area of pre-SMCRA disturbance. Plate 5-4 also shows areas of non-mining disturbance which occurred after 1980 but prior to 1996. These disturbances were created by logging activities in the area and are not subject to the requirements of R645-301 through R645-302. No areas shown on Plate 5-4 are subject to the requirements of R645-200 through R645-203. The pre-mining topography for the Pace Canyon Fan Portal Site can be seen on Plate PC5-4 in Appendix 5-10.

A certified map showing the location of the topsoil stockpile is provided as Plate 2-3. The location of the proposed topsoil stockpile for the Pace Canyon Fan Portal Site is shown on Plate PC5-2 in Appendix 5-10. The proposed location of a sediment trap and basin are also shown on this plate.

The proposed location of the sedimentation pond is noted on Plate 5-2. No water treatment facilities will exist at the site other than the sedimentation pond.

The following facilities or activities will not exist or occur within the permit area:

- Coal preparation plant,
- Coal cleaning,
- Coal processing waste banks, dams, or embankments,
- Disposal of non-coal (non-waste rock) waste other than durable rock-type construction materials such as cinder block, and
- Air pollution control facilities.

Hence, certified maps or cross sections of these facilities are not provided in this plan. The durable rock-type construction materials will be disposed of in locations designated to receive underground development waste.

Surface Configurations. Certified maps and cross sections showing the proposed final (post-reclamation) surface configuration of the Dugout Canyon disturbed area are provided on Plates 5-5

and 5-6, respectively. Certified maps and cross sections showing the proposed final (post-reclamation) surface for the Pace Canyon Fan Portal Site is shown on Plate PC5-5 in Appendix 5-10.

Hydrology. Certified maps and cross sections associated with the hydrology of the Dugout Canyon Mine area are provided in Chapter 7.

Geology. Certified maps and cross sections associated with the geology of the Dugout Canyon Mine area are provided in Chapter 6.

512.200 Plans and Engineering Designs

All plans and engineering designs presented in this M&RP were prepared by or under the direction of and certified by a qualified registered professional engineer.

Excess Spoil. No excess spoil will be generated from the permit area.

Durable Rock Fills. No durable rock fills will exist in the permit area.

Coal Mine Waste. The designs of the waste-rock facilities at the Dugout, SUFCo and Skyline Mines were certified by a qualified registered professional engineer. Information regarding these disposal facilities can be found in their respective M&RPs.

Impoundments. An impoundment was constructed for the mining and reclamation operation in Dugout Canyon and consists of a sedimentation pond (see Plate 7-5). A sediment trap has been proposed for the Pace Canyon Fan Portal Site (see Figure 7-12C in Appendix 7-12). These impoundments have been designed under the direction of a professional engineer using current, prudent, engineering practices. These designs were certified by a qualified registered professional engineer.

Cross sections of the proposed surface facilities are provided on Plate 5-3 and Figure 7-9-2 (Appendix 7-9). The disturbed area shown on Plate 5-2 is the same as the land area for which a performance bond or other guarantee has been posted.

Under the currently approved construction plan, several areas within the existing disturbed area boundary will not be significantly disturbed during site construction. The first such area consists of 0.08 acres located on the hillside west of the portal pad, north of the substation access road, and east of the storage area adjacent to that road. The second such area consists of 0.13 acres located on the hillside above the mine haulage/manway portal. Each of the above areas is located on a hillside above the area of actual disturbance.

Plate PC5-2 in Appendix 5-10 shows the layout of the Pace Canyon Fan Portal Site. Cross sections of this facility are also shown on this map. Figure PC-2 in Appendix 5-10 depicts the Gilson seam mine planned workings. (February 2005). Facilities at the Pace Canyon Fan Portal Site will include:

- Portal - see Section 529,
  Fan Shaft - 20 foot diameter shaft, 60 to 70 feet deep,
  Fan and motor building - metal structure containing a fan,
  Transformers - metal structure sitting within a concrete containment structure,
  Emergency Generators - two trailer mounted generators sitting within a concrete containment structure,
  Fuel Storage Tank - tank sitting within a concrete containment structure adjacent to the generators,
  Pump Building - contains pump for lubricating fan,
  Topsoil Storage Piles,
  Sediment Trap - see Appendix 7-12.

The pad will accommodate the mine fan, associated ducting and motor building, diesel generators, transformers, fuel storage tank, and intake portal which will also accommodate an escape way. The fan ducting is equipped with a vertical evase (diffuser) to assist in reducing noise associated with the operation of the fan.

Transportation Facilities. Roads that will be constructed, used, or maintained by SCM in the permit area for the mining and reclamation operations are shown on Plate 5-2. No rail systems or overland conveyor systems (other than the material-handling conveyors in the mine yard) will be

All support facilities will be removed following mining in accordance with the reclamation plan discussed in Section 540 of this M&RP.

Water Pollution Control Facilities. Water pollution control facilities at the Dugout Canyon Mine consist of the sedimentation pond, the appurtenant structures associated with the sedimentation pond, and a sewage/wastewater holding tank. All water pollution control facilities will be removed following mining in accordance with the reclamation plan discussed in Section 540 of this M&RP.

The sedimentation pond and appurtenant structures will be constructed as discussed in Chapter 7 and will be used and maintained as discussed in Section 533.700. Sanitary sewage will be routed by gravity through a pipeline from the mine surface facility to a below-grade collection tank which will be located adjacent to the office/bath house building. Wastewater which collects in the holding tank(s) will be periodically hauled from the site and disposed of in the sewage lagoon at the Soldier Canyon Mine or the Price River Water Improvement District facility at Wellington, Utah. Approval for the use of these facilities by the Dugout Canyon Mine is provided in Appendix 5-3A

Water pollution control at the Pace Canyon Fan Portal Site will consist of alternate sediment control measures, a sediment trap, a sediment basin and secondary containment for all tanks, transformers, motors and generators. Details regarding the alternate sediment control measures and sediment trap can be found in Appendix 7-12.

527 Transportation Facilities

527.100 Road Classification

Primary roads within the disturbed area include the primary haul road, the coal storage pad road, the substation access road, the portal pad access road, and the water tank access road. The survey monument access road is classified as an ancillary road. The locations of these roads are shown on Plate 5-2. Typical cross sections representing these roads are shown in Figure 5-1.

The private dirt roads outside of the disturbed area but within the permit area will not be classified. These unimproved dirt roads are owned and maintained by the surface land owners, including Canyon

As noted previously in this section, temporary storage of debris generated at the mine will be in a dumpster. As a result, this debris will be protected from the wind and other elements. Because debris that is generated at the mine site will be only temporarily stored at the mine prior to off-site disposal, there is no significant potential for this debris to spontaneously combust. Fire extinguishers will be kept on mobile equipment in the mine yard to extinguish any fires should combustion of the waste materials occur. No waste materials that constitute a fire hazard will be accumulated in the permit area. No hazardous materials, as defined in 40 CFR, will be disposed of underground. These materials will be disposed of in accordance with all applicable state and federal regulations.

528.400 Dams, Embankments, and Impoundments

No dams, embankments, or impoundments will be used for the handling or disposal of coal, overburden, excess spoil, or coal mine waste in the permit area.

529 Management of Mine Openings

It is currently anticipated that five underground mine openings will be associated with the Rock Canyon and Gilson Seams. A portal and shaft were constructed into the Gilson seam at the Pace Canyon Fan Portal Site (see Plate PC5-2 in Appendix 5-10). The primary purpose of the shaft and portal will be for ventilation. The portal will also be used as an emergency escape way. A fence was installed to surround the Pace Canyon Fan facilities to assist in managing the mine openings, refer to Figure PC-3 in Appendix 5-10 for the approximate location of the fence. Two types of fence were used at the Pace Canyon site, both fences are approximately eight feet tall, one is constructed of chain link, the other is field fence (refer to Appendix 5-10 for details). The field/wildlife fence was constructed per DWR wildlife exclusionary fence recommendations. Since the facilities are behind a locked gate, barb wire is optional for the top of the chain link. Should additional protection become necessary at the Pace Canyon Portal opening, a gate across the portal entrance will be installed. Additional openings into the Gilson Seam may be planned in the future but are not part of this M&RP.

will proceed from the upstream end of the surface facilities to the downstream end, thus allowing the sedimentation pond and sediment traps to remain effective for as long as possible.

At the Pace Canyon Fan Portal facilities the gravel associated with sediment control of the site will be placed in the shaft for disposal during reclamation of the site. The Hilfiker wall will be constructed using on-site material. Soil at the site will be screened to collect rock which will be used to fill the wall. During reclamation the steel mesh used to build the wall will be recycled or placed into the shaft during backfilling. The rock and soil used to build the will be used as fill during reclamation.

Construction of Reclamation Channels. Reclamation channels will be constructed at the locations shown on Plate 5-5 for the Dugout Canyon facility and Figure 7-12F in Appendix 7-12 for the Pace Canyon Fan Portal Site. These channels will be constructed to capture runoff from undisturbed areas and convey this runoff to and through Dugout Creek or Pace Creek. Details regarding the design and construction of these channels are provided in Section 760 of this M&RP.

As noted on Plate 5-5, slopes adjacent to the reclaimed Dugout Creek have typically been designed with a grade of 2H:1V. These slopes are generally shallower than the natural slopes adjacent to the creek both up- and downstream from the disturbed area (where natural slopes on the hillsides adjacent to the stream are typically 1.5H:1V or steeper). Hence, access to the stream by wildlife and livestock under post-mining conditions should not be hindered within the reclaimed area.

Attempts to reduce the post-reclamation slopes entering the steam channel were not fruitful since reducing the slopes would result in increased cut quantities which would require off-site disposal. Furthermore, since the reclaimed slopes will generally be less than the natural slopes both up- and downstream from the disturbed area, a further reduction was not considered necessary to support post-mining wildlife and livestock usage of the area.

Sedimentation Pond Removal and Interim Sediment Control. Prior to the start of reclamation activities, temporary silt fences will be emplaced in the stream channel perpendicular to the flow direction in accordance with Figure 5-4. A minimum of four such silt fences will be installed in the

APPENDIX 5-10

Pace Canyon Fan Facilities

LIST OF FIGURES (Continued)

The following figures are located in Appendix 7-12:

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Appendix

Sediment-control measures were implemented during the relocation of the west fork of Dugout Creek. These measures will include installation of three straw-bale dikes and/or reinforced silt fences in appropriate locations within the creek channel below the relocation site to minimize potential contributions of sediment to Dugout Creek. The straw-bale dikes/silt fences will remain in-place until channel relocation and pad construction is completed.

Pace Canyon Fan Portal Facilities

The entire site is an ASCA area. Sediment from the site will be controlled by a combination of contemporaneous reclamation, revegetation, gravel, and the use of a sediment trap. Plate Figure 7-12E identifies the various alternative sediment control methods that will be used and where the methods will be implemented. Other than the realigned road and a small area on the outslope of the sediment trap embankment the entire site will drain to the sediment trap. Although calculations in Appendix 7-12, Attachment 2 demonstrate that the contemporaneous reclamation, gravel, and revegetation will reduce the sediment yield to less than pre-mining conditions a sediment trap was constructed to contain sediment generated by the site.

Sedimentation Ponds. A single sedimentation pond has been designed for the Dugout Canyon Mine facilities. The sedimentation pond is located in the southwest corner of the disturbed area. This pond will function individually.

The sedimentation pond will be located as near as possible to the disturbed areas as indicated on Plates 7-4 and 7-5. The pond will not be located within a perennial stream channel.

Design, Construction, and Maintenance

Sediment Storage Volume. The sedimentation pond has been designed to control sediment from disturbed and undisturbed areas. The disturbed area contributing runoff to the sedimentation pond contains 16.9 acres from watersheds DWS-1 through DWS-7 (portions of which will be undisturbed or contemporaneously reclaimed - see Appendix 7-9). The undisturbed area contributing runoff to the sedimentation pond contains 33.7 acres from watersheds WS-1, -3, -5, -6, -7, -8, -9a, and -11. Refer to Plates 7-7 and 7-8 for a delineation of watershed boundaries.

structures have been located to minimize downstream sedimentation and flooding. Diversion ditches and culverts for all roads are described in Section 732.300.

A generic cross section showing a typical diversion ditch adjacent to a road is provided in Figure 5-1. This cross section is typical of the ditches to be installed at the Dugout Canyon Mine. As noted in Table 7-8, each of the ditches to be installed at the site will have positive freeboard when flowing at the design rate. Hence, the ditches have been designed to avoid spreading of water on the adjacent roads during the design event.

Primary Roads. The location of primary roads is discussed in Section 527 and presented on Plate 5-2 of this M&RP. The county road which accesses the mine site will be located by Carbon County, where practical, along the alignment of the existing dirt road to minimize erosion and be on stable ground. The access road will not ford Dugout Creek. However, prior to entering the disturbed area, the county road will cross Dugout Creek using a 10' diameter circular corrugated metal pipe culvert with headwalls. As this culvert is located outside the disturbed area boundary and part of the county road, design of this structure was handled by Carbon County. Within the disturbed area, Dugout Creek will be diverted through culverts UC-5 and UC-6 to prevent uncontrolled sediment from reaching the stream and to allow for efficient use of the site. A riprap-lined energy dissipater will be constructed downstream from the outlet of culvert UC-6 to withstand the peak flow from a 100-year, 6-hour storm event. Calculations regarding the design of the energy dissipater can be found in Appendix 7-9.

