Coyote Pit

May 2016

112(c) Application to the Colorado Division of Reclamation, Mining, and Safety

By:

Colorado River Ranch, LLC

Represented by:

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EXHIBIT T ..... RULE 1.6.2(1)(B)

GEOTECHNICAL STABILITY EXHIBIT

Introduction

The proposed Coyote Pit is located 0.5 miles north of Dotsero in Eagle County, Colorado and accessed from US Highway 6. Dotsero is at the confluence of the Eagle and Colorado Rivers and at the base of the Dotsero Crater. The site, in relation to Dotsero, is shown on the Exhibit B Index Map. The mining area is located on a dry terrace elevated above irrigated pasture to the west. The site is bordered. Parcel lines obtained from Eagle County are shown on the Exhibit B Index Map. A list of the names and mailing addresses of the landowners are listed in Exhibit R.

The overall permit area is 106.12 acres. The disturbed area for the Coyote Pit is 90.9 acres for the mining area and sediment ponds. The permit boundary is shown on Exhibit Map C-1.

The permittee for this site is Colorado River Ranch, LLC (CO River), which has a lease with the property owners.

The site will be reclaimed to a land use of rangeland on the slopes, and irrigated fields on the flats. The topography of the reclaimed land is shown on the Exhibit Map F.

EXHIBIT A LEGAL DESCRIPTION AND LOCATION MAP

The site is less than a half a mile from Dotsero, Colorado, and is 5 miles west of Gypsum, Colorado. A legal description is shown on the Exhibit C Map 1. The total permit area is 106.12 acres and consists of two areas: the operation area and the access road.

1. Legal Description

1.1 Operation Area

Located within Sections 5, 31, & 32 of T4S, R86W of the 6th PM. Using the north line of Section 5, described as being S 89°18'03" E with a distance 5222.39', as the basis of bearing. S 64°05'20" W a distance of 1981.12' from the NE corner of Section 5 to the point of beginning:

thence N 68°17'35" W a distance of 98.80';
thence N 67°04'51" W a distance of 526.83';
thence N 17°51'27" W a distance of 534.31';
thence N 20°08'06" W a distance of 352.36';
thence N 24°33'23" W a distance of 234.62';
thence N 33°31'31" W a distance of 149.19';
thence N 42°07'47" W a distance of 169.97';
thence N 47°38'41" W a distance of 98.24';
thence N 53°51'34" W a distance of 136.81';
thence N 60°09'16" W a distance of 163.18';
thence N 67°22'49" W a distance of 130.26';
thence N 71°12'23" W a distance of 112.83';
thence N 76°16'15" W a distance of 162.10';
thence N 78°41'24" W a distance of 199.20';
thence N 78°14'20" W a distance of 658.40';
thence N 73°02'21" W a distance of 142.87';
thence N 65°07'39" W a distance of 188.71';
thence N 58°07'42" W a distance of 123.18';
thence N 50°10'19" W a distance of 102.14';
thence N 39°44'21" W a distance of 277.48';
thence N 27°07'47" W a distance of 183.53';
thence N 19°24'46" W a distance of 129.34';
thence N 12°33'51" W a distance of 194.53';
thence N 03°28'49" W a distance of 392.03';
thence N 03°36'56" W a distance of 457.49';
thence N 00°00'33" E a distance of 313.10';
thence N 11°55'43" E a distance of 129.25';
thence N 18°44'47" E a distance of 227.30';

thence N 30°09'07" E a distance of 191.07';
thence N 40°24'55" E a distance of 234.99';
thence N 47°46'07" E a distance of 448.70';
thence N 89°42'43" E a distance of 384.16';
thence S 00°00'10" W a distance of 2636.85';
thence N 89°43'46" E a distance of 1321.39';
thence S 00°01'59" W a distance of 808.70';
thence S 73°40'12" E a distance of 759.40';
thence S 28°14'43" E a distance of 339.49';
thence S 28°23'01" E a distance of 371.02';
thence S 25°44'30" E a distance of 266.98';
thence S 27°09'00" E a distance of 185.89';
thence S 06°38'35" W a distance of 443.84';
thence S 08°28'33" W a distance of 36.95';
which is the point of beginning,
having an area of 4575937.90 square feet, or 105.05 acres

1.2 Access Road

Located within Sections 5, 31, & 32 of T4S, R86W of the 6th PM. Using the north line of Section 5, described as being S 89°18'03" E with a distance 5222.39', as the basis of bearing. S 49°00'14" W a distance of 1986.96' from the NE corner of Section 5 to the point of beginning:

A 60-foot width following the centerline described as follows:

thence N 40°40'54" W a distance of 16.80';
thence N 53°35'13" W a distance of 326.21';
thence with a curve turning to the right with an arc length of 15.28', with a radius of 30.00', with a chord bearing of N 38°59'41" W, with a chord length of 15.12';
thence N 24°24'10" W a distance of 81.60';
thence with a curve turning to the left with an arc length of 33.58', with a radius of 30.00', with a chord bearing of N 56°28'23" W, with a chord length of 31.86';
thence N 88°32'35" W a distance of 28.95';
thence with a curve turning to the right with an arc length of5 3.19', with a radius of 30.00', with a chord bearing of N 37°44'56" W, with a chord length of 46.49';
thence N 12°06'22" E a distance of 17.65';
thence with a curve turning to the left with an arc length of 7.15', with a radius of 30.00', with a chord bearing of N 05°09'11" E, with a chord length of 7.13';
thence N 01°42'32" W a distance of 40.27';
thence with a curve turning to the left with an arc length of 11.81', with a radius of 30.00', with a chord bearing of N 13°03'43" W, with a chord length of 11.73';
thence N 24°20'13" W a distance of 45.57';
thence with a curve turning to the left with an arc length of 23.29', with a radius of 30.00', with a chord bearing of N 46°34'24" W, with a chord length of 22.71';
thence N 68°48'35" W a distance of 48.86';

thence with a curve turning to the right with an arc length of 37.35', with a radius of 30.00', with a chord bearing of N 33°08'43" W, with a chord length of 34.98';
which is the point of beginning
having an area of 46724 square feet, or 1.07 acres.

EXHIBIT B

INDEX MAP

The following map shows the general location of the site.

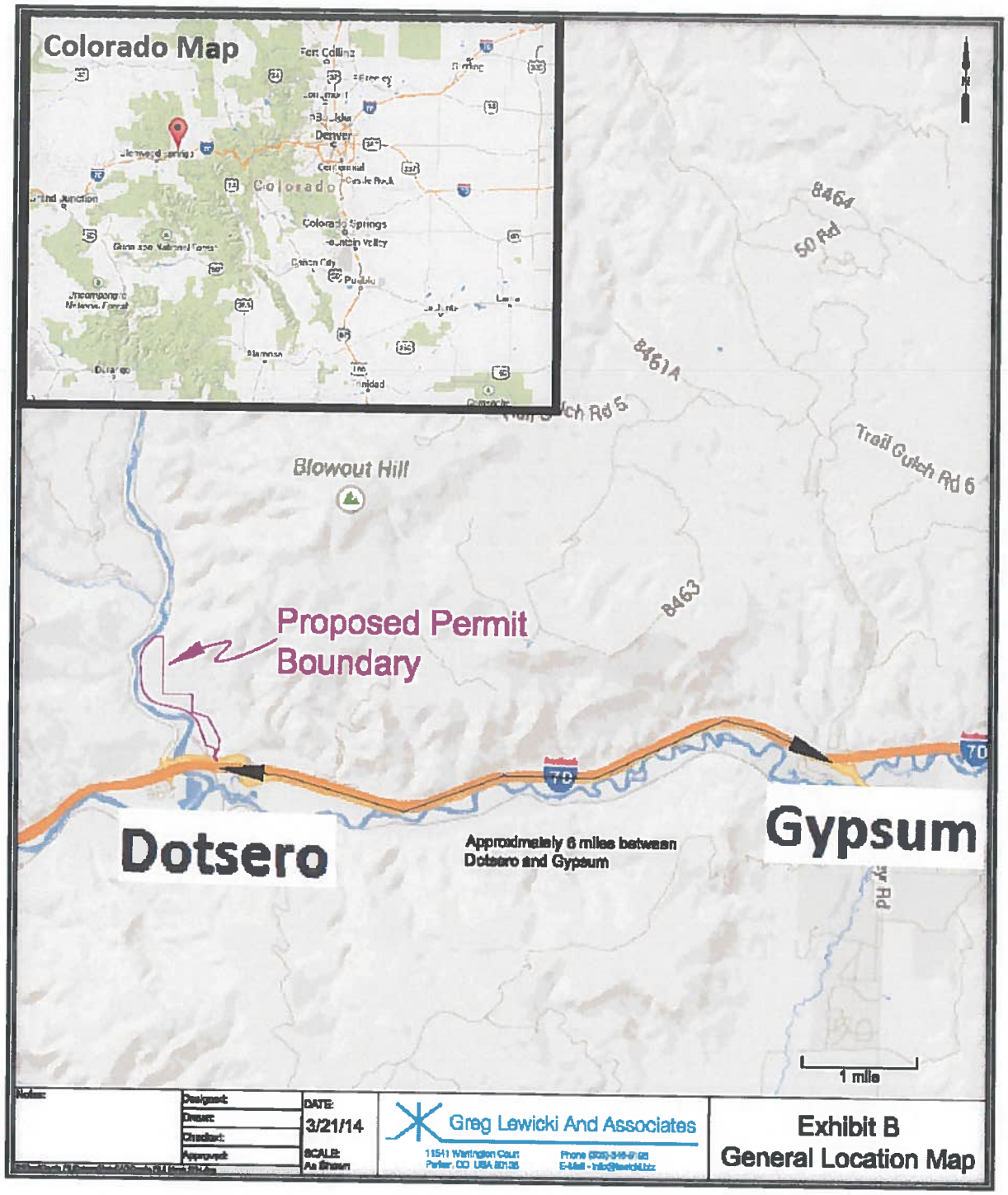


EXHIBIT C

PRE-MINING AND MINING PLAN MAPS OF AFFECTED LANDS

Exhibit C Map 1: Pre-mine conditions of the site

Exhibit C Map 2A & 2B: During-mining conditions of the site

Exhibit C Map 3A & 3B: Cross-sections showing before, during, & after mining topography as well as visual impacts

Appendix 3 contains all maps.

EXHIBIT D MINING PLAN

1. General Mining Plan

Access to the mining area will be from a new access road starting at Highway 6 (Frontage Road).

The permit area will be staked prior to any additional site disturbance. Exhibit C Map 2 shows the configuration of the site during mining. This map also displays the visual buffer berm. Exhibit C Maps also shows the configuration of the fully mined out pit as well as the location of the processing plants, stockpiles and office/shop area. Processing of the gravel will be conducted within the facilities area as shown on Exhibit C Map 2A. The gravel will be excavated and hauled to the crusher with a loader from all three mining pits, as shown on Map C-2A.

