Wheatgrass (Agropyron Smithii)	3	3	5	4	5	4	4
Southern smooth brome (Bromus inermis)	3	4	5	5	5	3	4
				TOTAL			20

* 1 = very poor
2 = poor
3 = fair
4 = good
5 = very good

A typical cross section of the diversion channel is provided in Figure 7. The channel should empty into a 18-inch CMP culvert with a flared inlet at the edge of the Crandall Creek bank to convey water down the bank to the stream.

Existing culverts in the mine yard were examined to determine their adequacy with respect to passing the peak flow from the 10-year, 24-hour precipitation event. Data provided in Appendix B indicate that the downstream-most culvert at the yard need be only 18 inches in diameter. Since this and all other upstream existing culverts at the yard are 24 inches in diameter, these culverts are adequately sized. A proposed new culvert to be placed at the downstream end of the upper administratiion pad (see Plate 3) should be 18 inches in diameter.

A berm will be placed around the proposed substation to prevent runoff water that accumulates thereon from flowing across the remainder of the site. Calculations contained in Appendix B indicate that 1.8 inches of water will accumulate within the bermed area during the 10-year, 24-hour storm. This berm is designed to be two feet in height and will, therefore, retain all water from the design event.

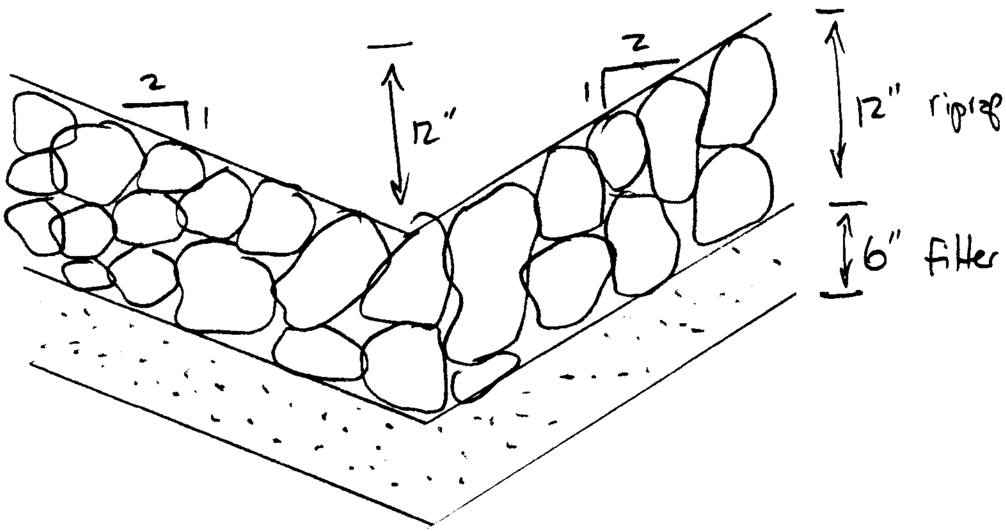

Figure 7. Typical diversion channel cross section.