The drainage control system for the primary roads within the permit area includes diversion ditches and culverts. Except for culverts UC-5 and UC-6, the diversions will adequately pass the peak runoff from the 10-year, 24-hour precipitation event. Culverts UC-6 and UC-5 have been designed to convey the peak flow resulting from the 100-year, 6-hour precipitation event. Culverts will be constructed to avoid plugging or collapse and erosion at the inlet or outlet. Drainage details for the access road are presented in Section 732.300.

Pace Canyon Road

Runoff and erosion on the road will be controlled by the use of water bars. The water bars divert runoff from the road before an erosive volume of water can accumulate. Four water bars will be placed approximately 200 feet apart on the road. The water bars were placed as shown on Figure 7-12A. The first water bar will be placed approximately 5 feet upgradient of the start of the realigned road to prevent any runoff rom the existing road from flowing onto the road. The other three water bars will divert any runoff that has fallen on the realigned road off the road into well vegetated areas. Due to the berm running parallel to the road only precipitation falling directly on the realigned road could impact the road. Therefore, very little runoff is expected to be generated. The little runoff generated by the realigned road will be controlled by the water bars.

A sediment trap was constructed in association with the Pace Canyon Fan Portal site. Contemporaneous reclamation and gravel should adequately control sediment at the site, with the sediment trap providing an extra measure of protection. Details regarding this sediment trap can be found in Appendix 7-12.

752.100 Siltation Structures and Diversions

Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs presented in Sections 732, 742, and 763 of this M&RP.

752.200 Road Drainage

All roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed according to plans and designs presented in Sections 732.400, 742.400, and 762 of this M&RP. All roads have been designed to:

- Control or prevent erosion, siltation and the air pollution attendant to erosion by vegetating or otherwise stabilizing all exposed surfaces in accordance with current, prudent engineering practices;
- Control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area;
- Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under Section 751;
- Minimize the diminution to or degradation of the quality or quantity of surface- and groundwater systems; and
- Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

753 Impoundments and Discharge Structures

Impoundments and discharge structures will be located, maintained, constructed and reclaimed as described in Sections 733, 734, 743, 745, and 760 of this M&RP.

754 Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste

Disposal areas for coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed as described in Sections 736, 737, 746, 747, 760 and Chapter 5 of this M&RP.

755 Casing and Sealing of Wells

All wells will be managed as described in Sections 551, 748 and 765 of this M&RP.

APPENDIX 7-12

Pace Canyon Fan Portal Site

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710 INTRODUCTION

This appendix gives details regarding the drainage and sediment controls at the Pace Canyon Fan Portal Site. Sections of Chapter 7 of the M&RP that would require significant revisions or additions related to the Pace Canyon Fan Portal Site have been recreated in this appendix to minimize confusion between the Dugout Canyon Site and the Pace Canyon Fan Portal Site. To aid in review the same numbering system used in Chapter 7 has been used in this appendix. Chapter 7 of the M&RP should be referred to for any sections not included in this appendix.

732 Sediment Control Measures

The sediment control measures for the Pace Canyon Fan Portal Area were designed to prevent additional contributions of sediment to streamflow or to runoff outside the permit area. In addition, they have been designed to meet applicable effluent limitations, and minimize erosion to the extent possible.

The structures used for the runoff-control plan for the area include disturbed and undisturbed area diversion channels, a sediment trap, containment berms, silt fences, and road diversions and culverts.

732.100 Siltation Structures

The siltation structure within the disturbed area is a sediment trap as described in Section 732.200.

732.200 Sedimentation Ponds

There are no sediment ponds at the fan portal site; instead there is a single sediment trap located at the south end of the disturbed area and a sediment basin at the north end of the disturbed area. Details regarding the sediment trap design are presented in Section 742.200 of this appendix.

Sediment accumulation will be removed periodically as needed. A large sediment load to the sediment trap and the sediment basin is not anticipated since Alternate Sediment Control Measures ("ASCM") are being used at the site. Alternate sediment control calculations are included in this appendix that demonstrate that the sediment yield from the site will be less than before the site was built. Thus, the sediment trap and sediment basin are not expected to accumulate a large volume

of sediment. The sediment will be disposed of at the approved waste rock disposal sites as described in Chapter 5, Section 520 of this M&RP.

The sediment trap and basin are within the disturbed area boundary and are subject to final reclamation. The areas are included in the calculation of the disturbed area subject to bonding and in the calculation of final reclamation costs.

Compliance Requirements. The sediment trap and basin will be maintained until removal in accordance with the reclamation plan (see Section 540 of this M&RP). When the trap and basin are removed, the land will be revegetated in accordance with the reclamation plan defined in Section 540.

The sediment trap and basin were constructed to contain all of the runoff from the 10-year, 24-hour storm event. The spillway for the sediment trap will easily pass the peak flow resulting from the 25-year, 6-hour precipitation event.

MSHA Requirements. MSHA requirements defined in 30 CFR 77.216 are not applicable since neither the sediment trap nor the sediment basin will impound water or sediment to an elevation of 20 feet or more above the upstream toe of the structure. The trap and basin will also store volumes of less than 20 acre-feet.

732.300 Diversions

The objective of the runoff control plan is to isolate, to the maximum degree possible, runoff from disturbed areas from that of undisturbed areas. This is accomplished by:

- Maintaining a stream buffer zone;
- Routing runoff from the adjacent undisturbed areas above the facilities through culverts and diversion ditches where feasible to bypass the disturbed area; and
- Routing any runoff from undisturbed areas which enters the disturbed area into the sediment control system.

The location of each diversion ditch or culvert for the site is presented on Figure 7-12A. Larger watersheds contributing to these structures are noted on Figure 7-12B. Details regarding design of the diversions are presented in this appendix. A brief list of the diversion structures follows:

Diversion Ditches:

- Interception ditch PCUD-1 above the generators and fan structure collects runoff from adjacent undisturbed watershed and directs the runoff into a tributary of Pace Creek.

- Disturbed drainage ditch PCD-1 is located upstream from the sediment trap. The majority of runoff from the site will reach the sediment trap by sheet flow. This ditch will collect the sheet flow and safely convey the runoff into the sediment trap.

Diversion Culverts:

- Culverts PCUC-1, 2 and 3 all divert undisturbed runoff around the disturbed area.

- Culvert PCDC-1 conveys runoff in excess of the sediment trap's capacity to a tributary of Pace Creek. This culvert is the sediment trap's spillway.

Diversion ditches will be maintained with adequate erosion protection in the ditch sections where flow velocities are predicted to require protection. Adequate ditch capacities will be maintained. Debris will be removed from the culverts and outlets will be protected with riprap where deemed necessary. Detailed diversion designs are presented in Attachment 1 of this appendix.

732.400 Road Drainage

Road drainage facilities include a water bar to divert road runoff into the adjacent drainage just above the site and two culverts to divert runoff from undisturbed drainages under the road. Additional water bars are located on the road adjacent to the facilities (Figure 7-12A). Drainage from the realigned BLM road is treated the same as the rest of the road. A berm directs runoff from the fan portal site into the sediment trap.

Road drainage diversions and culverts will be maintained and repaired, as needed, following major storm events.

733 Impoundments

733.100 General Plans

There is a single sediment trap and a sediment basin operating at the site as described in Section 732.200. The sediment trap topography and cross sections are presented on Figure 7-12C, while topography and cross sections associated with the sediment basin are presented on Figure 7-12D. Design information for these structures is presented in Attachment 1 of this appendix.

Certification. All maps and cross sections of the sedimentation trap have been prepared by or under the direction of, and certified by a qualified, registered, professional engineer.

Maps and Cross Sections. The topography and cross sections for the sediment trap and basin are provided on Figures 7-12C and 7-12D.

Narrative. A description of the sediment trap and the sediment basin is presented in Sections 732.200 and 742 of this appendix.

Subsidence Survey Results. No underground coal mining will occur beneath the proposed sediment trap or basin. Therefore, there will be no effects on these structures from subsidence.

Hydrologic Impact. The hydrologic and geologic information required to assess the hydrologic impacts of the proposed sediment trap and basin are presented in Section 724 and Chapter 6 of this M&RP, respectively.

Design Plans and Construction Schedule. There are no additional structures proposed for the mining operation at the Fan Portal site.

733.200 Permanent and Temporary Impoundments

Requirements. The sediment trap and basin have been designed using current, prudent engineering practices.

Permanent Impoundments. There are no permanent impoundment structures proposed for use in mining and reclamation operations within the disturbed and adjacent areas.

Temporary Impoundments. The sediment trap and basin are considered to be temporary impoundments at the fan portal site as part of coal mining and reclamation operations.

Hazard Notifications. The sediment trap and basin will be examined for structural weakness and erosion and if a potential hazard to the public exists the Division will be promptly informed. A plan will be formulated to mitigate the hazard associated with the sediment trap.

740 DESIGN CRITERIA AND PLANS

741 General Requirements

This appendix includes site-specific plans that incorporate minimum design criteria for the control of drainage from disturbed and undisturbed areas associated with the Pace Canyon Fan Portal Site.

742 Sediment Control Measures

742.100 General Requirements

Design. Sediment-control measures were designed to provide the following:

- Prevent additional contributions of sediment to stream flow or to runoff outside the permit area;
- Meet the effluent limitations defined in Section 751; and
- Minimize erosion to the extent possible.

Measures and Methods. The sediment control measures at the site include practices carried out within and adjacent to the disturbed area. Sediment control methods include:

- Retention of sediment within the disturbed area;
- Diversion of runoff away from the disturbed area;
- Diversion of runoff using channels or culverts through disturbed areas to prevent additional erosion;
- Provision of silt fences, riprap, contemporaneous revegetation, vegetative sediment filters, a sediment trap, and other measures that reduce overland flow velocities, reduce runoff volumes or trap sediment; and
- Treatment of mine drainage in underground sumps.

742.200 Siltation Structures

General Requirements. Additional contributions of suspended solids and sediment to stream flow or runoff outside the permit area will be prevented to the extent possible using alternate sediment control measures, including a sediment trap and a sediment basin. The sediment trap and other associated structures have been certified by a qualified registered professional engineer.

The sediment trap was designed and constructed and will be maintained as described in Chapter 5 and Sections 733 and 743 of this appendix.

As shown on Figure 7-12E, three types of alternate sediment control are used in addition to the sediment trap and sediment basin. In areas that will not be disturbed in the future and which have 2:1 slope or flatter the area was deep gouged, mulched, and hydroseeded. These areas include the topsoil stockpiles and their 2H:1V slopes even though there is also a full containment berm around the northern stockpile. This is the same sediment control method that has been used during final reclamation of many sites with great success. The areas that may be disturbed during operation, such as the sediment trap area, and areas of very steep slopes have been mulched and hydroseeded. Finally, the operational areas and areas prevented from being vegetated by MSHA requirements are covered by gravel or riprap. The gravel used was 2-inch minus gravel. In

Attachment 2 of this appendix alternate sediment control calculations have been made to demonstrate that the above three methods reduce the operational sediment yield of the site to less than the pre-mining sediment yield. Thus, the alternate sediment control measures sufficiently control sediment yield without the use of a sedimentation pond.

Sedimentation Ponds. A single sediment trap and a sediment basin have been constructed at the site. The sediment trap is located in the southwest corner of the disturbed area, while the sediment basin is located in the northeast corner of the site.

Design, Construction, and Maintenance

Sediment Storage Volume. The sediment trap was designed to control sediment from disturbed and undisturbed areas. The area contributing runoff to the sediment trap contains 3.09 acres from watershed PCWS-1 (portions of which are undisturbed or contemporaneously reclaimed) and the south soil stockpile. The sediment load of the runoff flowing into the sediment trap will be less than if an equal amount of runoff from an undisturbed area flowed into the sediment trap (see Attachment 2 of this appendix). Thus, sediment is expected to accumulate slowly. However, sediment will be removed when accumulated sediment fills up approximately half of the sediment trap's capacity.

Detention Time. The combination of the alternate sediment control measures and sediment trap should allow any effluent to meet UPDES and 40 CFR Part 434 limitations.

Design Event. The sediment trap was constructed to contain all of the runoff resulting from the 10-year, 24-hour precipitation event before runoff flows out the spillway. The sediment trap can hold all of the 10-year, 24-hour precipitation event even if the spillway is plugged.

Sediment *Trap* Description. Watershed PCWS-1 defines the area that flows to the sediment trap (see Figure 7-12A). This watershed includes both disturbed and undisturbed areas.

The curve numbers used to determine the runoff volumes were based on information presented in Attachment 1 of this appendix. The area weighted average curve number for PCWS-1 was estimated to be 79. Refer to Table 7-12A for a list of all disturbed and undisturbed watershed areas associated with the site.

The storm runoff volume to the sediment trap resulting from the 10-year, 24-hour storm event was calculated to be 5530 cubic feet (0.13 acre-foot). The calculations, presented in Attachment 1 are based on hydrologic design methods described in Appendix 7-10 (Hydrologic Design). The capacity of the sediment trap is 5714 cubic feet (0.13 acre-foot), slightly larger than the anticipated runoff during the design event (see Table 7-12B).