Topsoil will be salvaged from all mining areas. The expected topsoil thickness is 4 to 6 inches. The mining will be done contemporaneously with the reclamation. The maximum length of pit wall (eastern pit wall facing the river) will be 800 feet. Initially, topsoil will be stripped from an area of approximately 8 acres in the southern portion of Pit 1. Topsoil will be stockpiled adjacent to the stripped area. The operation will mine for a 6 to 9 months per year and produce gravel stockpiles to last the remainder of the year. Overburden will also be stripped from the same area as the topsoil. This overburden will also be stockpiled for later reclamation. Mining of the raw gravel will then start and progress north. Further overburden removed in this process will be used to backfill the eastern cut slope, which will be mined at 1.5H:1V. A berm will be in place between the pit and the Colorado River. This berm will either be native material left in place, or, if said material is excavated early in the pit life, overburden will be used to build a berm. Product sales will occur throughout the year. Crushed product will be stored in stockpiles adjacent to the facilities area (see Exhibit C maps). All slopes will be mined to 1.5H:1V or less to reduce the amount of reclamation required after mining. The first cut will be stored adjacent to the pit. The mining areas and stockpiles are shown on Exhibit C Map 2A.

The gravel deposit was determined to be approximately 35 feet deep. The volumes were calculated by extrapolating the auger exploration data. The auger drill hit many large rocks and was not able to determine the depth of gravel deposit in some places. Figure 1 shows the location of the drill holes. Due to the lack of much data for Pits 2 and 3, the volume calculations are only estimations. It should not cause problems for reclamation if the volumes change since the current calculations show an

excess of over a million cubic yards of overburden. All excess overburden will be applied to the floor of the reclaimed pit (irrigated area) and not placed as slope backfill. This is discussed in further detail in Exhibit E.

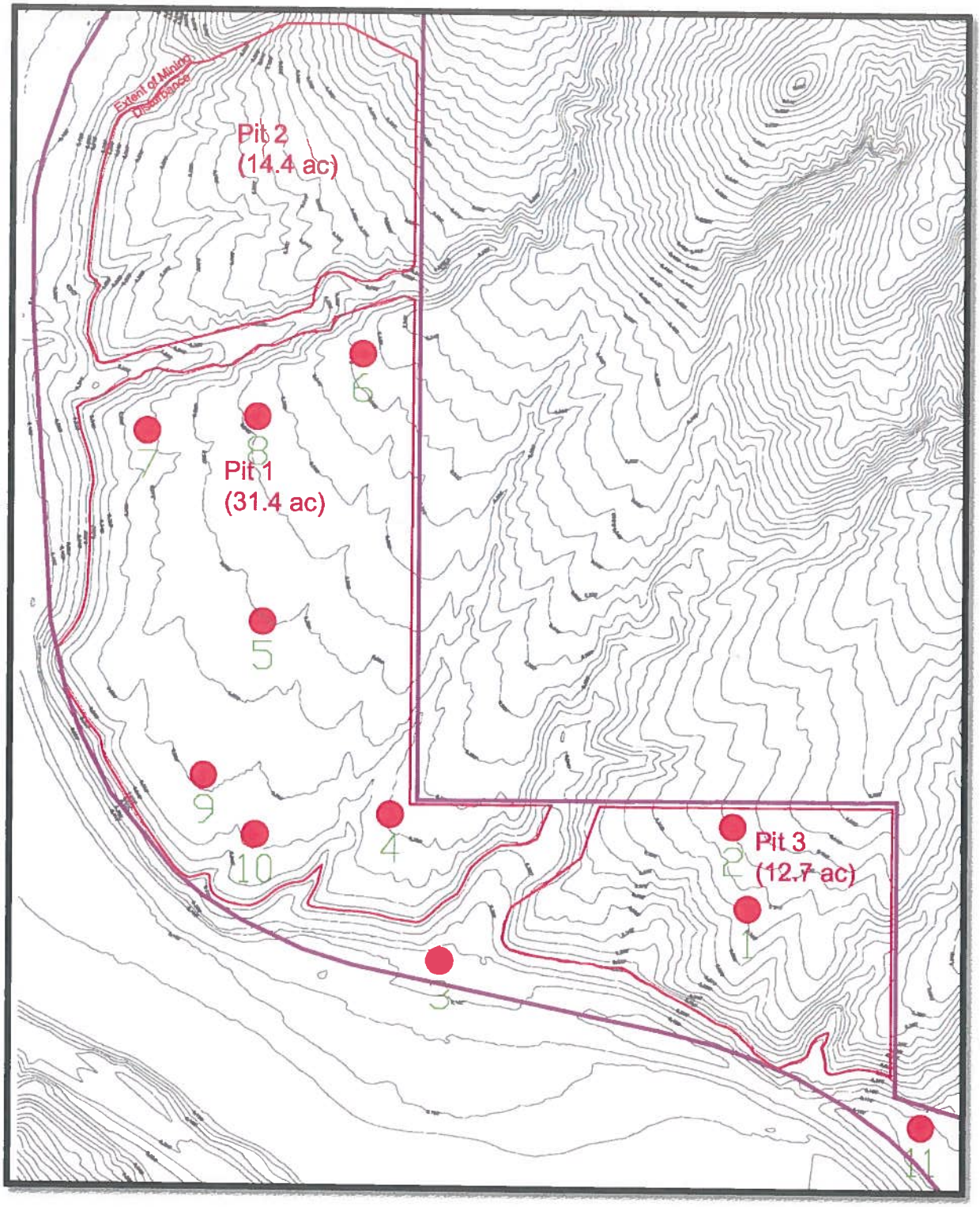


Figure 1: Map showing locations of exploration drill holes

Table D-1: Volume Calculations

Phase 1					
	Overburden (cubic yards)		Gravel		Total
	Cut	Swelled	Cubic Yards	Tons	Cubic Yards
Pit 1	788,443	851,519	757,811	1,136,705	1,546,254
Pit 2	626,484	676,603	396,866	595,293	1,023,350
Pit 3	56,507	61,028	305,494	458,236	362,001
Total	**1,471,435**	**1,589,150**	**1,460,171**	**2,190,234**	**2,931,606**

Phase 2					
	Overburden (cubic yards)		Gravel		Total
	Cut	Swelled	Cubic Yards	Tons	Cubic Yards
Pit 1	158,839	171,547	425,373	638,053	584,212
Pit 2	321,358	347,066	166,043	249,062	487,401
Pit 3	19,269	20,811	20,121	30,181	39,390
Total	**499,467**	**539,424**	**611,537**	**917,296**	**1,111,003**

Total					
	Overburden (cubic yards)		Gravel		Total
	Cut	Swelled	Cubic Yards	Tons	Cubic Yards
Pit 1	947,283	1,023,065	1,183,184	1,774,758	2,130,466
Pit 2	947,842	1,023,669	562,909	844,355	1,510,751
Pit 3	75,777	81,839	325,615	488,418	401,392
Total	**1,970,902**	**2,128,574**	**2,071,707**	**3,107,530**	**4,042,609**

The material volumes described in Table D-1 are based on drilling. The two phase approach shown in this permit represents the two forms of this operation: the mining operation with the visual berm in place, and the site after the berm is removed at the very end of each pits life. At no point will all of the pits be mined out, and have their visual berms removed at once. Each pit is being reclaimed concurrently; Maps 2A & 2B show these two phases conceptually.

The anticipated total disturbed area for the mining area portion of the operation consists of 90.9 acres, which includes the sediment ponds. The additional disturbance comes from the access road, gravel stockpiles, and the office / shop area. This is approximately 5.81 acres (8,438 feet in length) for the access road, 6.14 acres for the mine management area (culvert installation, etc.) and 20.5 acres for

the office, shop, and processing/facilities area. Therefore, the total disturbed area is 90.9 acres over the life of the mine. The disturbance at any one time is much smaller since there will be ongoing reclamation as the pit advances.

Table D-2: Mine Acreages

	Acreage
Mine Road	5.81
Pit 1	31.41
Pit 2	14.39
Pit 3	12.65
Facilities Area	20.50
Mine Management Area	6.14
Total Disturbed Area	**90.90**

Topsoil will be stripped as needed and prior to mining each year. Overburden will be removed at the same time as the topsoil but will be handled separately. Topsoil will be stockpiled or directly replaced depending on the portion of the area being mined. Overburden will be placed on the eastern cut slope and not stockpiled. Some overburden will be placed on the pit floor, as needed to make a volume balance. Gravel will be directly loaded into the crusher by a loader or will be hauled to the crusher from the mining face in a truck.

2. Mining Timetable

The following tables (Table 3, Table 4 and Table 5) are a best estimate of the sequence of operations for the life of the mine and is based on producing 230,000 raw tons per year. The estimate life of this mine is 12 years.

Table D-3: Pit 1 Mining Timetable

Pit 1					
Year	Cut Overburden (thousand cubic yards)		Gravel (thousand cubic yards)		Reclamation (acres)
	Phase 1	Phase 2	Phase 1	Phase 2	
1	239				
2	239		230		
3	239		230		5.2
4	71	61	230		5.2
5		86	68	162	5.2
6		12		230	5.2
7				33	5.2
8					5.2
9					
10					
11					
12					
Total	788	159	758	425	31.4

Table D-4: Pit 2 Mining Timetable

Pit 2					
Year	Cut Overburden (thousand cubic yards)		Gravel (thousand cubic yards)		Reclamation (acres)
	Phase 1	Phase 2	Phase 1	Phase 2	
3					
4					
5					
	310				
	316	58	197		
8		263	200	30	4.8
9				136	4.8
10					4.8
11					
12					
Total	626	321	397	166	14.4

Table D-5: Pit 3 Mining Timetable

Pit 3					
Year	Cut Overburden (thousand cubic yards)		Gravel (thousand cubic yards)		Reclamation (acres)
	Phase 1	Phase 2	Phase 1	Phase 2	
1					
2					
	17				
	39	18	94		
10		1	211	18	4.2
11				2	4.2
12					4.2
Total	56	19	305	20	12.6

The mining schedule is planned to minimize disturbance by reclaiming areas as additional mining is undertaken. These tables are based on a reasonable projection of average production rates, which can vary significantly. The tables show that mining and reclamation will take approximately 12 years and the total gravel mined will be approximately 3 million tons, as shown in Table 1. The large size of this operation allows for the operator to plan for the future as well as the local communities to know there is a long term source of material in this area of Eagle County.

3. Mine Facilities and Operations

The crushing and screening will take place within the pits. Fuel will be brought to the site by a mobile fueling truck. On site fuel storage needs will vary depending on the plants that are located on site at any one time. The mining, crushing and screening equipment will require a single 3,000 gallon diesel tank which will be located near the crushing/screening plant as shown on Map C-2A.

The tank will have secondary containment of at least 110% of the full tank capacity. The 3,000 gallon tanks will be a factory double-walled tank on skids. Spills within the mine area also have a third level of containment, which is the berm around the area. The tank is subject to a strict SPCC plan for the site. An SPCC Plan will be placed in the mine office and the employees will be trained to take the appropriate steps for inspections and spill response in case of a spill. All portable plants will have their own tanks built into the plant that have built-in secondary containment and are covered under their own portable plant SPCC Plans. If any fuel spill is encountered, the material will be removed from the site. The Division will be notified in the case of any toxic or hazardous substance, including spills of petroleum product in accordance with the requirements of Rule 3.1.13. Upon final reclamation, all equipment will be removed from the site.