The spillway on the sediment trap was set at an elevation of 6991.0 and consists of an 18-inch diameter riser and barrel CMP. As calculations in Attachment 1 demonstrate, this spillway can easily pass the runoff from a 25-year 6-hour storm event. From the final analysis of the 25-year, 6-hour storm event, the maximum inflow rate to the sediment trap from storm runoff under design conditions was calculated to be 0.97 cubic foot per second (cfs). Although the sediment trap will reduce the peak outflow, the same flow of 0.97 cfs was used to design the spillway. The spillway has a maximum capacity of 5.5 cfs without generating a headwater. The top of the sediment trap embankment is approximately 2 feet above the inlet elevation for the spillway. Therefore, the trap has been designed with adequate freeboard. The spillway outlet is protected by the placement of D_{50} = 9 inch riprap, which is adequately protective of erosion.

TABLE 7-12A
SUMMARY OF WATERSHED DATA

Watershed[a]	Curve Number	Area (acres)	Time of Concentration (hours)
PCWS-1	79	3.09	0.0395
PCWS-2	80	2.55	0.038
PCWS-3	80	37.42	0.126
PCWS-4	80	149.3	0.235
Topsoil (North)	80	0.09	0.010

(a) See Figures 7-12A and 7-12B for watershed boundaries

TABLE 7-12B
STAGE-CAPACITY CURVE FOR THE SEDIMENT TRAP

ELEVATION (FT)	AREA (FT^2)	INCREMENTAL VOLUME (FT^3)	CUMULATIVE VOLUME (FT^3)
6,986	13.3		0
6,987	379.9	196.1	196.1
6,988	569.9	474.4	670.5
6,989	760.0	665.0	1335.5
6,990	919.4	839.7	2175.2
6,991	1088.2	1003.8	3179.0
6,992	1268.0	1178.1	4357.1
6,993	1446.7	1357.4	5714.5

Sediment *Trap* Dewatering Device. The primary spillway will be the outlet for stormwater in the sediment trap. Water will be discharged from the pond in accordance with UPDES guidelines.

Sediment *Trap* Short Circuiting. Short circuiting may occur if the storage capacity of the sediment trap is exceeded. However, the alternate sediment control measures will adequately control the sediment yield from the site. The sediment trap will still provide sediment control beyond what is required.

Sediment *Trap* Sediment Removal. Sediment removal from the sediment trap will occur when the sediment level reaches approximately 50% of the sediment trap's storage capacity. This corresponds to an approximate elevation of 6990.7 or 0.3 foot below the spillway inlet elevation. The sediment removed from the sediment trap will be transported and disposed of as discussed in Chapter 5, and Chapter 7, Section 732.200 of this M&RP. Water that meets the quality standards set forth in the UPDES permit will be discharged to Pace Creek before sediment cleanout begins. Water not meeting the standards will be used for dust suppression within the disturbed area or on mine roadways.

Sediment *Trap* Excessive Settlement. The majority of the sediment trap was excavated from native undisturbed material or from under the existing road, thereby making settlement highly

unlikely. That portion of the embankment which was constructed was compacted in a manner to minimize settlement.

Sediment *Trap* Embankment Material. During construction of the sediment trap, the material used in the embankment was inspected to ensure the material was free of sod, large roots, frozen soil, and acid- or toxic forming coal-processing waste.

Sediment *Trap* Compaction. The sediment trap was primarily excavated out of native undisturbed ground, thereby eliminating the need for additional compaction. That portion of the embankment constructed was compacted to a minimum dry density as determined by ASTM D1557.

Sediment *Basin* Description. The watershed draining to the sediment basin consists of the bermed area surrounding the north topsoil stockpile (see Figure 7-12A). This area has been reclaimed, with an estimated curve number of 80.

The storm runoff volume to the sediment basin resulting from the 10-year, 24-hour storm event was calculated to be 174 cubic feet (0.004 acre-foot). The capacity of the sediment basin is 310 cubic feet (0.007 acre-foot), nearly twice as large as the anticipated runoff during the design event (see Table 7-12C). Given its small size, the sediment basin is designed as a total containment structure without an overflow device.

TABLE 7-12C
STAGE-CAPACITY CURVE FOR THE SEDIMENT BASIN

ELEVATION (FT)	AREA (FT^2)	INCREMENTAL VOLUME (FT^3)	CUMULATIVE VOLUME (FT^3)
7,021	0		0
7,022	71.8	28.7	28.7
7,023	138.1	105.0	133.7
7,024	214.6	176.4	310.1

Sediment *Basin* Dewatering Device. Given its small size, the sediment basin was constructed without an overflow device. Any water discharged from this structure will be pumped in accordance with UPDES guidelines.

Sediment *Basin* Short Circuiting. Short circuiting will not occur since the basin is constructed as a non-discharging structure.

Sediment *Basin* Sediment Removal. Sediment removal from the sediment basin will occur when the sediment level reaches approximately 50% of the sediment basin's storage capacity. This corresponds to an approximate elevation of 7023.2 or about 0.8 foot below the top of the basin. The sediment removed from the basin will be transported and disposed of as discussed in Chapter 5, and Chapter 7, Section 732.200 of this M&RP. Water that meets the quality standards set forth in the UPDES permit will be discharged to Pace Creek before sediment cleanout begins. Water not meeting the standards will be used for dust suppression within the disturbed area or on mine roadways.

Sediment *Basin* Excessive Settlement. The sediment basin embankment was compacted in a manner to minimize settlement.

Sediment *Basin* Embankment Material. During construction of the sediment basin, the material used in the embankment was inspected to ensure the material was free of sod, large roots, frozen soil, and acid- or toxic forming coal-processing waste.

Sediment *Basin* Compaction. The sediment basin was compacted to a minimum dry density as determined by ASTM D1557.

MSHA Sediment Ponds. MSHA requirements defined in 30 CFR 77.216 are not applicable at this site. Refer to Section 732.200.

Other Treatment Facilities. There are no other treatment facilities within the mine permit area.

Exemptions. No exemptions are being proposed at this time.

742.300 Diversions

General Requirements. The diversions within the permit area consist of drainage ditches and culverts. All diversions within the permit area were designed and constructed to minimize adverse impacts to the hydrologic balance, to prevent material damage outside the permit area, and to assure the safety of the public.

All diversions and diversion structures were constructed and will be maintained and used to:

Be stable;

Provide protection against flooding and resultant damage to life and property;

Prevent, to the extent possible, additional contributions of suspended solids to stream flow outside the permit area; and

Comply with all applicable local, state, and federal laws and regulations.

All diversions within the disturbed area will be removed when no longer needed. The diversions will be reclaimed in accordance with the reclamation plan defined in Chapter 5.

Peak discharge rates from the undisturbed and disturbed area drainages within the area were calculated for use in designing diversion ditches and culverts. The storm runoff calculations for the temporary diversion structures were based on the 10-year, 6-hour precipitation event of 1.35 inches.

Curve numbers were based on those defined in Attachment 1 of this appendix and professional judgement. A description of the methods used to determine the peak discharge rates is presented in Appendix 7-10 of this M&RP.

The disturbed and undisturbed drainage areas within and above the facilities area are presented on Figures 7-12A and 7-12B. A summary of the characteristics of watersheds contributing to the diversions is presented in Table 7-12A.

All diversions constructed as part of this project are presented on Figure 7-12A. The minimum capacity and freeboard of each diversion ditch and culvert was determined based on the minimum ditch slope. The maximum velocity and need for a channel lining or outlet protection was calculated

based on the maximum ditch or culvert slope. Slopes were measured from a aerial topography generated with a 1 foot contour interval. A description of the methods used to determine diversion capacities, flow velocities, and riprap sizes is presented in Attachment 1 of this appendix. All diversion calculations are presented in Attachment 1 of this appendix.

Diversion of Perennial and Intermittent Streams. No perennial streams are diverted at this site. The 36-inch culvert PCUC-2 will divert the runoff from the intermittent stream south of the portal. The 36-inch culvert PCUC-3 will divert runoff from the intermittent stream north of the site. The design calculations for both culverts can be found in Attachment 1 of this appendix. At the inlet of culvert PCUC-2 a series of vertical posts were constructed to prevent trash/debris from entering the culvert. The posts were placed in a zigzagged pattern above the inlet.

Diversion of Miscellaneous Flows. Diversion ditches and culverts were utilized within the fan portal area to divert miscellaneous flows from disturbed and undisturbed area drainages.

Diversion Ditches. A summary table of the minimum channel geometry, channel slope, peak discharge, minimum riprap requirements, maximum flow velocity and minimum freeboard values for each diversion ditch within the facilities area is presented in Table 7-12D. All calculations are contained in Attachment 1 of this appendix. Each ditch has adequate capacity and erosion protection to safely pass the peak flow resulting from the 10-year, 6-hour precipitation event. A description of the diversion ditches within the facilities area is presented in Section 732.300 of this appendix.

Diversion Culverts. A summary table of the culvert size, slope, peak discharge, outlet riprap, and outlet flow velocity for each culvert within the facilities area is presented in Table 7-12E. Calculations are contained in Attachment 1 of this Appendix. Culverts were designed to convey the peak runoff resulting from the 10-year, 6-hour precipitation event. A description of the diversion culverts within the facilities area is presented in Section 732.300 of this appendix.

Diversion Berms. Berms were installed at the site primarily to meet MSHA requirements for safety concerns adjacent to slopes. However, these berms may also locally convey runoff from higher-elevation pads to lower-elevation pads, where it will be conveyed via diversion ditches to the sediment trap. As a result, calculations concerning the hydraulic characteristics of these berms are provided in Attachment 1 of this appendix.

TABLE 7-12D
SUMMARY OF DIVERSION DITCHES

Diversion	Minimum Bottom Width (ft)	Minimum Top Width (ft)	Minimum Depth (ft)	Side Slopes (H:V)	Minimum Slope (%)	Maximum Slope (%)	Peak Flow[a] (cfs)	Required Riprap D_{50} (in)	Minimum Freeboard (ft)
PCUD-1	0	4.25	0.6	2.2:1	1.7	5.0	0.25	none	0.44
PCD-1	2.0	6.0	1.1	1.8:1	6.4	66.7	0.51	none	1.0

[a] Peak discharge resulting from the 10-year, 6-hour precipitation event.

Note: Constructed dimensions of the ditches may vary. However, an adequate cross section will be maintained to ensure that the ditches have adequate hydraulic capacity.

TABLE 7-12E
SUMMARY OF DIVERSION CULVERTS

Diversion Culvert	Diameter (in)	Material	Inlet Type	Outlet Slope (%)	Peak Flow[a] (cfs)	Outlet Riprap D_{50} (in)
PCUC-1	18	CMP	Projecting	7.9	0.49	none[b]
PCUC-2	36	CMP	Mitered	10.7	5.96	9
PCUC-3	36	CMP	Mitered	2.5	19.05	9-12
PCDC-1	18	CMP	Riser	24.2	0.97	9
Mine Water Discharge Culvert	6	HDPE	NA	28.2	0.70	(c)

[a] Peak discharge resulting from the 10-year, 6-hour precipitation event except culverts PCDC-1 (designed for the peak discharge resulting from the 25-year, 6-hour event).

[b] Culvert discharges onto natural cobbles and boulders, providing additional erosion protection, even though riprap is not required at the outlet.

[C] Discharges directly into stream channel. Will periodically monitor the discharge location for erosion.

742.400 Road Drainage

All Roads. The BLM road was realigned as shown on Plate PC5-2, in Appendix 5-10. The road will be maintained as the rest of the road above and below the realigned segment.

743 Impoundments

All pertinent information regarding the sediment trap and sediment basin is presented in Sections 732.200 and 742.200 of this appendix.

744 Discharge Structures

The discharge structures within the permit area consist of the spillway on the sediment trap and a discharge line from the underground workings. The spillway on the sediment trap adequately passes the peak discharge from the 25-year, 6-hour precipitation event. Detailed information concerning the sediment trap is presented in Sections 732.200 and 742.200 of this appendix.

The spillway on the sediment trap consists of an 18-inch diameter CMP. The spillway discharges to a tributary of Pace Creek. The design calculations for the spillway are presented in Attachment 1 of this appendix. The spillway details are presented on Figure 7-12C.

744.100 Erosion Protection

The only discharge structure associated with an impoundment is the spillway from the sediment trap. The flow velocity at the spillway outlet under peak flow conditions is 7.40 fps. This velocity is considered to be erosive. Therefore, riprap with a D_{50} of 9 inches (minimum) was installed at the culvert outlet. The calculations for the spillway outlet are presented in Attachment 1 of this appendix.

744.200 Design Standards

Discharge structures within the disturbed area were designed and constructed according to standard engineering procedures.

APPENDIX 7-12
ATTACHMENT 1

Hydrology Calculations

Pace Canyon Portal Site
As-Built Hydrology Evaluation

Rainfall Depth (from NOAA Atlas 2: Volume VI - Utah)

10-yr	6-hr	1.35 in
10-yr	24-hr	1.95 in
25-yr	6-hr	1.65 in
25-yr	24-hr	2.35 in
100-yr	6-hr	2.05 in

Curve Numbers

The curve numbers were determined by combining vegetation, hydrologic soil group, vegetation density, vegetation condition, and field observation.

The vegetation type of the undisturbed watersheds draining toward the Pace Canyon Portal is identified as mixed conifer with a dominant Pinyon-Juniper and Douglas for overstory (see Plate 3-1 and Appendix 3-4 of the approved MRP).

Plate 2-1 of the approved MRP identifies two soil types in the associated watersheds: map unit 96 (Rock outcrop Rubbleland Troversilla complex) and map unit 84 (Podo-Rock outcrop complex 50-70 percent slope). The soil survey of Carbon Area, Utah (1988) identifies the Hydrologic Soil Group as D for these soils.