A portable wash plant will be utilized on site to create washed products for the Concrete and Asphalt plants as well as sell washed aggregate products. The wash plant will be fed with crushed and screened products and will remove the fine material as required in the material specifications. These fines will be deposited in the wash pond located near the wash plant within facilities area. This pond will periodically be cleaned out. The fines will be deposited in the depression around the plant area and reclaimed at the end of mining. Water consumed in the wash plant will be hauled from the irrigation ditches on this parcel. See Exhibit G for additional details on water use.

The portable concrete plant will consist of a lime silo, fly ash silo, loading hopper, control room and a batching hopper. Concrete mixer trucks will haul the material from the facilities area to the various project locations. No concrete or asphalt trucks will travel to the mining pit. The mixer trucks will be stored next to the concrete plant when not in use. The sediment ponds will also serve as a concrete washout ponds. Excess concrete created during batch operations will be laid out on a gravel pad and allowed to cure. The excess concrete will be recycled in the crushing operation.

The portable asphalt plant will consist of burner fuel tanks, asphalt cement tanks, mixer drum, loading hopper and a control room. Asphalt batching operation will only be conducted in warmer months as it can only be installed in these months. The asphalt plant may be stored on site during the winter months depending on the projects schedules. Excess asphalt produced during batching operations as well as spillage will be cleaned up daily and placed in an asphalt material storage location. The asphalt material will be directly recycled into the mixer drum on the next asphalt production run.

No permanent structures will be built within the mining area. The control rooms, scale house, truck scales and plants will be portable, although the scale will have a concrete foundation. The office and shop will be constructed in the office and shop area, as shown on Map C-2A.

Maintenance vehicles will visit the site regularly to provide oil, grease, and perform other minor maintenance on vehicles and equipment. Any major repair work required will be performed in the shop.

The following list is the best estimate of the required equipment to be used onsite throughout the mine life:

4. **Gravel Crushing Equipment**

- Portable Jaw Crusher
- Portable Cone Crusher
- Portable Screen Decks
- Portable Stacking / Transporting Conveyors
- Water Truck for dust suppression
- Portable Generators for plants

- Electric Control Van
- Wheel Loader Cat 988, Cat 980
- Cat D-9 size dozer or equivalent
- Portable Wash Plant
- Portable Concrete Plant and Mixer Trucks to take material off-site
- Raw Material Trucks to haul raw gravel from crusher to facilities area

5. Portable Asphalt Plant and Highway Haul Trucks

Support equipment will to come to the site on an as-needed basis. The facilities area will house the mine office, the shop, parts storage and a truck scale. The employee and vendor parking area will also be located here.

There will be no blasting as part of this operation.

No refuse, acid or toxic producing materials are expected to be encountered in this operation. If these materials are encountered, topsoil will be placed over the area and mining will move to a different area.

Any new fencing will be installed according to the Division of Parks and Wildlife's specifications.

The operator commits to clearly marking the affected area boundary with stakes surveyed on site, once the permit is approved. It is planned that the material may be used to provide base material for construction projects in the area.

One main road will be present in the mining area and will change locations in the pit as mining progresses. This road will access the mining areas, which also is accessed by the new access road. In pit roads are not delineated as they will move throughout mining.

6. Topsoil and Overburden Handling

As previously stated, the average topsoil depth on the mining terrace is 4-6 inches. Overburden thickness varies from 3 feet to 50 feet. Topsoil will be salvaged from all mining areas. Topsoil from the first cut will be stockpiled nearby. All other topsoil will be directly replaced.

Overburden encountered during mining will be placed on the eastern pit slope backfill and the excess will be placed on the pit floor of previously excavated areas. The topsoil stockpile will be seeded with the rangeland seed mix shown in Exhibit E.

Further details of overburden and topsoil re-distribution are discussed in Exhibit E. The overburden and topsoil that is placed on the backfilled 3H:1V slope will be seeded and mulched in spring or fall.

7. Access Road

There are two portions of the access road within the permit area, as seen on Map C-2A. The lower portion will start in the facilities area and will connect to the paved access on Highway 6. CO River is working with CDOT to determine what improvements are needed at this location. The other access road starts in the northern end of Pit 2 and will traverse a significant drainage (Watershed D) then enter the Pit 1 area, where an additional large drainage will be crossed, both of these crossings, as well as minor drainages within the pit itself, may be subject to Army Corps of Engineers requirements for a nationwide permit. All watersheds are delineated on the Hydrology Map in Exhibit G. All crossings of drainages for the access roads and all ditches leading to the sediment ponds are designed. This detail is presented in Exhibit G.

8. Water Handling

All water rights issues such as availability of water for this operation, consumption rates, dust control, etc. are presented in Exhibit G - Water Information.

9. Schedule of Operations

Mining operations will only occur as dictated by demand. Mining, crushing and screening may take place in any part of the year but is expected to be limited to less than 7 months per year. Product will be sold throughout the year, although far less material is expected to be sold in winter months. The

operator will not have night gravel mining operations, although minor truck activity or repairs may occur after hours.

10. Eagle County/Gypsum Impacts and Environmental Impacts

The aggregate production is estimated to be 230,000 tons annually, although this is only approximate since past forecasts of economic conditions have been erratic. Impacts to Eagle County and Gypsum include:

a) Truck traffic: Highway trucks will utilize the new access road to Highway 6 to haul material to individual project locations. An access permit has been filed with CDOT for access to Highway 6. The engineering report for the access has shown that the low level of production may still require significant improvements to the access intersection.

b) Noise: Due to the fact that the operation will be behind a berm on an elevated terrace, it is unlikely that significant noise impacts will occur to users of the Colorado River Road. Also, there is no reasonable place to stop and park along this road adjacent to the pit area. The high earth berm will tend to direct noise upward from the pit area. The operation will easily be able to comply with all noise regulations under Colorado statutes. The Department of Health regulates noise levels under Section 25-12-103 of the Colorado Revised Statutes 1983, as amended. Since the operation is to take place behind a berm, it will be extremely difficult for residents nearby to experience significant noise impacts. CO River realizes that although the number of loaded trucks planned per day for this limited operation is small, it will still impact those residences along the Colorado River Road and Highway 6 Dotsero. CO River is willing to meet with any owners of these residences to work out additional mitigation measures to lower truck noise.

c) Dust: Although the pit activities will be watered and all operations on the site are regulated by the Air Quality Control Division of the CDPHE, the relatively low annual production, aggressive watering of roads and limiting the disturbed area should prevent significant dust impacts. An Air Emission Permit for the site and the plants will be obtained from CDPHE and will be strictly followed.

d) Visual impact: The Coyote Pit is located on privately owned property with Bureau of Land Management owned property to the east and private property to the west. The Denver and Rio Grande Railroad runs along the east side of the Colorado River. The Colorado River Road runs on the west side of the Colorado River. There are a few residences located in general vicinity. These residences will have minimal view of the Coyote Pit operations. A visual berm will be maintained on the outside western portion of the pits, until all pits are mined out. The visual berm will be removed at the very end of the mining process. The only portion of the mining operation that will be visible is the upper portion of the eastern pit wall. The landscape in that area of the pit is relatively barren. The pit wall will blend in to the surrounding landscape. Additional visual impacts will occur along the Colorado River Road, but only for short segments. The pits will generally not be visible from the road. The facilities area will be visible from the road only on the southern bend. The structures will all be painted with a beige color to blend into the surrounding landscape.

e) The product from this mine will positively impact the local community by supplying construction materials for the foreseeable growth of this part of Eagle County. It also has the advantage of supplying this area with construction material from the same area, thus limiting the amount of truck traffic that goes through the town of Eagle and also greatly lessening truck traffic on the highway system, which in turn will lessen road repairs. Also, lessening truck traffic by providing construction materials near to the end use will also lessen the amount of greenhouse gases produced for many years to come.

f) The hydrological system will detain all runoff so that sediment will not leave the site and cloud any downstream waters. There will be sanitation facilities located in the mining area, therefore no leach fields or other means of sewage disposal within the mining area.

g) The Coyote Pit will be reclaimed to rangeland and irrigated fields as shown on Map F-1. The operator will work closely with the Gypsum, NRCS, CDPW and the DRMS to ensure that the reclamation plan is the most appropriate for achieving the post-mining land use.

11. Import Fill, Recycled Concrete and Asphalt

The pit may accept concrete and asphalt materials that have been removed from existing sites in order that they can be recycled through the plants on site. Fill material may also be accepted into the mine

site. Fill material will be spread out on the mined out pit floor and will be blended into the final landscape. Some material may also be re-sold as construction material. Any importation of structural fill materials will occur in accordance with the requirements of Rule 3.1.5(9). None of this material can be accepted by the Operator unless the attached form is filled out by the entity bringing the material to the site. The form provides an assurance that all material brought to the site is inert and has no toxic or acid forming material above acceptable limits.

Affidavit for Import of Materials into Coyote Pit

Date or Time Period of Import:

Description of Import Material:

_____

_____

_____

Entity Providing Material to Pit (not the trucking Company):

_____

_____

_____

I hereby certify that the material described above and brought to the Coyote Pit site is inert, which means it is free from any chemicals, toxic substances, acid forming material, or any other material which would violate the material waste disposal laws of the State of Colorado.

_____ _____

Signature Written Name of Signer

_____ _____

Signer's Position in Company Company

Date: _____

EXHIBIT E RECLAMATION PLAN

1. General Reclamation Plan

The total area of the permit is 106.12 acres. The permit has both a disturbed area (90.9 acres) and an undisturbed area (15.22 acres). Much of the undisturbed areas are perimeter areas of the pit and the access road. The access road is to be left in place for access to the reclaimed irrigated fields. The reclaimed land use is shown below in Table 1.

Table E-6: Post Mining Land Uses

Post Mining Land Use Acreages	
Irrigation Fields	28.5
Rangeland	36.1
Road	5.8
Commercial/Industrial	20.5
Total	**90.9**

Reclamation will be conducted as new areas are disturbed throughout the year. This will most likely occur in small increments a few times per year, with topsoil and overburden being placed in the previously excavated areas of the pit. See Map F for details. Once the pit mines out the initial 7-10 acres, the pit will strip topsoil on 2-5 acres per year and will place this topsoil directly on regraded mined out areas in back of the pit. In this way, reclamation will be concurrent and the maximum pit exposed area at any one time will limited. This will also help reduce the exposed land area, which will reduce the reclamation bond and impacts to wildlife. The pit floor will be graded to drain towards the river. The pit excavation itself will prevent on-site stormwater from leaving the site until vegetation is sufficient to control erosion.

Topsoil will be salvaged from all mining areas. The expected topsoil thickness is 4 to 6 inches. The mining will be done contemporaneously with the reclamation. The maximum length of pit wall (eastern pit wall facing the river) will be 800 feet. Initially, topsoil will be stripped from an area of approximately 8 acres in the southern portion of Pit 1. Topsoil will be stockpiled adjacent to the stripped area. The operation will mine for a 6 to 9 months per year and produce gravel stockpiles to last the remainder of the year. Overburden will also be stripped from the same area as the topsoil. This overburden will also be stockpiled for later reclamation. Mining of the raw gravel will then start

and progress north. Further overburden removed in this process will be used to backfill the eastern cut slope, which will be mined at 1.5H:1V. A berm will be left in place on the west side of the pit for visual protection as well as to reduce dust and noise for neighbors west of the Colorado River. This berm will either be native material or overburden. Product sales will occur throughout the year. Crushed product will be stored in stockpiles adjacent to the facilities area (see Exhibit C maps). All slopes will be mined to 1.5H:1V or less to reduce the amount of reclamation required after mining. The first cut will be stored adjacent to the pit. The mining areas and stockpiles are shown on Exhibit C Map 2A.

2. Topsoil Placement

The amount of topsoil proposed to be salvaged and replaced is 39,300 cubic yards. All of the areas will receive topsoil replaced to a thickness of 4 to 6 inches. The compacted areas will be ripped prior to topsoil placement the help root penetration past the topsoil.

3. Haul Roads and Access

See Exhibit C maps for details of the proposed roads. Access through the site will remain after mining using the access road installed as shown on Map F.

4. Reclamation Timetable

The timetable for reclamation is shown below in Table 2. Exhibit L: Reclamation Costs describes the worst case bond scenario.

Table E-7: Reclamation

Year	Pit 1	Pit 2	Pit 3
	Reclamation (acres)	Reclamation (acres)	Reclamation (acres)
1			
2			
3	5.2		
4	5.2		
5	5.2		
6	5.2		
7	5.2		
8	5.2	4.8	
9		4.8	
10		4.8	4.2
11			4.2
12			4.2
Total	31.4	14.4	12.6

The timetable above is based on production of 230,000 tons of gravel per year. The life would be greatly reduced if this production increases in the future

5. Revegetation Plan

5.1 Rangeland Post Mining Land Use

The reclamation seed mix is intended to restore a vegetation community that is good for cattle and/or sheep grazing and deer/elk grazing but the mix also contains shrub seed which could potentially result in sage grouse use in the future. Many years of experience in reclaiming sites such as this have shown that although the reclamation seed mix contains considerable grasses which will rapidly grow, eventually the shrubs (particularly sagebrush) will take over the site and fully restore the existing community.

The areas being reclaimed will be harrowed and drill seeded in the spring and fall with a mix consisting of the following in order to control erosion:

Species	Pounds Pure Live Seed per Acre (drilled rate)
Sulfur Flower Buckwheat	2.0
Daisy Fleabane	1.0
Galleta (floret)	3.0
Small Burnet	2.0
Indian Ricegrass	3.0
Winterfat	0.5
Shadscale	0.5
Scarlet Globemallow	0.5
Bottlebrush	0.5
Rabbitbrush	0.5
Four-winged Saltbush	1.0
Total	14.5

This mix will provide a variety of shrubs, forbs and grasses for the reclamation of the terrace and all of the species have been recommended by the local office of the Colorado Division of Parks and Wildlife. These grasses have proven to do well in the dry medium elevation environment of western Colorado. They will prevent erosion and do provide forage and cover for animals. Certified weed free hay or straw mulch will also be applied at the rate of 2000 lbs/acre. The mulch will be crimped into the ground to provide soil stabilization. Fertilizer is not anticipated to be used for revegetation assistance. Annual evaluations will be conducted on the revegetation efforts and the use of fertilizer will be re-evaluated at that time.

5.2 Irrigated Pasture Post Mining Land Use

Common Name	Scientific Name	% of Mix
Western Wheatgrass	Pascopyrum smithii	10
Pubescent Wheatgrass	Elytrigia intermedia	20
Smooth Brome	Bromos inermis	15
Russian Wildrye	Psathyrostachys juncea	15
Slender Wheatgrass	Elymus trachycalus	30
Green Needlegrass	Nassella viridula	10

Species and/or % may change depending on availability.

Seeding rate: 10.0 lb / acre drilled or 20.0lb / acre broadcast seeded.

Fertilizer:	Di-Ammonium phosphate (18-46-0)	250 lbs./acre
Straw Mulch:	(weed free)	80 bales/acre
Tackifier	(plant based)	As recommended by supplier
Fiber mulch	(wood cellulose)	200 lbs./acre

6. Post-Reclamation Site Drainage

The main drainage channels will be reconstructed and have been designed to hold a 100-year, 24-hour storm event. All drainage outside of the reconstructed channels will sheet flow down the side slopes (3H:1V) across the reclaimed pit floor. Stormwater runoff will then flow into the natural drainages and into the river. All reconstructed channels are discussed in Exhibit G and shown on Exhibit Map F. All sediment ponds will remain permanent, but will be graded to 3H:1V slopes. The ponds will be lined and compacted with silty clay to reduce infiltration.

7. Revegetation Success Criteria

Rangeland revegetation will be deemed adequate for the rangeland portion when erosion is controlled, and the vegetation cover is similar to the existing cover, and is considered satisfactory according to Division standards. No shrub standard is proposed for the reclamation success criteria.

The irrigated pastureland vegetation will be deemed adequate when erosion is controlled and the vegetation is growing. The existing topsoil is thin (4-6 inches) and is not expected to produce high quality vegetation, even when irrigated. The landowner has requested this post mining land use and will take over maintenance after bond release.

8. Monitoring Reclamation Success

Monitoring the reclamation on an ongoing basis will ensure its success. The operator plans to use the local NRCS office to determine the capacity of the reclaimed land to control erosion. If minor changes or modifications are needed to the seeding and reclamation plan, revision plans will be submitted to the Division. It is hoped that the Division will provide assistance in evaluating the success of the ongoing reclamation process. Information on all areas disturbed and reclaimed as well as any other important items regarding the reclamation will be submitted in the annual reports to the Division. Eagle County and Division of Parks and Wildlife will also be consulted on the progress of the reclamation.

9. Weed Control

Measures will be employed for the control of any noxious weed species. Control measures will also be used if the growth of weed species on the reclaimed area threatens further spread of the weeds to nearby areas. A Weed Control Plan will be utilized as follows:

1) Each April, a weed survey will be taken of the permit area.

2) If any patches or plants have been identified, they will be sprayed by backpack sprayer or 4-wheeler using chemicals approved for use by the weed control staff of Montrose County.

3) After reclamation, weed surveys and spraying will continue until the perennial cover and production of the site have met DRMS requirements and bond release has been obtained.

The Division and Eagle County weed control staff will be consulted regarding any weed infestation areas and any control measures prior to their initiation. The plan does not contemplate total weed removal on the property. Past experience has shown that some initial weed cover in the first year following the re-topsoiling is beneficial to the reclamation effort in rangeland site

EXHIBIT F RECLAMATION PLAN MAP

Exhibit Map F shows the final contours of the reclaimed area as well as the final land uses.

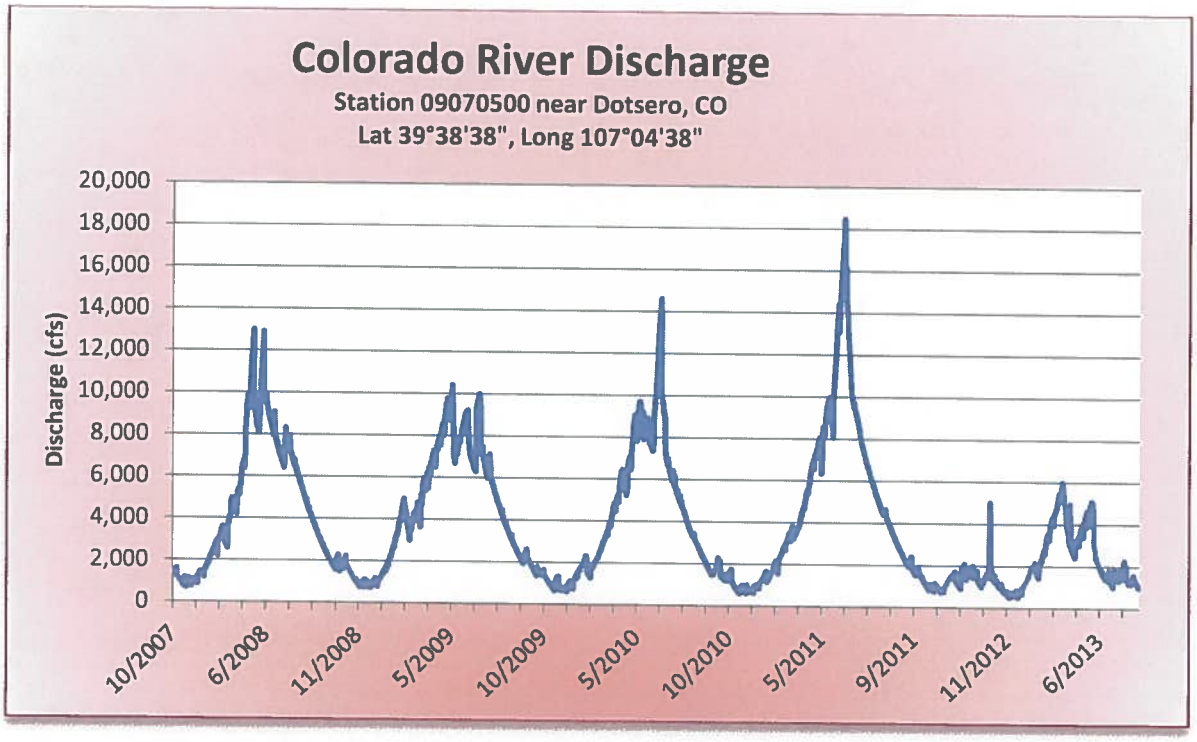
Appendix 3 contains all maps.

EXHIBIT G WATER INFORMATION

1. Surface Water General Discussion

The surface water features within and near the permit area are the Colorado River, Eagle River, and Deep Creek. The Colorado River runs south along the edge of the proposed permit boundary. The Colorado River joins with the Eagle River at Dotsero. Deep Creek flows into the Colorado River from the west and north of the proposed permit. The proposed permit is located above the Colorado River floodplain. Table G-1 shows the recent discharge rates of the Colorado River at 1.5 miles downstream from Eagle River. According to USGS, the natural flow of the Colorado River has been affected by transmountain diversion, storage reservoirs, power development, diversions for irrigation of about 68,000 acres upstream from the station, and return flow from irrigated areas.

Table G-8: Colorado River Discharge (from USGS)



Existing stormwater on the terrace either infiltrates through the gravel or runs off through the un-named drainages. Surface water within the disturbed area will be collected during mining in the northwest portion of the mining area and will infiltrate. No sediment will be allowed to leave the site

and cloud any downstream waters. The site will not affect existing water rights, since the pit will not expose groundwater and will not store stormwater for more than 72 hours.

After reclamation, stormwater encountered in the mining area will continue to infiltrate or evaporate.

The existing surface drainage is through numerous dry ephemeral drainages of various sizes. The drainages transport water from the upper portion of the watershed and sides of the watershed to the flat terrace area. The smaller drainages dissipate which causes any water to sheet flow and infiltrate into the ground. The water eventually becomes part of the Colorado River groundwater system. The larger drainages have a defined channel leading directly to the river. There are numerous culverts under the railroad to allow the water to continue to the river (the railroad runs parallel to the river).