Field observation indicates that the drainages on either side of the portal area do not flow for smaller storm events.

A general description of the vegetation type indicates a cover density between 60-70% which indicates a fair hydrologic condition.

Based on these observations and data, the curve number for the undisturbed drainage area was assumed to be 80 (see page 3).

During the operational period there will be also be reclaimed areas and graveled pads and roads.

The curve number for reclaimed area was assumed to be 80, except in the area of the southern soil stockpile which will be treated with the deep gouging method. Runoff from the deep gouged area will be extremely limited. Hence, a curve number of 60 was assumed for this area.

Four watersheds have been identified. Three of the four watersheds are upgradient of the disturbed area and do not contain disturbed areas related to the portal construction.

The curve number for disturbed, unreclaimed areas was assumed to be 89, as indicated on page 4. The combined curve number for the disturbed drainage area was determined by using an area weighted average, with watershed areas determined from Figures 7-12A and 7-12B.

Curve number summary:

	Area (Acre)	CN
Deep Gouged	0.55	60
Reclaimed Area	0.45	80
Undisturbed Area	1.38	80
Disturbed Area	0.71	89
Total	3.09	

$$CN = \frac{(0.55*60)+(0.45*80)+(1.38*80)+(0.71*89)}{3.09} = 79$$

The north soil stockpile was treated as a separate watershed with the berm around the stockpile being the watershed boundary. The pile was seeded. The same curve number for a reclaimed area will be assumed i.e. CN=80.

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.

Source: U.S. NRCS. 1986. Urban Hydrology for Small Watersheds. Technical Release 55. Washington, D.C.

9.2

Table 9.1.--Runoff curve numbers for hydrologic soil-cover complexes

(Antecedent moisture condition II, and I_a = 0.2 S)

Land use	Cover: Treatment or practice	Cover: Hydrologic condition	Hydrologic soil group: A	B	C	D
Fallow	Straight row	----	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	"and terraced	Poor	66	74	80	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	"and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes 1/ or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	"and terraced	Poor	63	73	80	83
	"and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	"	Fair	25	59	75	83
	"	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) 2/		----	72	82	87	89
(hard surface) 2/		---	74	84	90	92

1/ Close-drilled or broadcast.
2/ Including right-of-way.

Source: U.S. NRCS (NEH-4/630)

Runoff Summary:

Watershed Area a	Drainage Area (acre)	Curve Number	S (in)	Y (%)	I (ft)	L (hr)	Time of Conc. (hr)	Peak Flow (cfs)
PCWS-1	3.09	79	2.66	---	---	---	0.0395	0.51
PCWS-2	2.55	80	2.50	70.9	535	0.023	0.038	0.49
PCWS-3	37.42	80	2.50	70.4	2377	0.076	0.126	5.96
PCWS-4	149.3	80	2.50	57.7	4563	0.141	0.235	19.05

Notes

Watershed locations can be found on Figures 7-12A and 7-12B

$$S = \frac{1000}{CN} - 10$$

Y = average watershed slope =(length of contour lines)(contour interval)/(watershed area)

I = hydraulic length

$$L = \text{watershed lag} = \frac{(I^{0.8}(S+1)^{0.7})}{(1900Y^{0.5})}$$

Time of Concentration = 1.67L

Peak Flow is based on a 10-yr 6-hr storm event (calculations can be found on page 7 – 10)

The methodology for calculating PCWS-1 time of concentration is base on the Upland method. Calculating the travel time (Tt) for each type of upland flow and summing all of the travel times will equal the Tc in the watershed outlet (see page 6).

$$T_t = \frac{l}{3600V}$$

Where T_t = Travel time in hours

l = hydraulic length in feet

V = velocity in feet per second

PCWS-1 Slope in Percent and Velocity in feet per seconds

Undisturbed Area: $S = \left(\frac{7300\,ft - 7060\,ft}{318\,ft}\right) \times 100\% = 75\%$

Assume: Short Grass Pasture (Overland Flow)
From Figure 15.2 (page 6) Velocity = 6 ft/s

Reclaimed Area: $S = \left(\frac{7060\,ft - 7020\,ft}{48\,ft}\right) \times 100\% = 83\%$

Assume: Cultivated, Straight Row (Overland Flow)
From Figure 15.2 (page 6) Velocity = 8.25 ft/s

Disturbed Area: $S = \left(\frac{7020\,ft - 6690\,ft}{438\,ft}\right) \times 100\% = 6.8\%$

Assume: Pave Area (Sheet Flow); & Small Upland Gullies
From Figure 15.2 (page 6) Velocity = 5.25ft/s

PCWS-1 Travel Time or Time of Concentration

$$T_t = T_c = \frac{l}{3600V} = \frac{318\,ft}{3600 \times 6\,ft/s} + \frac{48\,ft}{3600 \times 8.25\,ft/s} + \frac{438\,ft}{3600 \times 5.25\,ft/s} = 0.0395hr$$

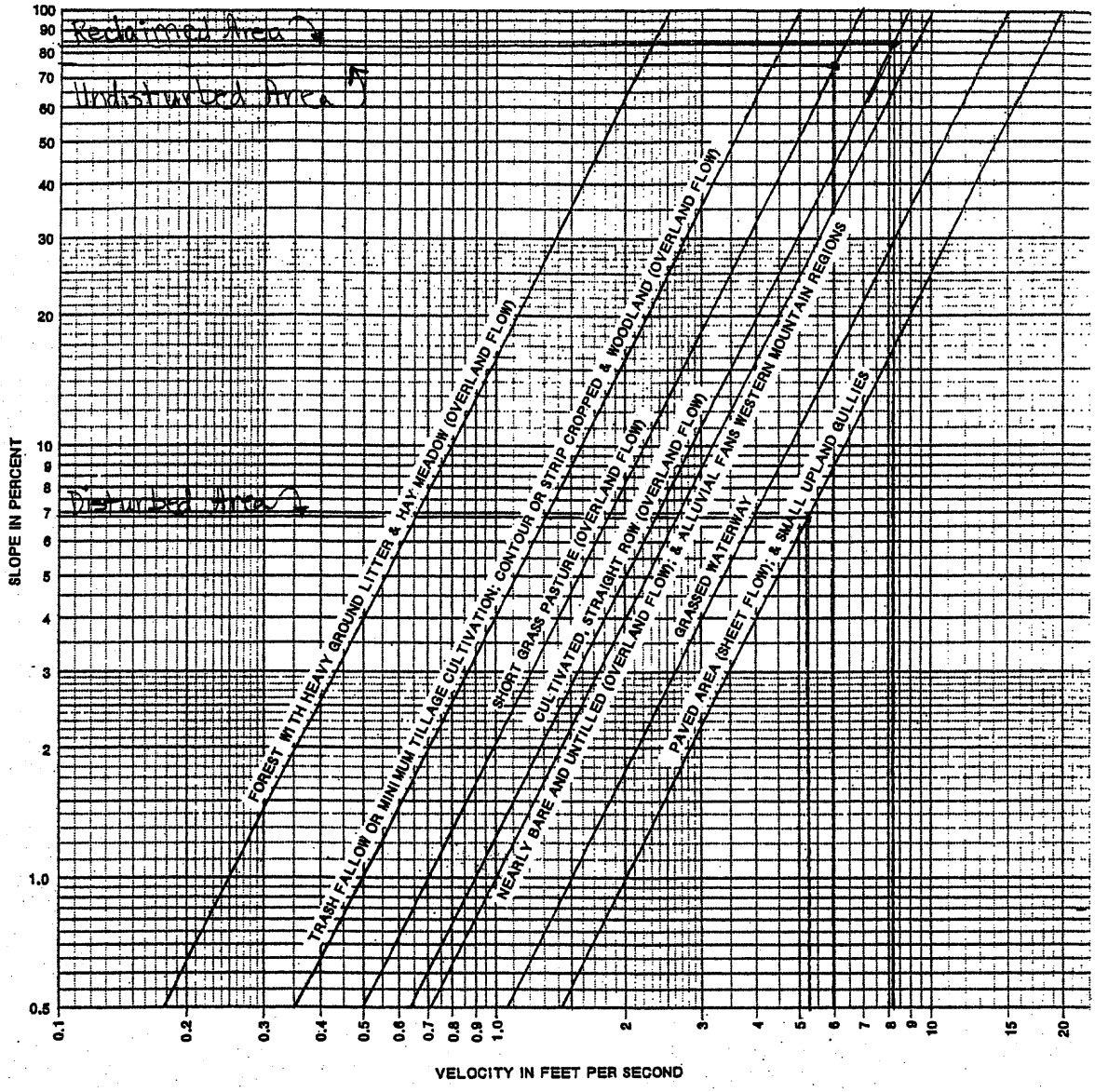

Figure 15.2.—Velocities for upland method of estimating T_c

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-1

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 3.09 acres
Depth = 1.35 inches	CN = 79.00
Duration = 6.0 hrs	Time conc.= 0.04 hrs

OUTPUT SUMMARY

Runoff depth: 0.193 inches
Initial abstr: 0.532 inches
Peak flow: 0.51 cfs (0.164 iph)
at time: 2.507 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-2

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 2.55 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.04 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 0.49 cfs (0.191 iph)
at time: 2.507 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-3

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 37.42 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.13 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 5.92 cfs (0.157 iph)
at time: 2.548 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-4

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 149.30 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.24 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 18.86 cfs (0.125 iph)
at time: 2.624 hrs

Drainage Ditch Design

Assumptions

1) All ditches designed for the 10-yr 6-hr storm event
2) When riprap is required the method presented by Searcy, (1967) was used (see page 25).
3) Riprap thickness is two times the D50.
4) A Mannings n of 0.03 was assumed for base earth.
5) A Mannings n of 0.035 was assumed for rocky earth.
6) A Mannings n for riprap channels will be determined using the following equation:
   $n = 0.0456(D_{50} \times Slope)^{0.159}$

   (Abt. S.R. et.al. 1987)
   D_{50} =Median riprap size (in)
   Slope = (ft/ft)

7) Filter blankets under riprap channels are ½ the riprap thickness.

PCUD-1

Contributing watershed is 50% of PCWS-2

$Q_{10-6} = 0.25$ cfs
MinimumSlope = 1.7 %
MaximumSlope = 5%

Trapezoidal ditch

Bottom Width = 1.5 ft
Top Width = 4.25 ft
SideSlopes = 2.2 : 1
Depth = 7.5*inches*
MaxVelocity = 1.71 fps: No riprap needed.
MaxDepth = 0.09 ft
Freeboard = 0.44 ft

See page 14 and 15 for calculation sheets.
See page 20 for the figure.

Hence, this ditch is adequately sized.

PCD -1

Contributing watershed: 100% of PCWS-1 now drains to this ditch.

Q_{10-6} = 0.51 cfs
MinimumSlope = 6.41%
MaximumSlope = 66.7%
Trapezoidal ditch
Flow is against the berm on one side
SideSlopes = 1.78
Depth = 0.10 *ft*
MaxVelocity = 4.67 fps: No riprap needed.
MaxDepth = 0.05 ft
BottomWidth = 2.0 ft

See page 16 and 17 for calculation sheets.
See page 21 for the figure. Hence, this ditch is adequately sized.

Berm along East of the site

The site is designed to cause runoff to sheet flow through the gravel on the pad. However, for this design it will be assumed that all runoff estimated in PCD-1 will flow along the berm.

Q_{10-6} = 0.51 cfs
MinimumSlope = 7.143%
MaximumSlope = 9.259%

Triangular ditch

The berm was evaluated assuming it would behave as a triangular ditch, with a side slope of 1:1 against the berm and 10:1 away from the berm (i.e, along the floor of the pad).