Ephemeral drainages will be reconstructed as shown on Map F. The channels will be engineered to convey a 100-year, 24-hour storm event. The banks will be planted with appropriate riparian vegetation. The restored streams will be stable and sufficiently designed to trap sediment and prevent excess sediment from entering the river. The reduced gradient of the restored streams will also increase infiltration and reduce sedimentation. Appendix 2 contains designs for the restored channels and associated culverts.

2. Hydrology and Sediment Control for Mining

The terrace deposit for proposed mining is located east of the Colorado River. The permeable nature of the gravel and its height above the river preclude any aquifers from being present in the material that would be mined. The phreatic surface is likely to be only slightly above the river, keeping it well below the middle portions of the terrace deposit.

The excavation will be confined to an area well above the normal high water levels from the river. There are no wetland areas within the project area and no mining will take place along the river. Mining will not affect the historic drainage pattern across the property nor will it affect the flood plain of the Colorado River.

2.1 Pit 1

Pit 1 will most likely be mined first. During Phase 1 a berm will be maintained on the downslope of the pit. All stormwater runoff will be held within the pit. The berm is over 20 feet in height. Water will not be discharge during Phase 1. Phase 2 will remove the berm. The first portion of the berm to be removed will be in the location of the Pond 1. Alternate sediment control (straw bale, silt fence, or other) will be constructed and maintained for all areas of disturbance at this stage. Once the sediment pond is constructed all runoff will be directed to the pond. Collection ditches will be constructed along the downstream perimeter of the pit to divert all runoff to Pond 1. Pond 1 and its associated ditches will be designed and constructed to hold a 10-year, 24-hour storm event. A small portion of Pit 1, located at the southernmost portion, will only have alternate sediment control due to the small area and separation by the pre-existing drainage, which will be reconstructed.

2.2 Pit 2

Pit 2 will most likely be mined second. During Phase 1 a berm will be maintained on the downslope of the pit. All stormwater runoff will be held within the pit. The berm is around 30 feet in height. Water will not be discharge during Phase 1. Phase 2 will remove the berm. The first portion of the berm to be removed will be in the location of the Pond 2. Alternate sediment control (straw bale, silt fence, or other) will be constructed and maintained for all areas of disturbance at this stage. Once the sediment pond is constructed all runoff will be directed to the pond. Collection ditches will be constructed along the downstream perimeter of the pit to divert all runoff to Pond 2. Pond 2 and its associated ditches will be designed and constructed to hold a 10-year, 24-hour storm event. A small portion of Pit 2, located at the southernmost portion, will only have alternate sediment control due to the small area and separation by the pre-existing drainage, which will be reconstructed.

2.3 Pit 3

Pit 3 will most likely be mined last. During Phase 1 a berm will be maintained on the downslope of the pit. All stormwater runoff will be held within the pit. The berm is around 16 feet in height. Water will not be discharge during Phase 1. Phase 2 will remove the berm. The first portion of the berm to be removed will be in the location of the Pond 3. Alternate sediment control (straw bale, silt fence, or other) will be constructed and maintained for all areas of disturbance at this stage. Once the sediment pond is constructed all runoff will be directed to the pond. Collection ditches will be constructed along the downstream perimeter of the pit to divert all runoff to Pond 3. Pond 13and its

associated ditches will be designed and constructed to hold a 10-year, 24-hour storm event. A small portion of Pit 3, located at the southernmost portion, will only have alternate sediment control due to the small area and separation by the pre-existing drainage, which will be reconstructed.

3. Groundwater

Since the test pits did not show groundwater and there are no visible seeps or springs, groundwater is not expected to be encountered during mining. While no groundwater is anticipated to be exposed by excavation, if it is exposed, excavation will cease at an elevation of 2 feet above the groundwater level.

4. Irrigation Water

Irrigation water will be supplied by the landowner via water right from the Colorado River.

5. Water Consumption for the Operation

The Pit is on an elevated terrace and there is no groundwater on the terrace. This is known from existing operations on the terrace further north of this site and also the lack of springs emanating from the base of the gravel anywhere on the site. There is very little moisture in the gravel that will evaporate when the material is mined.

The water uses are dependent upon the breakdown of products forecast for the pit production and sales. This breakdown is given below:

table-water production uses

5.1 Control Dust on the Haul Roads and Excavation Areas

Water used for dust suppression is usually 100 percent depletive with no measurable return flows to the river system. Dust from the haul roads will be controlled by paving for all areas outside the mining pit boundary. Water will be used on all in pit roads. Water will only be applied when needed at this elevation, since cold conditions on site for much of the year result in little evaporation and/or dust. It is assumed that watering of roads will require 1700 gallons water 4x per day for 100 days per year. Other days will have natural

moisture on the roads or the site will be inactive since the annual production is not very high. This is equivalent to 2.09 acre feet per year.

It is also assumed that minor amounts may be needed during very dry windy conditions during the mining operation. This use is expected to be 1.2 acre feet per year. Therefore, the total consumptive use for this category is 3.29 acre feet per year.

5.2 Crushing and Screening Plant Operations

The crushing/screening plant uses 200 gallons per hour at a throughput rate of 225 tons per hour, but 180 tons per hour will be assumed, so this amount for 180 tons per hour is conservative

Therefore, the total hours needed per year to produce the required tonnage is 522 hours. The crusher will be an enclosed crusher with water sprays and the screen deck will also have sprays at the entrance and on the screen deck itself. This is an amount of 0.32 acre feet per year. Although the crusher/screen plant uses considerable water, it does not run for many hours during the year to meet the annual production

5.3 Wash Plant Operations

The wash plant will be used to remove fines from the material that will be used to make concrete. Based on a throughput rate of 1000 tons per day, the plant will use 32,000 gallons of water per day and will operate 24 days per year. This is a use of 2.36 acre feet per year. Approximately 60% of this water will be recycled from the wash pond, but 40% will be consumptive use through evaporation and infiltration. This results in a consumptive use of 0.94 acre feet.

5.4 Concrete Batching

The concrete plant will have a throughput rate of 2000 tons per day. Based on the estimated annual concrete production, the plant will operate 10 days per year and will use approximately 4000 gallons for each operating day. Therefore, the consumptive use is 0.12 acre feet per year.

5.5 Asphalt Plant Operation

The asphalt plant will have a throughput rate of 2000 tons per day. Based on the estimated annual asphalt production, the plant will operate 10 days per year and will use approximately 4000 gallons for each operating day. Therefore, the consumptive use is 0.12 acre feet per year.

5.6 Potable Water for Drinking

Potable drinking water is estimated to be 50 gallons per month, but this water will be purchased commercially and will not be considered in the consumptive use calculations

EXHIBIT H WILDLIFE INFORMATION

The only potential negative impact concerns any eagles which may use the cottonwood trees along the Colorado River. Since the amount of disturbance is small, this should not result in a large impact to the eagles, since their use of these cottonwood trees is very limited. The eagles do not nest in these trees but occasionally use the trees for resting.

River bank material provides shelter for numerous species of wildlife in the arid Southwest, including reptiles, amphibians, birds, mammals and invertebrates. Bank shelters are created through the action of water, wind, and gravity, independent of whether the river contains water year-round. In fact, dry wash embankments are notoriously full of small caves and crevices critical in the life of desert animals such as the desert tortoise (*Gopherus agassizii*). These shelters not only provide refuge from predators, but also critical protection from extreme heat and aridity.

1. Significant Wildlife Resources on the Affected Lands

The Division of Parks and Wildlife considers the important winter range for deer and elk. Bald eagles may use the cottonwood trees along the Colorado River. Black bear, moose, and bighorn sheep range through the area as well. The bulk of the wildlife activity is near the river, which is well away from mining activity

2. Significant Non-Game Resources on the Affected Lands

Greater sage grouse, squirrel, otter and other small animals are found along the Colorado River.

3. Seasonal Use of Affected Lands

The winter range of bald eagle and elk is documented around the project area, particularly west of the Colorado River.

4. Presence and Estimated Population of Threatened or Endangered Species

No threatened or endangered species are in, or use the project area according to CPW data.

5. Fish Resources

Trout, chub, and other fish can be found in the Colorado River, but no fish resources will be affected by the mining operation, since it is a dry land terrace. Sediment will be contained on site.

6. General Effects of the Operation on the Existing Wildlife

The primary effect of any surface mining operation is the impact of fences on altering existing animal travel routes. However, fencing is necessary to minimize animal-vehicle collisions.

EXHIBIT I SOILS INFORMATION

The soil survey performed by the NRCS covers the permit area. The soil mapping is shown on the Exhibit B Map. The associated soil types descriptions are enclosed in Appendix 1.

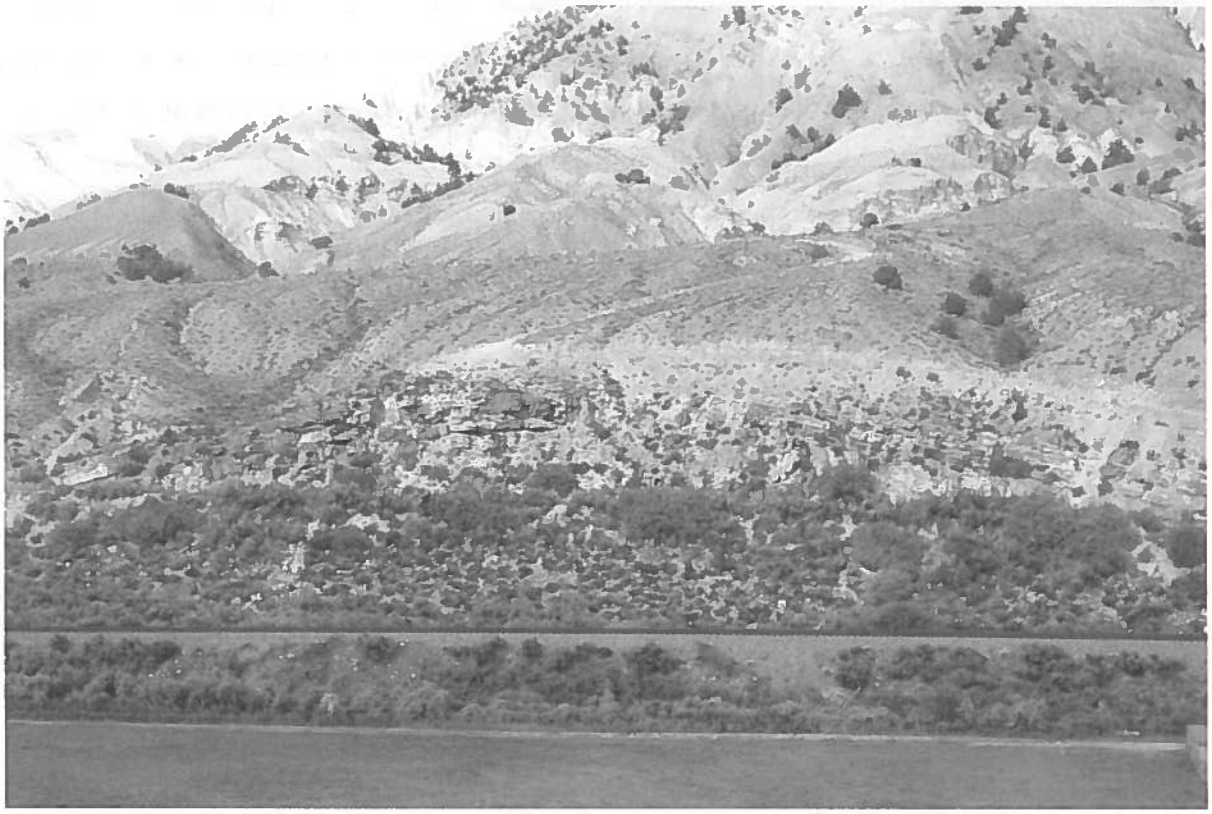
The expected average topsoil thickness on the terrace to be mined is 12 inches. This includes the A and B Horizons. This topsoil will be taken to Stockpile 1 located in the southwest corner of the permit area and will be used in the reclamation.