Q_{10-6} = 0.51 cfs
SideSlopes = 1:1
Depth = Berm Ht. = 1.0 ft
MaxVelocity = 2.92 fps: No riprap needed.
MaxDepth = 0.18 ft
Freeboard = 0.72 ft

See page 18 and 19 for calculation sheets.
See page 22 for the figure.
Hence, this berm is adequately sized.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PCUD-1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	Rough earth
Slope	0.050000	ft/ft
Left Side Slope	2.20	H : V
Right Side Slope	2.20	H : V
Bottom Width	1.50	ft
Discharge	0.25	cfs

Results		
Depth	0.09	ft
Flow Area	0.1	ft²
Wetted Perimeter	1.92	ft
Top Width	1.88	ft
Critical Depth	0.09	ft
Critical Slope	0.042341	ft/ft
Velocity	1.71	ft/s < 5fps
Velocity Head	0.05	ft
Specific Energy	0.13	ft
Froude Number	1.08	
Flow Type	Supercritical	

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Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PCUD-1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	Rough earth
Slope	0.017000	ft/ft
Left Side Slope	2.20	H : V
Right Side Slope	2.20	H : V
Bottom Width	1.50	ft
Discharge	0.25	cfs

Results		
Depth	0.12	ft < 1ft ∴ Freeboard = 0.49ft
Flow Area	0.2	ft²
Wetted Perimeter	2.07	ft
Top Width	2.02	ft
Critical Depth	0.09	ft
Critical Slope	0.042342	ft/ft
Velocity	1.20	ft/s
Velocity Head	0.02	ft
Specific Energy	0.14	ft
Froude Number	0.66	
Flow Type	Subcritical	

PCD-1 MIN SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon PCD- min
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	Rough earth
Slope	0.064100	ft/ft
Left Side Slope	1.78	H : V
Right Side Slope	1.78	H : V
Bottom Width	2.00	ft
Discharge	0.51	cfs

Results		
Depth	0.10	ft
Flow Area	0.2	ft²
Wetted Perimeter	2.43	ft
Top Width	2.37	ft
Critical Depth	0.12	ft
Critical Slope	0.038454	ft/ft
Velocity	2.23	ft/s
Velocity Head	0.08	ft
Specific Energy	0.18	ft
Froude Number	1.26	
Flow Type	Supercritical	

< 1.0ft ∴ Freeboard = 0.87ft

PCD-1 MAX SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon PCD-1-max
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	Rough earth
Slope	0.667000	ft/ft
Left Side Slope	1.78	H : V
Right Side Slope	1.78	H : V
Bottom Width	2.00	ft
Discharge	0.51	cfs

Results		
Depth	0.05	ft
Flow Area	0.1	ft²
Wetted Perimeter	2.21	ft
Top Width	2.19	ft
Critical Depth	0.12	ft
Critical Slope	0.038453	ft/ft
Velocity	4.67	ft/s < 5fps
Velocity Head	0.34	ft
Specific Energy	0.39	ft
Froude Number	3.68	
Flow Type	Supercritical	

BERM DESIGN MINIMUM SLOPE
Worksheet for Triangular Channel

Project Description	
Worksheet	Pace Canyon Berm -min
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	Bare ground
Slope	0.071430	ft/ft
Left Side Slope	1.00	H : V
Right Side Slope	10.00	H : V
Discharge	0.51	cfs

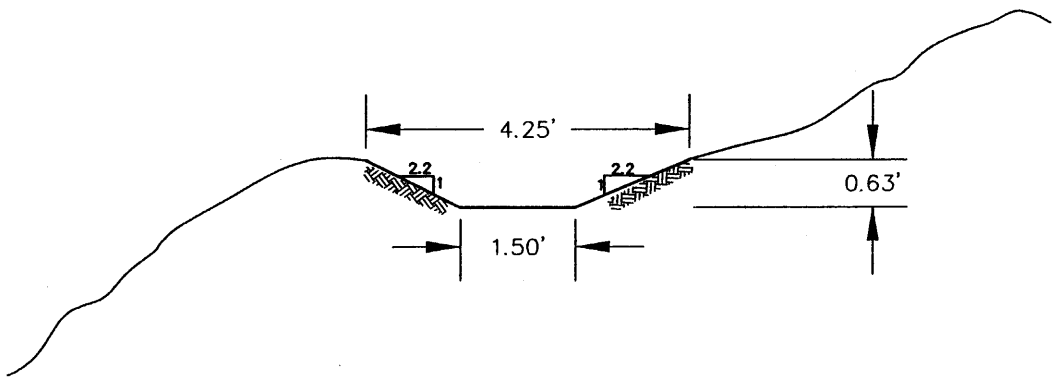
Results		
Depth	0.19	ft < 1.0ft ∴ OK
Flow Area	0.2	ft²
Wetted Perimeter	2.14	ft
Top Width	2.06	ft
Critical Depth	0.22	ft
Critical Slope	0.028853	ft/ft
Velocity	2.65	ft/s
Velocity Head	0.11	ft
Specific Energy	0.30	ft
Froude Number	1.53	
Flow Type	Supercritical	

BERM DESIGN MAXIMUM SLOPE
Worksheet for Triangular Channel

Project Description	
Worksheet	Pace Canyon Berm -max
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	Bare ground
Slope	0.092590	ft/ft
Left Side Slope	1.00	H : V
Right Side Slope	10.00	H : V
Discharge	0.51	cfs

Results		
Depth	0.18	ft
Flow Area	0.2	ft²
Wetted Perimeter	2.04	ft
Top Width	1.96	ft
Critical Depth	0.22	ft
Critical Slope	0.028851	ft/ft
Velocity	2.92	ft/s < 5.0 fps ∴ no riprap needed.
Velocity Head	0.13	ft
Specific Energy	0.31	ft
Froude Number	1.73	
Flow Type	Supercritical	



NO SCALE

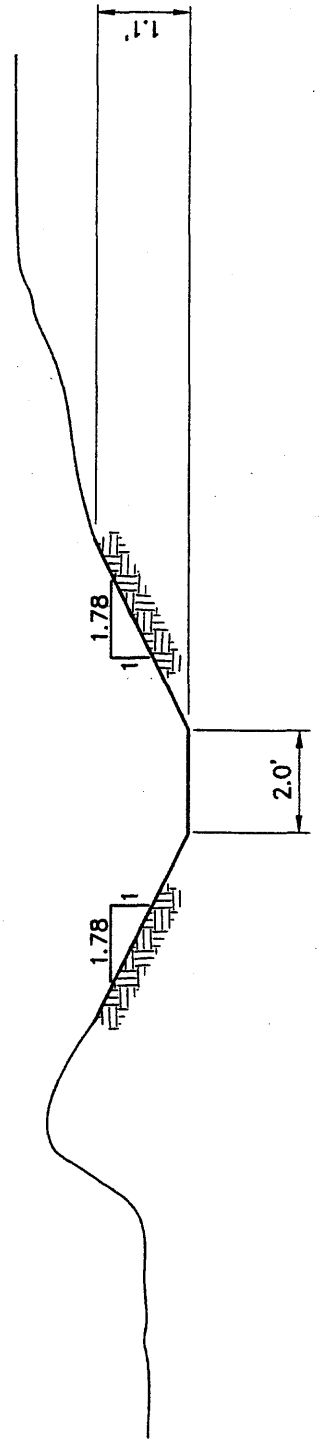
PCUD–1

EarthFax

G:\UC801\07\HYDROLOGY\FG-PCUD-1.DWG

G:\UC801\07\HYDROLOGY\FG-PCD-1.DWG

EarthFax



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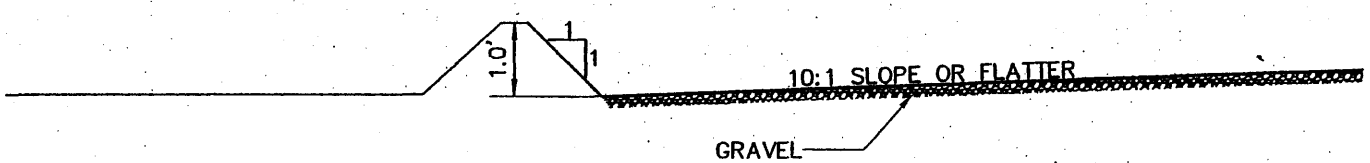
PCD-1



NO SCALE

BERM

EarthFax

G:\UC801\07\HYDROLOGY\FIG-BERM.DWG

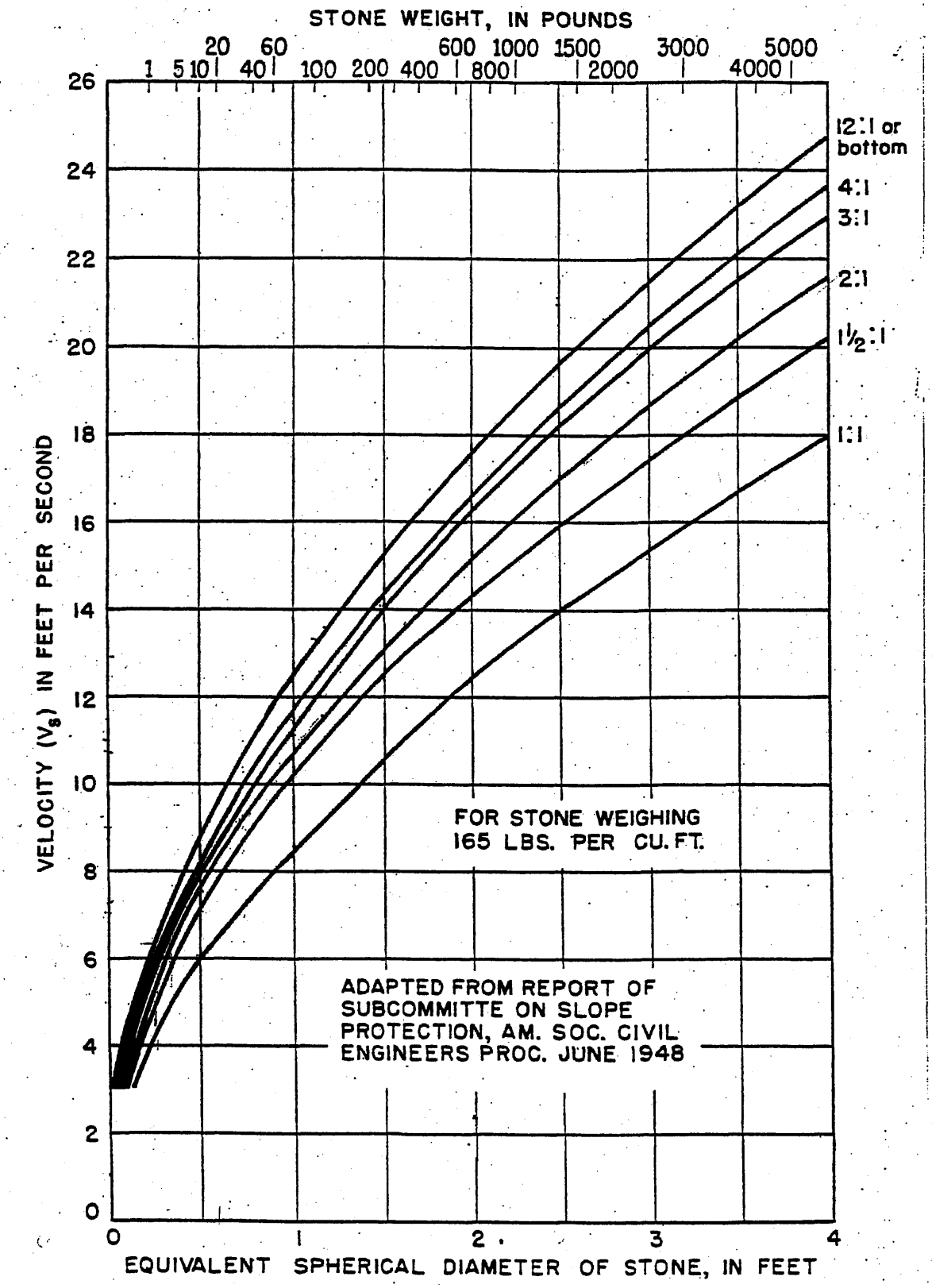


FIG. 2-SIZE OF STONE THAT WILL RESIST DISPLACEMENT FOR VARIOUS VELOCITIES AND SIDE SLOPES

Searcy, J.K. 1967. Use of Riprap for Bank Protection. U.S. Dept. of Transportation, Bureau of Public Roads, U.S Government Printing Office, Washington D.C.

Culvert Deign

PCUC -1

All of PCWS-2 flows into this culvert, which is an 18-inch diameter CMP with a projecting inlet.

$$Q_{10-6} = 0.49 \text{ cfs}$$

Minimum inlet capacity of HW/D = 1 is 5.5 cfs. Hence, this is adequately sized.

Check outlet velocity:

18" CMP
Slope = 7.9%

See page 27 for calculation sheets.

Discharge Velocity = 4.07 fps: No riprap needed.
MaxDepth = 0.20 ft
No riprap required at culvert outlet. However, culvert discharges onto cobbles and boulders, providing additional erosion protection.

PCUC -2

All of PCWS-3 flows into this culvert, which is a 36-inch diameter CMP with a mitered inlet.

$$Q_{10-6} = 5.96 \text{ cfs}$$

To add a factor of safety a 36 inches CMP should be used. Minimum inlet capacity at HW/D=1 is 34.5 cfs. Hence, this culvert is adequately sized.

Check outlet velocity:

36" CMP
Slope = 10.7%

See page 28 for calculation sheets.

Discharge Velocity = 8.73 fps
MaxDepth = 0.46 ft
Actual riprap diameter use D_{50} = 9"
Riprap required at culvert outlet.
Required riprap D_{50} = 6" Hence, riprap is adequate.

See page 23 for riprap figure.

PCUC -3

All of PCWS-4 will flow into this culvert, which is a 36-inch diameter CMP with a mitered inlet.

$$Q_{10\text{-}6} = 19.05 \text{ cfs}$$

The culvert inlet capacity is over 30 cfs. Hence, this culvert is adequately sized.

Check outlet velocity

36" CMP
Slope = 2.5%

See page 29 for calculation sheets.

Discharge Velocity = 7.27 fps
MaxDepth = 1.19 ft
Riprap required at culvert outlet.
Minimum riprap required 4" (see page 25)
9 - 12" Riprap at the outlet. Hence, riprap is adequate.

Mine Water Discharge Culvert

Flow up to 300 gpm = 0.7 cfs
Water will be pumped out of the mine. Therefore, inlet capacity is not an issue.

Check Outlet Velocity: 6" HDPE pipe
MaxDepth = 0.17ft<0.5ft: ok
Slope = 35'/134' = 28.2%
Discharge Velocity = 11.75 fps
Minimum Riprap required D_{50} = 11"
Actual use D_{50} = 15 – 18" Riprap at the outlet.
Pipe discharges directly into stream channel. Should periodically monitor for erosion.

See page 30 for calculation sheets.

PCUC-1
Worksheet for Circular Channel

Project Description	
Worksheet	Pace Canyon PCUC-1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	CMP
Slope	0.079000	ft/ft
Diameter	18	in
Discharge	0.49	cfs

Results		
Depth	0.18	ft
Flow Area	0.1	ft²
Wetted Perimeter	1.06	ft
Top Width	0.98	ft
Critical Depth	0.26	ft
Percent Full	12.0	%
Critical Slope	0.017527	ft/ft
Velocity	4.07	ft/s
Velocity Head	0.26	ft
Specific Energy	0.44	ft
Froude Number	2.05	
Maximum Discharge	17.20	cfs
Discharge Full	15.99	cfs
Slope Full	0.000074	ft/ft
Flow Type	Supercritical	

< 5fps ∴ no riprap needed.

PCUC -2
Worksheet for Circular Channel

Project Description	
Worksheet	Pace Canyon PCUC-2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	
Slope	0.107000	ft/ft
Diameter	36	in
Discharge	5.96	cfs

Results		
Depth	0.46	ft
Flow Area	0.7	ft²
Wetted Perimeter	2.41	ft
Top Width	2.16	ft
Critical Depth	0.77	ft
Percent Full	15.3	%
Critical Slope	0.013334	ft/ft
Velocity	8.73	ft/s
Velocity Head	1.19	ft
Specific Energy	1.64	ft
Froude Number	2.74	
Maximum Discharge	127.12	cfs
Discharge Full	118.17	cfs
Slope Full	0.000272	ft/ft
Flow Type	Supercritical	

outlet riprap required $D_{50} = 6"$
Actual use $D_{50} = 9"$
∴ Riprap is adequate

PCUC-3
Worksheet for Circular Channel

Project Description	
Worksheet	Pace Canyon PCUC-3
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	
Slope	0.025000	ft/ft
Diameter	36	in
Discharge	19.05	cfs

Results		
Depth	1.19	ft
Flow Area	2.6	ft²
Wetted Perimeter	4.09	ft
Top Width	2.94	ft
Critical Depth	1.40	ft
Percent Full	39.8	%
Critical Slope	0.014132	ft/ft
Velocity	7.27	ft/s
Velocity Head	0.82	ft
Specific Energy	2.01	ft
Froude Number	1.36	
Maximum Discharge	61.45	cfs
Discharge Full	57.12	cfs
Slope Full	0.002781	ft/ft
Flow Type	Supercritical	

< 3' OK

> 5fps ∴ Need riprap at outlet D50=4"

Actual use D50 = 9" – 12"

∴ Riprap is adequate

EarthFax Engineering Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Mine Water Discharge Culvert
Worksheet for Circular Channel

Project Description	
Worksheet	Pace Canyon Mine Water
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

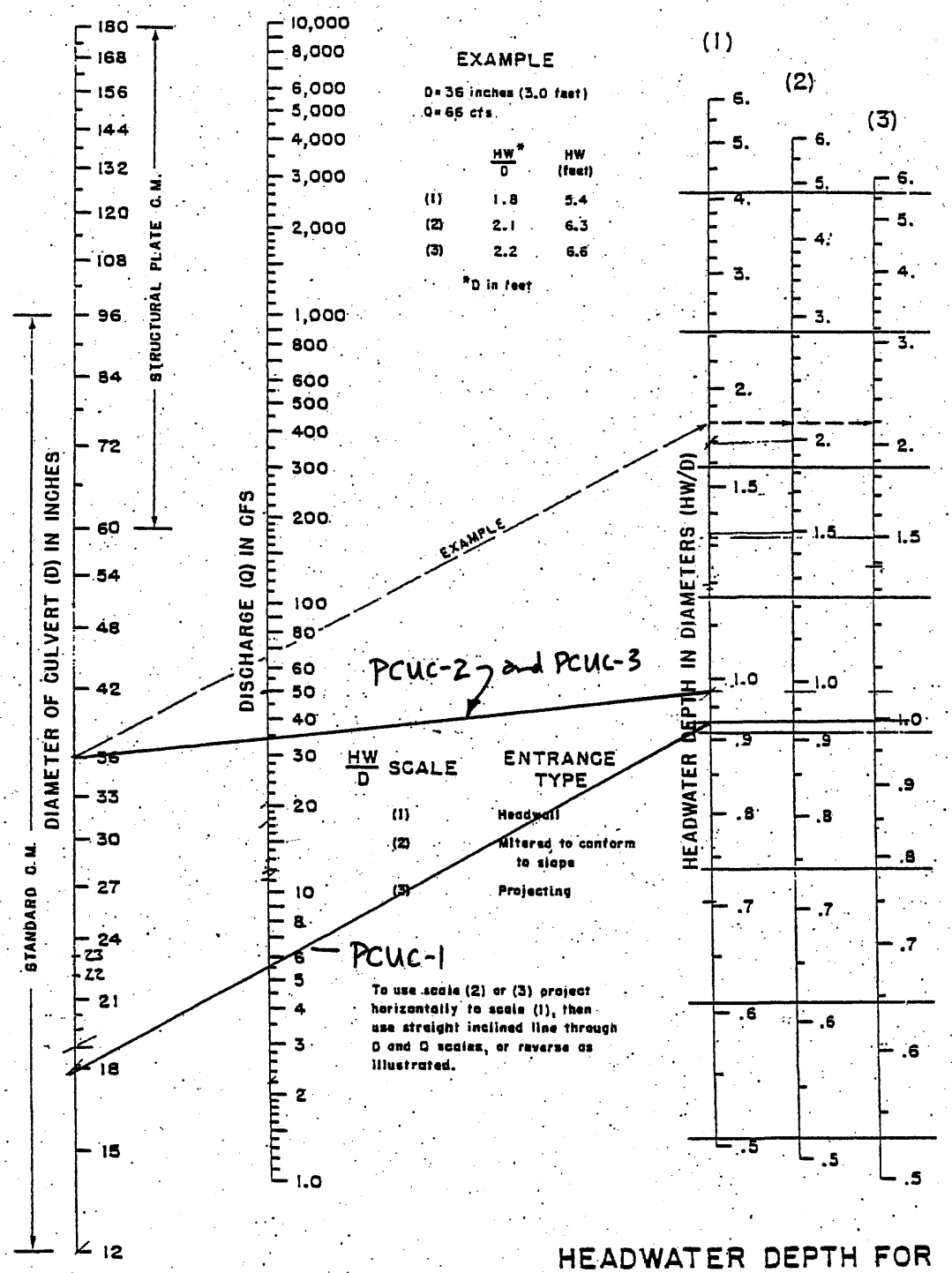
Input Data		
Mannings Coefficient	0.014	HDPE Pipe
Slope	0.282000	ft/ft
Diameter	6	in
Discharge	0.70	cfs

Results		
Depth	0.17	ft
Flow Area	0.1	ft²
Wetted Perimeter	0.63	ft
Top Width	0.47	ft
Critical Depth	0.42	ft
Percent Full	34.3	%
Critical Slope	0.017186	ft/ft
Velocity	11.75	ft/s
Velocity Head	2.15	ft
Specific Energy	2.32	ft
Froude Number	5.85	
Maximum Discharge	2.98	cfs > 0.7cfs ∴ OK
Discharge Full	2.77	cfs
Slope Full	0.018052	ft/ft
Flow Type	Supercritical	

outlet riprap required

Actual use D50 = 15 to 18" riprap at outlet

CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Ref (U.S. Dept. of Transportation, 1977)

Sediment Trap Design

Sediment control at this site is being achieved using Alternate Sediment Control Measures (ASCM). These ASCMs include contemporaneous reclamation, clean gravel placed on pads and roads, silt fences (during constriction), a sediment trap and a sediment basin.

The sediment trap and the sediment basin are part of the ASCM and are not intend to be sediment ponds. Thus, the sediment trap and basin were not designed as sediment ponds and do not have the capacity of sediment ponds.

The contemporaneous reclamation and gravel should adequately control sediment. The sediment trap and basin provide an extra measure of protection.

Sediment Trap Capacity

Spillway Elevation	Area (ft^2)	Volume (ft^3)
6986	13.34	
6987	378.88	196.1
6988	569.92	474.4
6989	760.02	665.0
6990	919.43	839.7
6991	1088.17	1003.8
6992	1268.02	1178.1
6993	1446.69	1357.4
Total Volume		5714.5
Volume (acre-ft)		0.1312

The runoff depth for the 10-yr 24-hr storm event is 0.493 inches (see page 34).

$$TotalRunoffVolume = \left[\frac{(0.493 inches)}{(12 inches/ft)} \times (3.09 acres) \times (43560 ft^2/acre)\right] = 5529.8 ft^3$$

The sediment trap can hold the runoff from the 10-yr 24-hr storm event even if the spillway is plugged.

Although not required as it is for a sediment pond the sediment trap's overflow culvert was designed to pass the 25-yr 6-hr storm event.

Q_{25-6} = 0.97 cfs (See Page 33)

The spillway is an 18-inch diameter CMP. It's capacity will be modeled assuming a projecting inlet with no routing through the trap (i.e., the dampening effects of routing through the trap will be ignored).

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-1 25-YEAR 6-HOUR

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 3.09 acres
Depth = 1.65 inches	CN = 79.00
Duration = 6.0 hrs	Time conc.= 0.04 hrs

OUTPUT SUMMARY

Runoff depth: 0.331 inches
Initial abstr: 0.532 inches
Peak flow: 0.97 cfs (0.311 iph)
at time: 2.507 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-1 10-YEAR 24-HOUR

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type II	Area = 3.09 acres
Depth = 1.95 inches	CN = 79.00
Duration = 24.0 hrs	Time conc.= 0.04 hrs

OUTPUT SUMMARY

Runoff depth: 0.493 inches
Initial abstr: 0.532 inches
Peak flow: 1.75 cfs (0.562 iph)
at time: 12.003 hrs

Spillway Design, (PCDC-1)

$Q_{25-6} = 0.97$ cfs

InletCapacity = 5.5 cfs (See page 31) – Adequate

OutletVelocity = 7.40 fps (See page 36)

Requires Riprap with a minimum $D_{50} = 6$" and to prevent erosion. The actual D_{50} in the discharge channel is 9". Hence, this riprap is adequate to prevent erosion.

PCDC-1 SED TRAP SPILLWAY
Worksheet for Circular Channel

Project Description	
Worksheet	Pace Canyon PCDC-1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	
Slope	0.242000	ft/ft
Diameter	18	in
Discharge	0.97	cfs

Results		
Depth	0.19	ft
Flow Area	0.1	ft²
Wetted Perimeter	1.10	ft
Top Width	1.00	ft
Critical Depth	0.37	ft
Percent Full	12.7	%
Critical Slope	0.016849	ft/ft
Velocity	7.40	ft/s
Velocity Head	0.85	ft
Specific Energy	1.04	ft
Froude Number	3.60	
Maximum Discharge	30.11	cfs
Discharge Full	27.99	cfs
Slope Full	0.000291	ft/ft
Flow Type	Supercritical	

Topsoil Stockpiles Sediment Control

A berm was constructed around the north topsoil stockpile. This is a total containment berm and will contain the entire 10-yr 24-hr storm event.

Rainfall Depth = 1.95" (10-yr 24-hr)

CN = 80 (Revegetated area with some deep gouging)
The runoff depth for the 10-yr 24-hr storm event is 0.532 inches (see page 38).

See page 38 for calculation sheet.

$$TotalRunoffVolume = \left[\frac{(0.532 inches)}{(12 inches / ft)} \times (0.09 acres) \times (43560 ft^2 / acre)\right] = 173.8 ft^3$$

Sediment Basin Capacity for North Topsoil Stockpile

Spillway Elevation	Area (ft^2)	Volume (ft^3)
7021		
7022	71.81	28.72
7023	138.11	104.96
7024	214.6	176.36
Total Volume		310.04
Volume (acre-ft)		0.00710

Hence, the sediment basin in the north topsoil stockpile area has the capacity to store approximately twice the volume of the 10-yr, 24-hr runoff. This basin is, therefore are adequate means of controlling runoff from the stockpile.