Topsoil will be used to reclaim as it is stripped, with the exception of the initial stockpile which will be used for final reclamation. As mining progresses and overburden is encountered, it too will be used immediately for reclamation. By reclaiming while mining, all soil will be salvaged and re-used as quickly as possible.

The topsoil stockpile will be seeded within a year after it is created with the same rangeland mix shown in the reclamation plan.

EXHIBIT J VEGETATION INFORMATION

The property consists of pinon/juniper with sage and some sparse grasses and small forbs. The cover in this area is only 20%. These lands are not irrigated and their only use is by occasional wildlife.



The Dotsero area is part of the Foothill Shrublands of Southern Rockies ecoregion. The Southern Rockies are composed of high elevation, steep, rugged mountains. Although coniferous forests cover much of the region, as in most of the mountainous regions in the western United States, vegetation, as well as soil and land use, follows a pattern of elevational banding. The lowest elevations are generally grass or shrub covered and heavily grazed. Low to middle elevations are also grazed and covered by a variety of vegetation types including Douglas-fir, ponderosa pine, aspen, and juniper-oak woodlands. Middle to high elevations are largely covered by coniferous forests and have little grazing activity. The highest elevations have alpine characteristics.

The Foothill Shrublands ecoregion is a transition from the higher elevation forests to the drier and lower Great Plains to the east and to the Colorado Plateaus to the west. This semiarid region has rolling to irregular terrain of hills, ridges, and footslopes, with elevations generally 6000 to 8500 feet. Sagebrush and mountain mahogany shrubland, pinyon-juniper woodland, and scattered oak shrublands occur. Other common low shrubs include serviceberry and skunkbush sumac. Interspersed are some grasslands of blue grama, Junegrass, and western wheatgrass. Land use is mainly livestock grazing and some irrigated hayland adjacent to perennial streams. The physiography of the Foothill Shrublands is unglaciated with hills, ridges and footslopes. The streams are moderate to high gradient perennial, intermittent and ephemeral streams with cobble, gravel and sandy substrates. The geology is quaternary glacial till, colluvium and alluvium. Tertiary and Cretaceous shale and sandstone are found in the Foothill Shrublands with Permian sandstone, limestone, and siltstone. The Precambrian metasedimentary includes sandstone, claystone, shale, siltstone and conglomerates. The Precambrian metamorphic rocks include amphibolite, schist, gneiss, quartzite, quartz-pebble conglomerate and marble.

The natural vegetation of the Foothill Shrublands ecoregion is sagebrush shrubland, pinyon-juniper woodland, and foothill-mountain grasslands. It also includes areas of mountain mahogany shrublands and scattered Gambel oak woodlands. The woodlands are often interspersed with mountain big sagebrush, skunkbush, serviceberry, fringed sage, rabbitbrush, blue grama, Junegrass, western wheatgrass and Indian ricegrass.

Ephemeral and intermittent streams are the defining characteristic of many watersheds in dry, arid and semi-arid regions, and serve a critical role in the protection and maintenance of water resources, human health, and the environment. Arid lands are characterized by low and highly variable annual precipitation, where evapotranspiration exceeds precipitation. It is because of these dry conditions, which result in great contrast between the moist riparian areas and adjacent dry upland communities, that arid and semi-arid region streams are so important. Riparian ecosystems occupy very small portions of the landscape in arid and semi-arid regions, yet they exert substantial influence on hydrologic, geomorphic, and ecological processes, and typically support the great majority of biodiversity in these regions. The riparian area or zone is the strip of vegetation along a stream, which is of distinct composition and density from the surrounding uplands. Ephemeral streams are

important sources of sediment, water, nutrients, seeds and organic matter for downstream systems and provide habitat for many species. Sediment deposition can have varying effects. For example, sediment deposited during flow events can encourage plant germination (i.e. Cottonwood, *Populus fremontii*) by providing seed beds and scarifying seeds, but it also can inhibit the growth of seedlings or some types of vegetation, such as non-native saltcedar (*Tamarix ramosissima*). This can be beneficial in some instances where stream restoration efforts are occurring. However, some aquatic species can be adversely affected by excessive sediment, which can interfere with reproduction and feeding.

Water limitation in arid environments results in patchy, sparse vascular plant cover. As a result, algal and soil microbial activity is important for nutrient cycling in these environments. Some dominant plant species such as mesquite (*Prosopis sp.)* living along ephemeral streams have nitrogen fixing bacteria associated with their roots, which can be an important influence on local nitrogen availability. Biological soil crusts, or cryptobiotic crusts, are a mixture of mosses, algae, microfungi, lichen and cyanobacteria that live on and just below desert soil surfaces. They are usually found in open, undisturbed areas where vegetation is sparse, for example in upland areas adjacent to ephemeral streams. These organic complexes help to stabilize desert soils, hold in soil moisture, fix carbon and nitrogen, and can stimulate plant growth. In some soil types, biological soil crusts can increase infiltration rates. Biological soil crusts can determine the amount, location, and timing of water infiltration into desert soils, which, in turn, determines the type and size of microbial response. Nutrients resulting from this pulse then create a positive feedback as increases in microbial and plant biomass enhance future resource capture or, alternatively, may be lost to the atmosphere, deeper soils, or downslope patches.

EXHIBIT K

CLIMATE

The table below shows the climate information for Dotsero, Colorado. Dotsero is located at 39°39′0″ North and 107°3′30″ West and at an elevation of 6150 feet.

Month	Chance of Sunshine			Historical Temperature (°F)			Average Precipitation (inches)	
	Clear Days	Partly Cloudy Days	Cloudy Days	Average	Maximum Average	Minimum Average	Rainfall	Snowfall
January	9	7	15	18.02°	30.65°	5.30°	0.95	10.4
February	8	7	13	20.52°	33.18°	7.83°	0.91	6.2
March	8	8	15	27.45°	38.95°	15.90°	1.72	6.8
April	8	9	13	34.73°	46.87°	22.53°	3.04	3.7
May	10	11	11	43.20°	57.27°	29.07°	1.67	1.1
June	15	9	6	55.17°	72.50°	37.83°	0.45	0.1
July	14	11	6	63.90°	80.03°	47.75°	1.97	0.0
August	13	11	6	57.40°	72.47°	42.33°	1.51	0.0
September	16	8	5	50.83°	66.67°	35.07°	1.07	0.4
October	15	8	8	39.70°	53.27°	26.07°	1.60	2.2
November	11	7	12	27.90°	40.17°	15.73°	1.26	6.2
December	10	8	13	15.07°	26.22°	3.87°	1.02	10.3
Annual	137	104	123	37.82°	51.52°	24.11°	17.17	47.4

EXHIBIT L RECLAMATION COSTS

Since mining will occur in multiple pits over 12 years, the reclamation costs for Coyote Pit are staged based on mining life in each of those three pits. The first worst case reclamation stage will be at the end of mining in Pit 1. An 800 foot wide highwall will need to be backfilled from 1.5H:1V to 3H:1V. The pit slopes, pit floor, and the facilities area will need to be topsoiled and revegetated.

Stage 2 worst case reclamation will occur when the 800 foot highwall needs to be backfilled in Pit 2. The pit slopes, pit floor, and the facilities area will need to be topsoiled and revegetated.

The bond for each stage is broken down below:

1. Stage 1 Worst Case Reclamation

Area requiring backfilling

800 feet of highwall to be backfilled at ~10,500 square foot backfill cross section = 311,111 CY

Area needing topsoiling:

Final slopes: 7.0 acres

Open Pit floor: 22.4 acres

Facilities Area: 7.9 acres

Total area = 44.3 acres

Area needing soil preparation, reseeding, mulching

Topsoiled area = 44.3

Stage 1 cost calculations and bond total can be found in Table L-1.

2. Stage 2 Worst Case Reclamation

Area requiring backfilling

800 feet of highwall to be backfilled at ~16,400 square foot backfill cross section = 485,926 CY

Area needing topsoiling:

Final slopes: 7.7 acres

Open Pit floor: 6.1 acres

Facilities Area: 7.9 acres

Total area = 21.7 acres

Area needing soil preparation, reseeding, mulching

Topsoiled area = 21.7

Stage 2 cost calculations and bond total can be found in Table L-2.

3. Operational Stage Independent Items

The office, shop, and other minor structures in the office/shop area will remain for commercial use after the mine is closed. The access road will remain for access to the upper terrace.

Table L-9: Stage 1 Reclamation Table

Activity Description	Time (Months)	Cost ($)
Remove all diesel tanks, truck scale and foundation, various surface supplies and final gravel stockpiles	2	$4,500
Backfill the mining face from 1.5H:1V to 3H:1V slope. • 311,111 CY @ $1.50/CY	0.5	$466,666
Topsoil of the graded sideslopes • 7.0 acres @ 5 inches = 4,706 cubic yards at $1.50 per cubic yard	0.2	$7,058
Rip the pit floor and compacted areas: 29.4 acres @ $200 per acre	0.5	$5,880
Place topsoil on pit floor: 22.4 acres @ 5 inches = 15,058 cubic yards @ $1.50 per cubic yard	0.5	$22,586
Disc topsoil areas prior to seeding: $100 per acre x 44.3 acres	0.1	$4,430
Seed and mulch all disturbed areas. Drill seeding and crimp mulching will be employed at $850/acre x 44.3 acres	0.1	$37,655

Totals	**3.9**	**$548,775**
DRMS Costs (28% x direct costs)		**$153,657**
Stage 1 Bond Amount		**$702,432**

Table L-2: Stage 2 Reclamation Table

Activity Description	Time (Months)	Cost ($)
Remove all diesel tanks, truck scale and foundation, various surface supplies and final gravel stockpiles	2	$4,500
Backfill the mining face from 1.5H:1V to 3H:1V slope. • 485,926 CY @ $1.50/CY	0.5	$728,889
Topsoil of the graded sideslopes • 7.7 acres @ 5 inches = 5,176 cubic yards at $1.50 per cubic yard	0.2	$7,764
Rip the pit floor and compacted areas: 13.8 acres @ $200 per acre	0.5	$5,880
Place topsoil on pit floor: 6.1 acres @ 5 inches = 4,100 cubic yards @ $1.50 per cubic yard	0.5	$6,150
Disc topsoil areas prior to seeding: $100 per acre x 21.7 acres	0.1	$2,170
Seed and mulch all disturbed areas. Drill seeding and crimp mulching will be employed at $850/acre x 21.7 acres	0.1	$17,360
Totals	**3.9**	**$772,713**
DRMS Costs (28% x direct costs)		**$216,360**
Stage 2 Bond Amount		**$989,073**
Stage 1 Bond Amount		**$702,432**
Additional Bond Needed from Stage 1 to Stage 2		**$286,641**

EXHIBIT M OTHER PERMITS AND LICENSES

Eagle County Special Use Permit

NPDES combined process water/storm water discharge permit

APEN – A fugitive air emissions permit will be needed from the Colorado Department of Public Health and Environment since the site.