Triangular Hydrograph Calculations using

SCSHYDRO Program

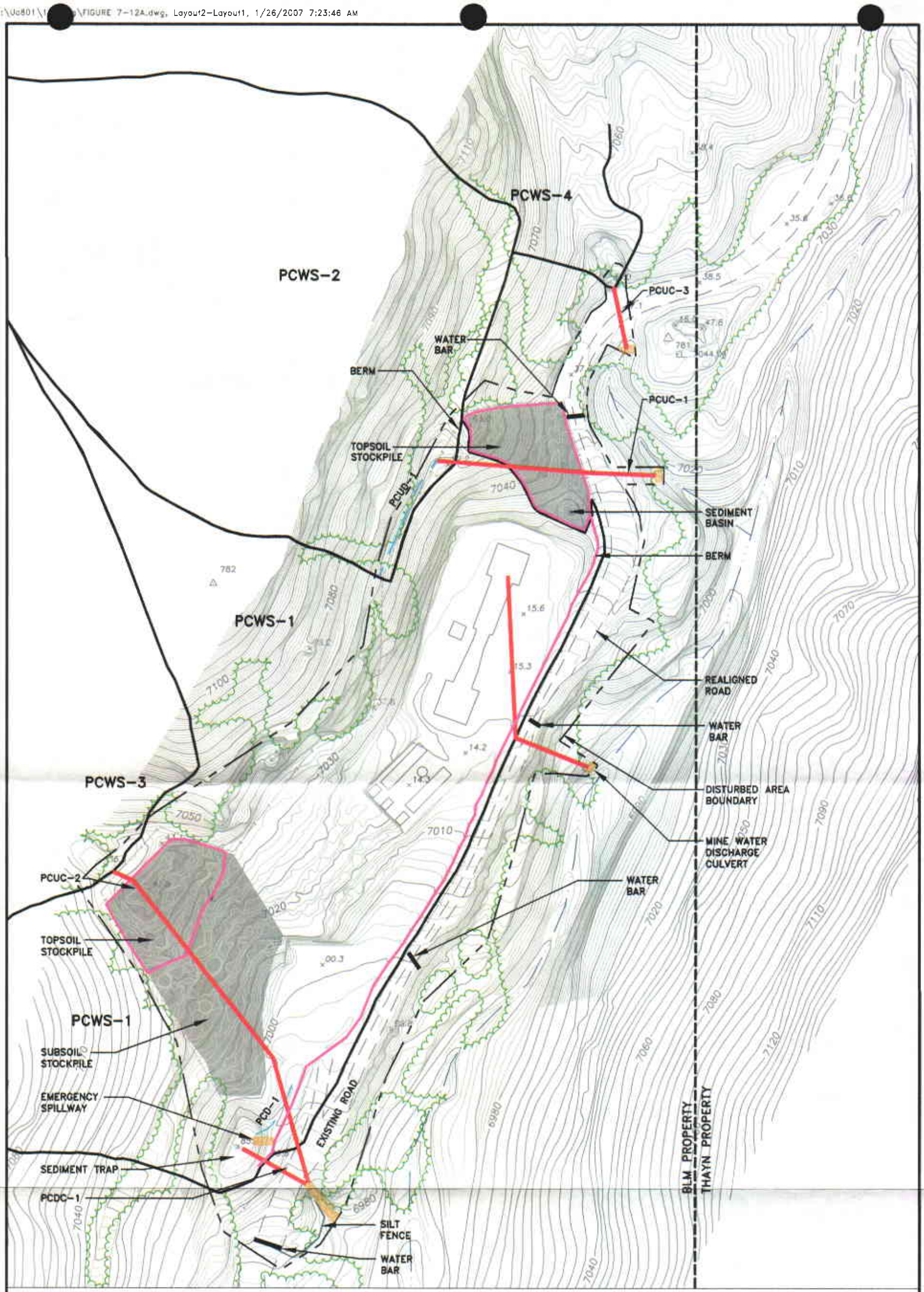
Watershed I.D.:
NORTH TOPSOIL STORAGE

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type II	Area = 0.09 acres
Depth = 1.95 inches	CN = 80.00
Duration = 24.0 hrs	Time conc.= 0.01 hrs

OUTPUT SUMMARY

Runoff depth: 0.532 inches
Initial abstr: 0.500 inches
Peak flow: 0.06 cfs (0.625 iph)
at time: 12.001 hrs



TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30

LEGEND

- WATERSHED BOUNDARY
- CULVERT
- RIPRAP
- BERM
- SOIL STOCKPILE

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No. 188246
RICHARD H. WHITE
STATE OF UTAH
26 Jan 2007

REVISIONS OR UP-DATES			DATE: 11-16-06	
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1	1-26-06	LDJ	DRAWN BY:	SMF
2	3-20-06	LDJ	CHECKED BY:	VSN
3	5-09-06	LDJ		
4	9-14-06	RBW		
			SCALE: 1"=60'	

FILENAME: U:\UC801\...\FIGURE 7-12A.DWG

Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN DISTURBED AREA DIVERSIONS

P.O. BOX 1029
WELLINGTON, UTAH 84542

DRAWING OR MAP NUMBER
FIGURE 7-12A

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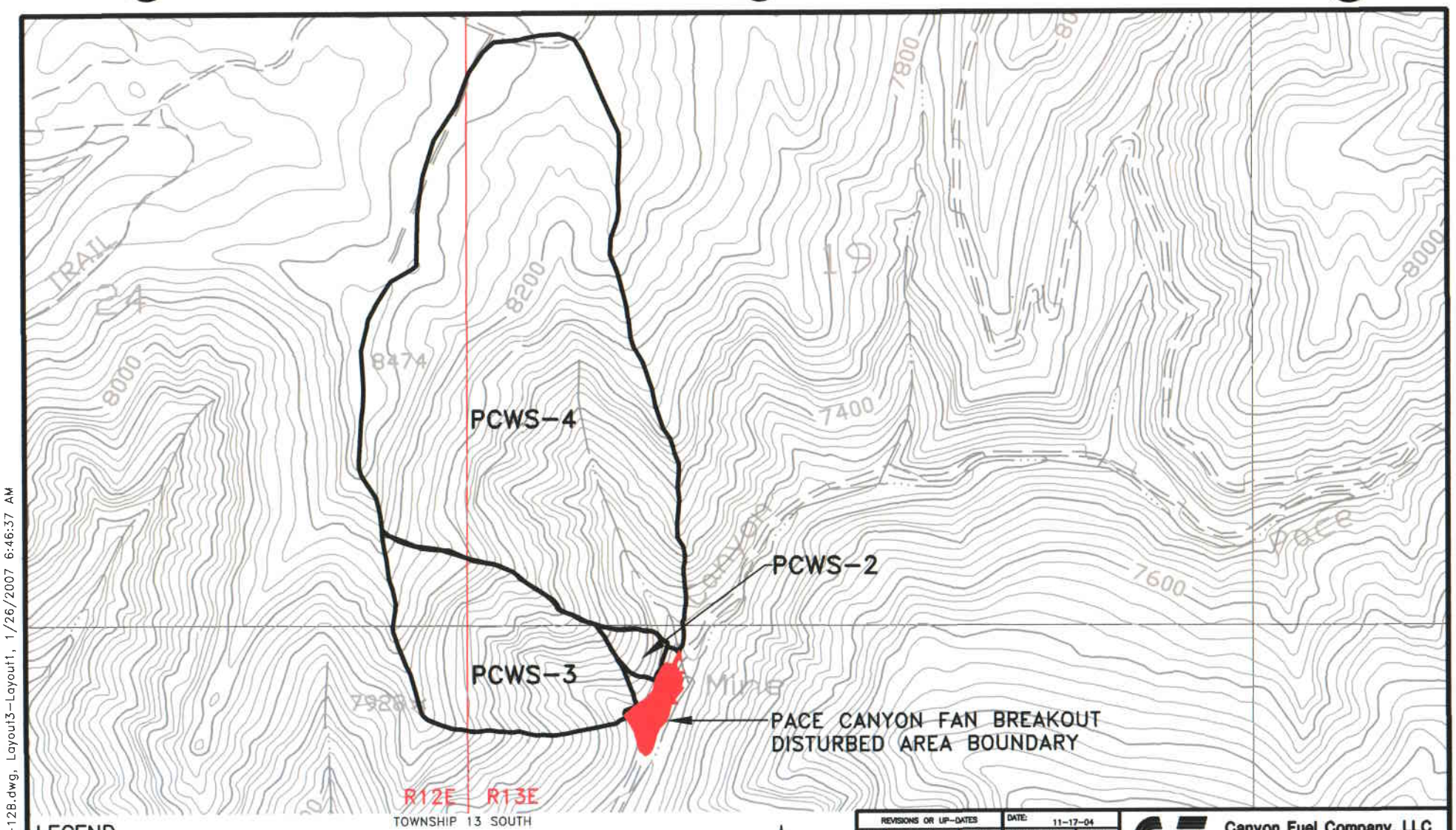


LEGEND

PACE CANYON UNDISTURBED WATERSHED BOUNDARY

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B. WHITE
STATE OF UTAH
26 Jan 2007

REVISIONS OR UP-DATES			DATE: 11-17-04	
NO.	DATE	BY	DESIGNED BY:	LDJ
1	1-28-05	LDJ	DRAWN BY:	SWF
2	5-05-05	LDJ	CHECKED BY:	VSM
3	9-14-06	RBW	CHECKED BY:	VSM
			SCALE:	1"=1000'
FILENAME: G:\UC801\19\DWG\FIGURE 7-12B.DWG\09-06-06				

Canyon Fuel Company, LLC
Dugout Canyon Mine

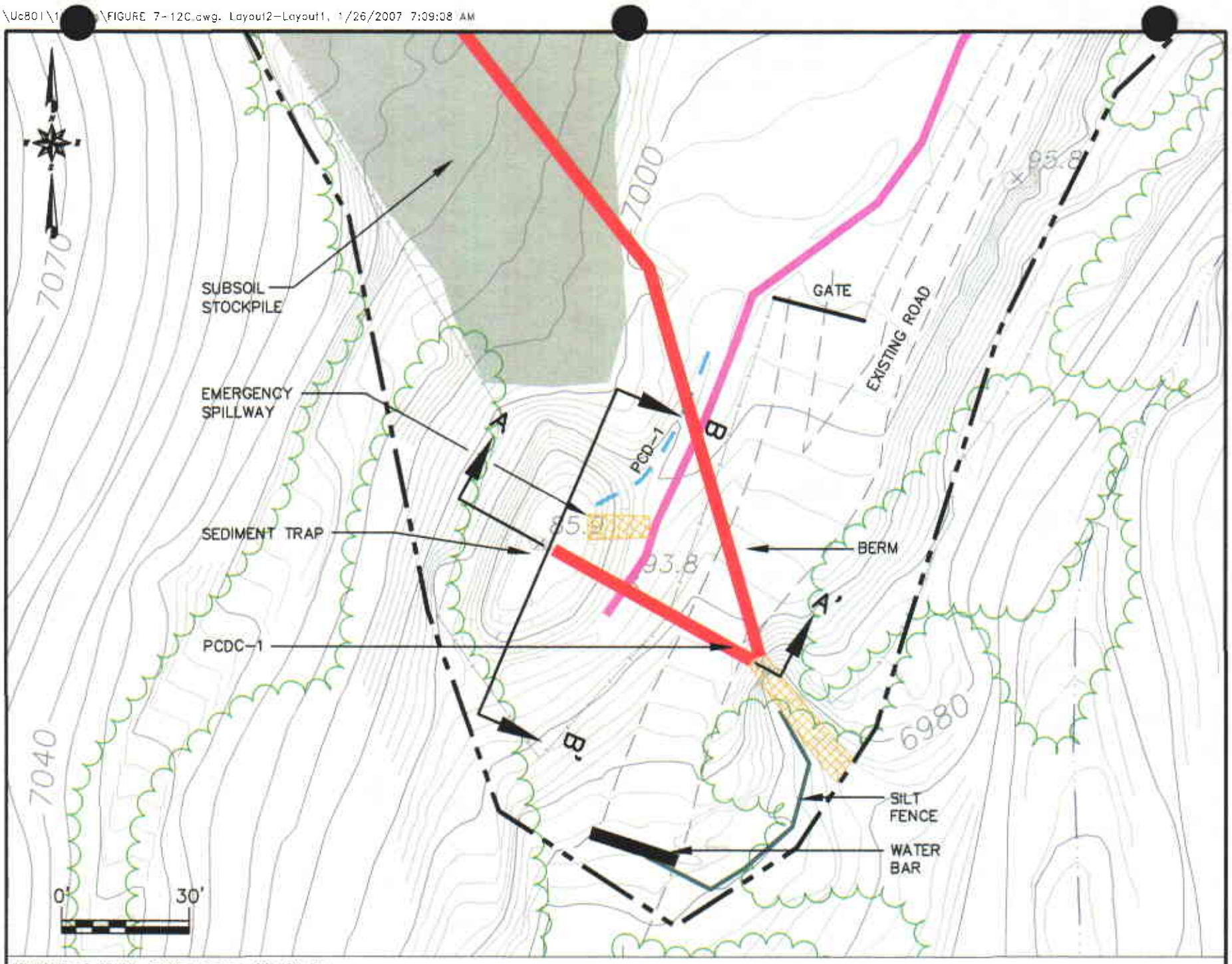
PACE CANYON FAN UNDISTURBED WATERSHED BOUNDARIES

P.O BOX 1029
WELLINGTON, UTAH 84542

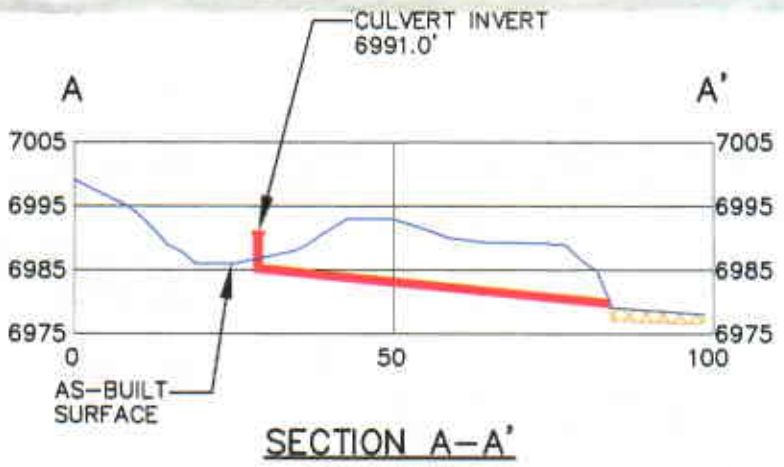
DRAWING OR MAP NUMBER
FIGURE 7-12B

EarthFax Engineering, Inc.