A Substitute Water Supply Plan or Augmentation Plan from the Division of Water Resources is not needed for the operation since this is not a wet pit that will leave a gravel pit lake.

A CDOT Access Permit will be required for access to US Highway 6

A Spill Prevention Control and Countermeasure (SPCC) Plan is needed for the mining operation since the site tank storage exceeds 1320 gallons (there will be a 3000 gallon tank and a 10,000 gallon tank). Other tanks that will be located on site will be associated with the individual processing plants. Fuel will be brought to the site with a mobile fueling truck. No spilled material will be allowed to leave the site and all tanks will have secondary containment. In addition, the portable plants that will be on site from time to time each have their own separate SPCC Plans.

An Army Corps of Engineer 404 permit will be not necessary because no wetlands or waters of the U.S. will be disturbed.

EXHIBIT N SOURCE OF LEGAL RIGHT TO ENTER

EXHIBIT O OWNER(S) OF RECORD OF AFFECTED LAND (SURFACE AREA) AND OWNERS OF SUBSTANCE TO BE MINED

Parcel #	Owner Name	Owner Address	Proposed Use
193531100003	Coyote River Ranch LLC	PO Box 3149 Vail CO 81658	Gravel/Sand Mining
193532300005	Coyote River Ranch LLC	PO Box 88, Wolcott CO 81655	Gravel/Sand Mining
211305100002	Roy Jay & Rena Kay Miller	PO Box 2016, Eagle CO 81631-2013	Haul Road & Facilities Area
211305100025	Jay T. & Linda L. Taylor	PO BOX 1215 GYPSUM, CO 81637-1215	Access Road

EXHIBIT P MUNICIPALITIES WITHIN TWO MILES

EXHIBIT Q PROOF OF MAILING OF NOTICES TO COUNTY COMMISSIONERS AND SOIL CONSERVATION DISTRICT

EXHIBIT R

PROOF OF FILING
WITH COUNTY CLERK AND RECORDER

EXHIBIT S

PERMANENT MAN-MADE STRUCTURES

EXHIBIT T RULE 1.6.2(1)(B)

Prior to the submittal of the application, a sign was erected at the entrance to the site which contained all the required information regarding Rule 1.6.2(1)(b).

Please see enclosed sign certification.

GEOTECHNICAL STABILITY EXHIBIT

The entire mining operation at the Coyote Pit will take place with cobbly, sandy material. The majority of the excavated slopes can be expected to consist of cohesionless sand and gravel. Mining will take place to a 1.5H:1V slope, and then be backfilled to a 3H:1V slope for final reclamation. The mining slope is evaluated to demonstrate safety during operation (short-term) and the reclamation slope is evaluated for permanence.

3.1 Scenario 1 – Mining Slope

From Table 2.5 in the SME Mining Reference Handbook[1], the gravel is classified as sand and gravel, mixed grain size. This material has an internal angle of friction of approximately 45 degrees and no cohesion.

The Factor of Safety (FOS) for sand and gravel with a (1.5H:1V) 33.7 degree slope in such material with an assumed internal angle of friction of 45 degrees can be approximated by evaluating the internal angle of friction as follows:

$$FOS = \frac{\text{Tangent of Internal Angle of Friction}}{\text{Tangent of Actual Angle of Failure Surface}}$$

$$FOS = \frac{\text{Tan } 45°}{\text{Tan } 33.7°} = \frac{1}{0.667} = 1.5$$

The minimum safety factor for short-term slopes is 1.5, therefore the 1.5H:1V slopes will be safe during mining.

3.2 Scenario 2 – Reclaimed Slope

From Table 2.5 in the SME Mining Reference Handbook, the backfill is best classified as loose sand, mixed grain size. This material has an internal angle of friction of approximately 34 degrees and no cohesion.

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[1] Original source: Houk and Bray 1977

The Factor of Safety (FOS) for sand and gravel with a (3.5H:1V) 18.4 degree slope in GP classified material with an assumed internal angle of friction of 34 degrees can be approximated by evaluating the internal angle of friction as follows:

$$FOS = \frac{\text{Tangent of Internal Angle of Friction}}{\text{Tangent of Actual Angle of Failure Surface}}$$

$$FOS = \frac{\text{Tan } 34°}{\text{Tan } 18.4°} = \frac{0.6745}{0.3326} = 2.0$$

The minimum safety factor in the permanent case is 1.5, therefore the 3H:1V slopes will be safe as the final condition.

3.3 Conclusion

The factor of safety in both scenarios is above the minimum of 1.5 for permanent conditions.

Ben Langenfeld, P.E.

P.E.# 0047151

Date: _____

Appendix 1 – Soil Report

United States Department of Agriculture

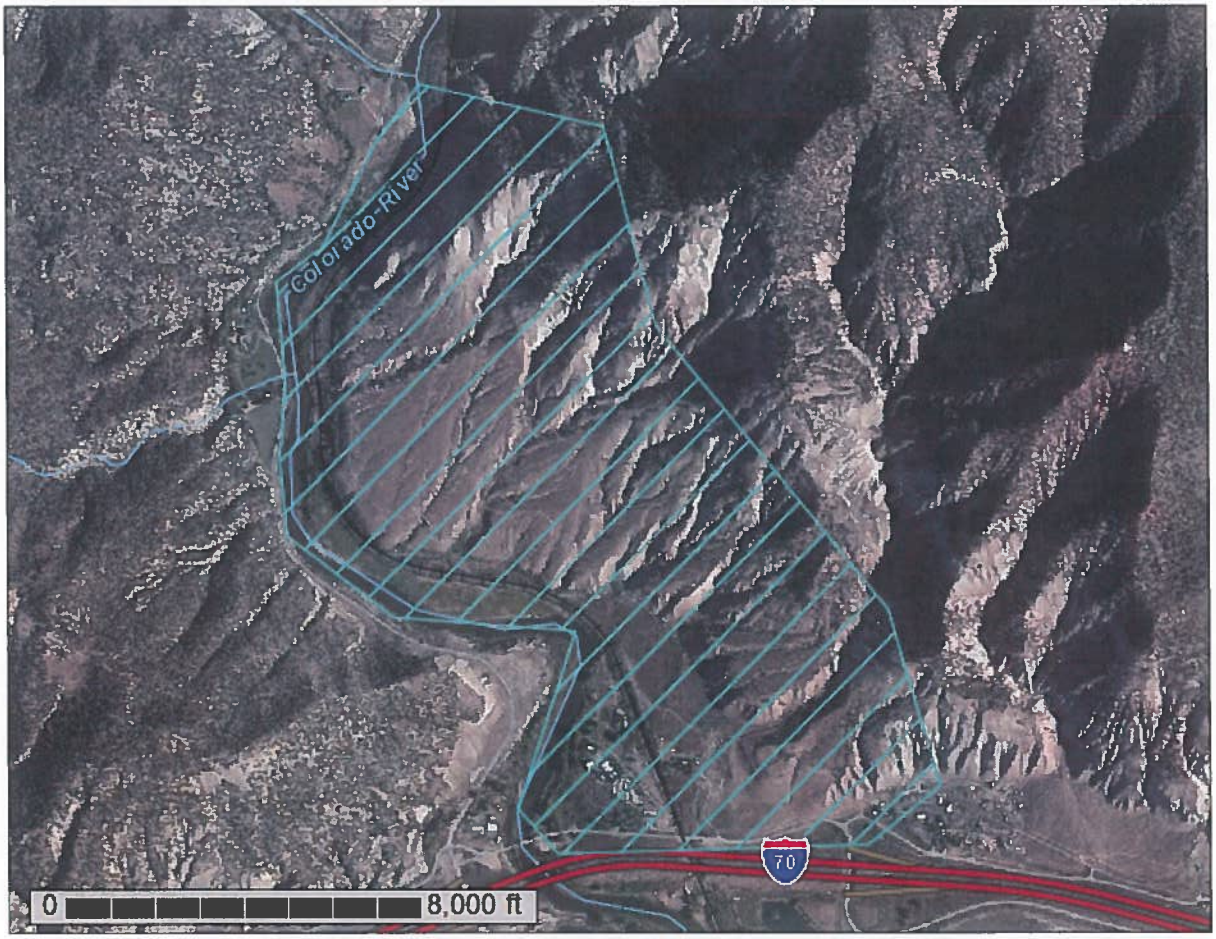
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties

Coyote Pit



April 3, 2014

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

107° 4' 25" W

107° 2' 52" W

39° 40' 18" N

39° 38' 43" N

Map Scale: 1:14,400 if printed on A portrait (8.5" x 11") sheet.

N

0 200 400 800 1200 Meters

0 500 1000 2000 3000 Feet

Map projection: Web Mercator Corner coordinates: WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties
Survey Area Data: Version 6, Dec 23, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 7, 2011—Sep 22, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties (CO655)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
25	Cushool-Rentsac complex, 15 to 65 percent slopes	2.7	0.5%
26	Dahlquist-Southace complex, 6 to 12 percent slopes	19.1	3.4%
33	Earsman-Rock outcrop complex, 12 to 65 percent slopes	0.0	0.0%
42	Fluvaquents, 0 to 10 percent slopes	0.7	0.1%
55	Gypsum land-Gypsiorthids complex, 12 to 65 percent slopes	18.4	3.3%
89	Mussel loam, 1 to 6 percent slopes	0.1	0.0%
92	Redrob loam, 1 to 6 percent slopes	1.5	0.3%
98	Southace cobbly sandy loam, 12 to 25 percent slopes	22.4	4.0%
99	Southace cobbly sandy loam, 25 to 65 percent slopes	184.2	32.9%
104	Torriorthents-Camborthids-Rock outcrop complex, 6 to 65 percent	190.5	34.0%
115	Yamo loam, 6 to 12 percent slopes	92.6	16.5%
120	Water	28.4	5.1%
Totals for Area of Interest		**560.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas

for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of

the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties

25—Cushool-Rentsac complex, 15 to 65 percent slopes

Map Unit Setting

Elevation: 6,200 to 7,600 feet
Mean annual precipitation: 10 to 15 inches
Mean annual air temperature: 42 to 45 degrees F
Frost-free period: 85 to 105 days

Map Unit Composition

Cushool and similar soils: 45 percent
Rentsac and similar soils: 40 percent

Description of Cushool

Setting

Landform: Mesas, mountains
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium derived from sandstone and shale

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Pinyon-Juniper (null_10)