G:\Uc801\19\Dwg\FIGURE 7-12B.dwg, Layout3-Layout1, 1/26/2007 6:46:37 AM

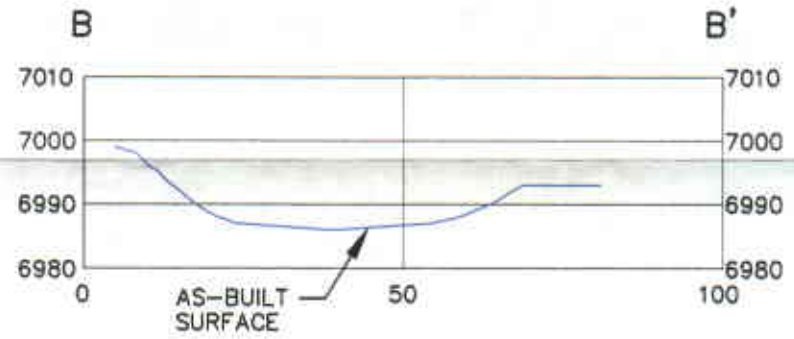


TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30



SECTION A–A'

HORZ: 1"=30'
VERT: 1"=30



SECTION B–B'

HORZ: 1"=30'
VERT: 1"=30

LEGEND

CULVERT

RIPRAP

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FLOWN 12-21-05

REGISTERED PROFESSIONAL ENGINEER
No. 168046
RICHARD B. WHITE
STATE OF UTAH
26 Jan 2007

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NO.	DATE	BY	DESIGNED BY:	LDJ
1	1-25-07	LDJ	DRAWN BY:	SWF
2	3-22-06	LDJ	CHECKED BY:	VSN
3	5-08-06	LDJ		
4	9-14-06	RBW		
			SCALE: 1"=30'	

FILENAME: B:\UC801\1-REVISIONS\FIGURE 7-12C.DWG

Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN SEDIMENT TRAP DETAIL AND CROSS SECTIONS

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WELLINGTON, UTAH 84542

DRAWING OR MAP NUMBER
FIGURE 7-12C

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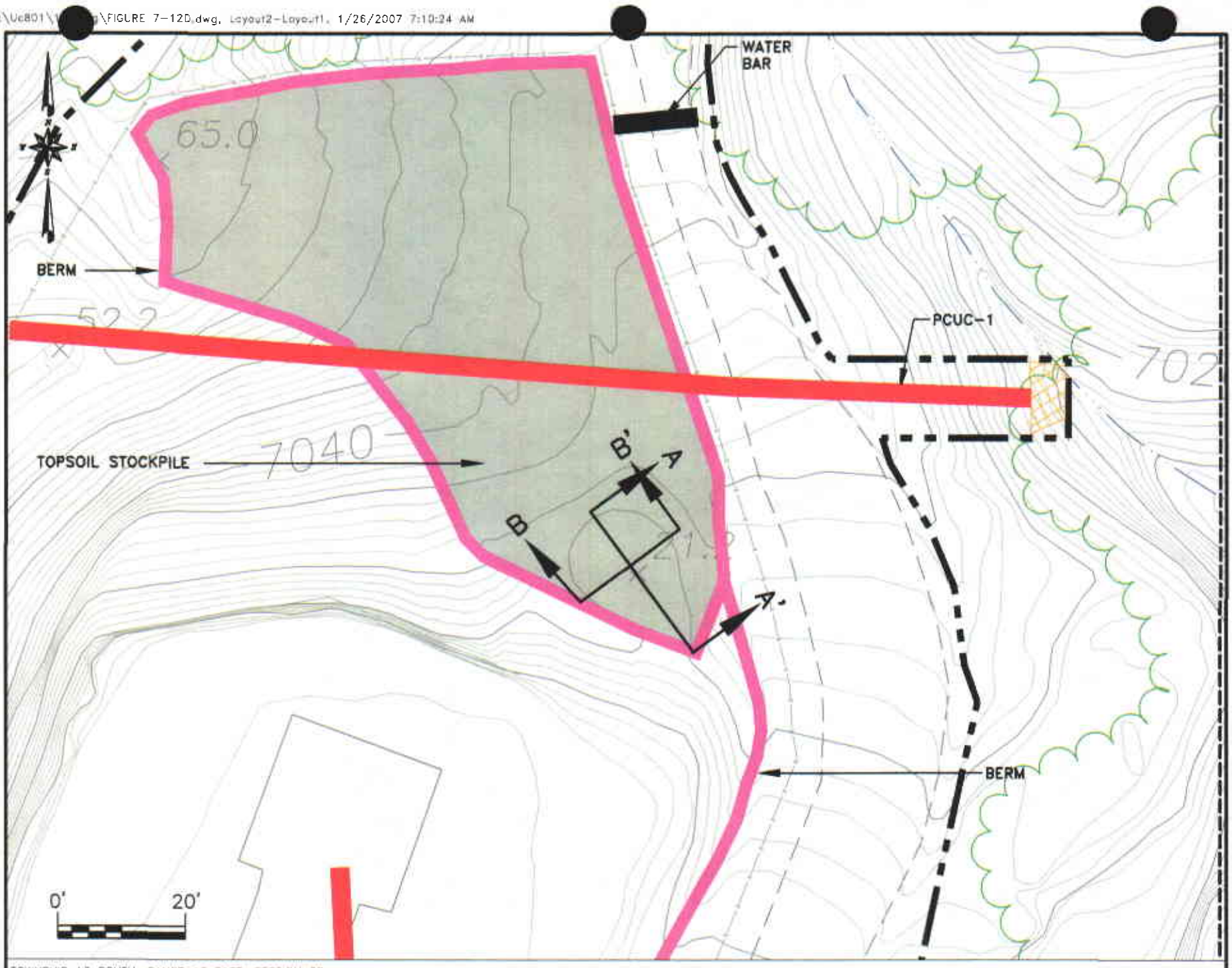
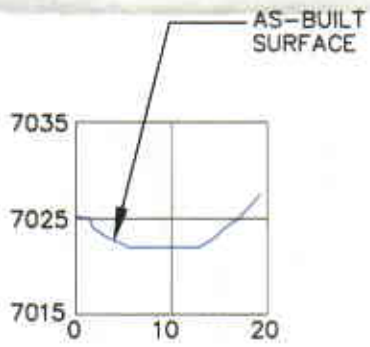
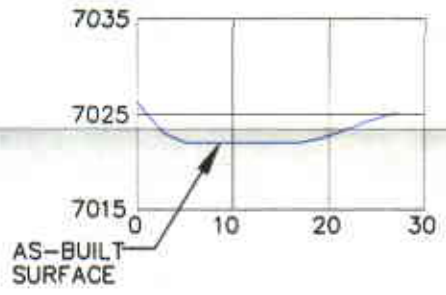


TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30



SECTION A–A'
HORZ: 1"=20'
VERT: 1"=20



SECTION B–B'
HORZ: 1"=20'
VERT: 1"=20

LEGEND

CULVERT

RIPRAP

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REGISTERED PROFESSIONAL ENGINEER No. 168248 RICHARD B. WHITE STATE OF UTAH
26 Jan 2007

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NO.	DATE	BY	DESIGNED BY:	LDJ
1	1-26-06	LDJ	DRAWN BY:	SAT
2	3-20-06	LDJ	CHECKED BY:	WBW
3	5-06-06	LDJ		
4	9-14-06	RBW		
			SCALE: 1"=20'	

FILENAME: P:\JOBS\...\DWG\FIGURE 7-12D.DWG

Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN SEDIMENT BASIN DETAIL AND CROSS SECTIONS

P.O. BOX 1029
WELLINGTON, UTAH 84542

DRAWING OR MAP NUMBER
FIGURE 7-12D

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:\Uc801\t\...g\FIGURE 7-12E.dwg, Layout2-Layout1, 1/26/2007 7:11:16 AM

PCUC-3
WATER BAR
BERM
PCUC-1
TOPSOIL STOCKPILE
PCUC-4
SEDIMENT BASIN
BERM
REALIGNED ROAD
WATER BAR
DISTURBED AREA BOUNDARY
MINE WATER DISCHARGE CULVERT
WATER BAR
PCUC-2
TOPSOIL STOCKPILE
SUBSOIL STOCKPILE
EMERGENCY SPILLWAY
PCD-1
EXISTING ROAD
SEDIMENT TRAP
SILT FENCE
WATER BAR
BLM PROPERTY
THAYN PROPERTY

TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30

LEGEND

- CULVERT
- RIPRAP
- BERM
- DEEP GOUGED, MULCHED AND SEEDED
- SEEDED
- GRAVEL

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REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR
No. 169246
RICHARD H. WHITE
STATE OF UTAH
26 Jan 2007

REVISIONS OR UP-DATES			DATE: 11-18-04	
NO.	DATE	BY	DESIGNED BY:	LDJ
1	1-26-06	LDJ	DRAWN BY:	SMF
2	3-20-06	LDJ	CHECKED BY:	VBM
3	9-06-06	LDJ		
4	09-14-06	RBW		
			SCALE:	1"=80'

FILENAME: G:\UC801\19\DWG\FIGURE 7-12E.DWG

Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN SEDIMENT CONTROL MAP

P.O. BOX 1029
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DRAWING OR MAP NUMBER
FIGURE 7-12E

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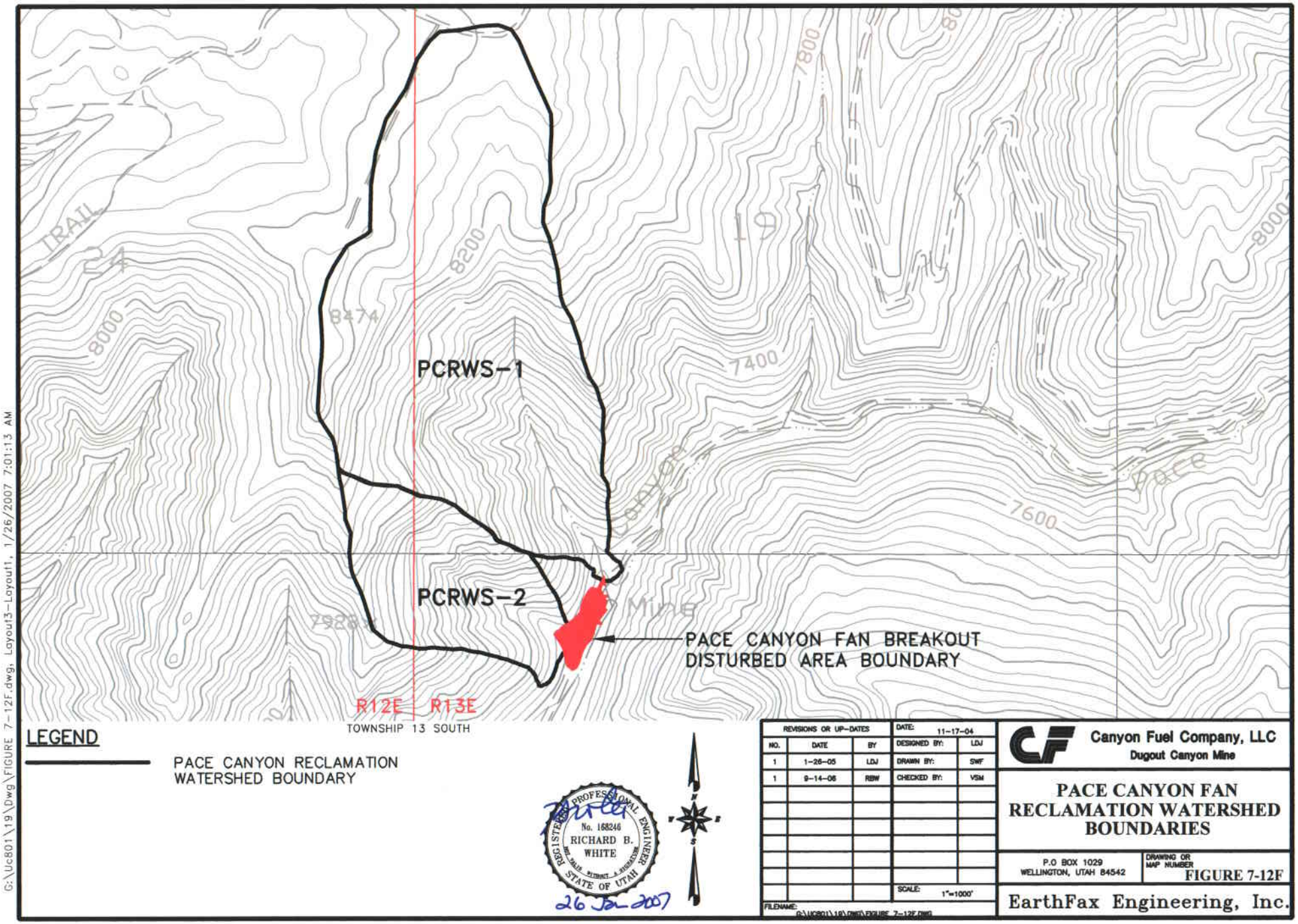

LEGEND

PACE CANYON RECLAMATION WATERSHED BOUNDARY

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B. WHITE
STATE OF UTAH
26 Jan 2007

REVISIONS OR UP-DATES			DATE: 11-17-04	
NO.	DATE	BY	DESIGNED BY:	LDJ
1	1-26-05	LDJ	DRAWN BY:	SWF
1	9-14-06	RBW	CHECKED BY:	VSM
			SCALE:	1"=1000'

FILENAME: G:\UC801\19\DWG\FIGURE 7-12F.DWG

Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN RECLAMATION WATERSHED BOUNDARIES

P.O BOX 1029
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DRAWING OR MAP NUMBER
FIGURE 7-12F

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