Typical profile

0 to 7 inches: Loam
7 to 11 inches: Loam
11 to 26 inches: Channery loam
26 to 35 inches: Extremely channery sandy loam
35 to 39 inches: Weathered bedrock

Description of Rentsac

Setting

Landform: Mesas, mountains
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Residuum weathered from sandstone

Properties and qualities

Slope: 25 to 65 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Very low (about 1.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: D
Other vegetative classification: Pinyon-Juniper (null_10)

Typical profile

0 to 6 inches: Channery loam
6 to 18 inches: Extremely channery loam
18 to 22 inches: Unweathered bedrock

26—Dahlquist-Southace complex, 6 to 12 percent slopes

Map Unit Setting

Elevation: 6,200 to 7,400 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 42 to 46 degrees F
Frost-free period: 75 to 95 days

Map Unit Composition

Dahlquist and similar soils: 50 percent
Southace and similar soils: 40 percent

Description of Dahlquist

Setting

Landform: Alluvial fans, terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Low (about 3.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: Loamy Slopes (R048AY303CO)
Other vegetative classification: LOAMY SLOPES (null_31)

Typical profile

0 to 6 inches: Cobbly sandy loam
6 to 13 inches: Very cobbly sandy clay loam
13 to 23 inches: Very cobbly sandy loam
23 to 60 inches: Extremely cobbly sandy loam

Description of Southace

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Stony Foothills (R048AY287CO)
Other vegetative classification: Stony Foothills (null_81)

Typical profile

0 to 10 inches: Very stony sandy loam
10 to 22 inches: Extremely stony sandy loam
22 to 60 inches: Extremely stony loamy coarse sand

33—Earsman-Rock outcrop complex, 12 to 65 percent slopes

Map Unit Setting

Elevation: 6,000 to 8,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 42 to 44 degrees F
Frost-free period: 80 to 105 days

Map Unit Composition

Earsman and similar soils: 45 percent
Rock outcrop: 35 percent

Description of Earsman

Setting

Landform: Mountains
Landform position (three-dimensional): Mountainflank, mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from calcareous sandstone and/or residuum weathered from calcareous sandstone

Properties and qualities

Slope: 12 to 65 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Very low (about 1.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: D
Other vegetative classification: PIYON-JUNIPER (null_15)

Typical profile

0 to 5 inches: Very stony sandy loam
5 to 19 inches: Very channery sandy loam
19 to 23 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities

Slope: 12 to 65 percent

Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile
0 to 60 inches: Unweathered bedrock

42—Fluvaquents, 0 to 10 percent slopes

Map Unit Setting
Elevation: 3,500 to 7,200 feet
Mean annual precipitation: 14 to 18 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 80 to 150 days

Map Unit Composition
Fluvaquents and similar soils: 90 percent

Description of Fluvaquents

Setting
Landform: Flood plains, valley floors
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Mixed alluvium

Properties and qualities
Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 8.0 mmhos/cm)
Available water capacity: Moderate (about 8.2 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability classification (irrigated): 6w
Land capability (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: River Bottom (R048AY236CO)
Other vegetative classification: riverbottom (null_19)

Typical profile

0 to 10 inches: Variable
10 to 24 inches: Stratified gravelly sand to clay
24 to 60 inches: Very gravelly sand, gravelly sand

55—Gypsum land-Gypsiorthids complex, 12 to 65 percent slopes

Map Unit Setting

Mean annual precipitation: 10 to 15 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 80 to 105 days

Map Unit Composition

Gypsum land: 65 percent
Gypsiorthids and similar soils: 20 percent

Description of Gypsum Land

Properties and qualities

Slope: 12 to 65 percent
Depth to restrictive feature: 0 inches to paralithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Maximum salinity: Slightly saline to strongly saline (8.0 to 32.0 mmhos/cm)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile

0 to 60 inches: Gypsiferous material

Description of Gypsiorthids

Setting

Landform: Drainageways, hills, mountains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed colluvium and/or mixed residuum

Properties and qualities

Slope: 12 to 50 percent
Depth to restrictive feature: 10 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 12 percent
Maximum salinity: Very slightly saline to slightly saline (4.0 to 8.0 mmhos/cm)
Available water capacity: Low (about 5.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Fine sandy loam
8 to 23 inches: Fine sandy loam
23 to 39 inches: Fine sandy loam
39 to 43 inches: Weathered bedrock

89—Mussel loam, 1 to 6 percent slopes

Map Unit Setting

Elevation: 6,500 to 7,500 feet
Mean annual precipitation: 13 to 14 inches
Mean annual air temperature: 42 to 44 degrees F
Frost-free period: 75 to 90 days

Map Unit Composition

Mussel and similar soils: 90 percent

Description of Mussel

Setting

Landform: Fans, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous alluvium

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Rolling Loam (R048AY298CO)
Other vegetative classification: Rolling Loam (null_60)

Typical profile
0 to 8 inches: Loam
8 to 42 inches: Sandy clay loam
42 to 60 inches: Gravelly sandy clay loam

92—Redrob loam, 1 to 6 percent slopes

Map Unit Setting
Elevation: 5,800 to 7,200 feet
Mean annual precipitation: 16 to 18 inches
Mean annual air temperature: 40 to 44 degrees F
Frost-free period: 85 to 105 days

Map Unit Composition
Redrob and similar soils: 85 percent
Minor components: 10 percent

Description of Redrob

Setting
Landform: Valley floors, flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium derived from sandstone and shale

Properties and qualities
Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 18 to 48 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.3 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability classification (irrigated): 4w
Land capability (nonirrigated): 4w
Hydrologic Soil Group: C
Ecological site: River Bottom (R048AY236CO)
Other vegetative classification: riverbottom (null_19)

Typical profile

0 to 14 inches: Loam
14 to 20 inches: Stratified loamy sand to stony loam
20 to 60 inches: Extremely cobbly loamy sand

Minor Components

Fluvaquents

Percent of map unit: 10 percent
Landform: Flood plains

98—Southace cobbly sandy loam, 12 to 25 percent slopes

Map Unit Setting

Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 42 to 46 degrees F
Frost-free period: 95 to 105 days

Map Unit Composition

Southace and similar soils: 90 percent

Description of Southace

Setting

Landform: Alluvial fans, mountains, terraces
Landform position (three-dimensional): Lower third of mountainflank, tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Loamy Slopes (R048AY303CO)
Other vegetative classification: LOAMY SLOPES (null_31)

Typical profile

0 to 3 inches: Cobbly sandy loam
3 to 14 inches: Gravelly loam
14 to 26 inches: Very gravelly loam
26 to 60 inches: Very cobbly fine sandy loam

99—Southace cobbly sandy loam, 25 to 65 percent slopes

Map Unit Setting

Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 42 to 46 degrees F
Frost-free period: 95 to 105 days

Map Unit Composition

Southace and similar soils: 85 percent

Description of Southace

Setting

Landform: Mountains, terraces, alluvial fans
Landform position (three-dimensional): Lower third of mountainflank, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium derived from sandstone and shale

Properties and qualities

Slope: 25 to 65 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Loamy Slopes (R048AY303CO)
Other vegetative classification: LOAMY SLOPES (null_31)

Typical profile

0 to 3 inches: Cobbly sandy loam
3 to 14 inches: Gravelly loam
14 to 26 inches: Very gravelly loam
26 to 60 inches: Very cobbly fine sandy loam

104—Torriorthents-Camborthids-Rock outcrop complex, 6 to 65 percent

Map Unit Setting

Elevation: 5,000 to 8,500 feet
Mean annual precipitation: 10 to 15 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 80 to 105 days

Map Unit Composition

Torriorthents and similar soils: 45 percent
Camborthids and similar soils: 20 percent
Rock outcrop: 15 percent

Description of Torriorthents

Setting

Landform: Mountains, ridges, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Mountainflank, side slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from sedimentary rock and/or residuum weathered from sedimentary rock

Properties and qualities

Slope: 6 to 65 percent
Depth to restrictive feature: 4 to 30 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Variable
4 to 30 inches: Gravelly loam
30 to 34 inches: Unweathered bedrock

Description of Camborthids

Setting

Landform: Hills, ridges, mountains
Landform position (two-dimensional): Footslope, backslope

Landform position (three-dimensional): Mountainflank, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from shale and/or colluvium derived from shale and/or alluvium derived from sandstone and/or colluvium derived from sandstone and/or alluvium derived from basalt and/or colluvium derived from basalt

Properties and qualities

Slope: 6 to 65 percent
Depth to restrictive feature: 15 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Variable
4 to 30 inches: Clay loam
30 to 34 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities

Slope: 6 to 65 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile

0 to 60 inches: Unweathered bedrock

115—Yamo loam, 6 to 12 percent slopes

Map Unit Setting

Elevation: 6,200 to 7,500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 40 to 44 degrees F
Frost-free period: 85 to 105 days

Map Unit Composition

Yamo and similar soils: 80 percent

Description of Yamo

Setting

Landform: Mountains, fans
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from sandstone and/or colluvium derived from shale and/or colluvium derived from gypsum

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: High (about 9.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Rolling Loam (R048AY298CO)
Other vegetative classification: Rolling Loam (null_60)

Typical profile

0 to 8 inches: Loam
8 to 14 inches: Loam
14 to 60 inches: Loam

120—Water

Map Unit Composition

Water: 95 percent
Minor components: 5 percent

Minor Components

Aquolls

Percent of map unit: 5 percent
Landform: Marshes
Down-slope shape: Linear
Across-slope shape: Linear

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Appendix 2 – Channel and Culvert Designs

Coyote Pit
Channel C Restoration
and
Culvert C

100-Year, 24-Hour

GLA

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11541 Warrington Court
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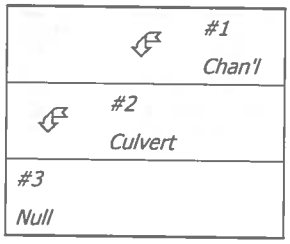
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.420 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.000	
Culvert	#2	==>	#3	0.000	0.000	
Null	#3	==>	End	0.000	0.000	



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	27.600	27.600	20.65	2.06
#2	0.000	27.600	20.65	2.06
#3	0.000	27.600	20.65	2.06

Structure Detail:

Structure #1 (Riprap Channel)

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	3.0:1	3.0:1	33.3	0.50		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	20.65 cfs	
Depth:	0.17 ft	0.67 ft
Top Width:	5.99 ft	8.99 ft
Velocity*:		
X-Section Area:	0.91 sq ft	
Hydraulic Radius:	0.150 ft	
Froude Number*:		
Manning's n*:		
Dmin:	6.00 in	
D50:	18.00 in	
Dmax:	22.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #2 (Culvert)

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
30.00	2.00	0.0150	3.00	0.00	0.90

Culvert Results:

Design Discharge = 20.65 cfs

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Structure #3 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	27.600	0.220	0.053	0.437	85.000	M	20.77	2.056
	Σ	**27.600**						**20.65**	**2.056**
#2	Σ	**27.600**						**20.65**	**2.056**
#3	Σ	**27.600**						**20.65**	**2.056**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	15.25	343.72	2,253.90	11.710	0.053
#1	**1**	**Muskingum K:**					**0.053**

Coyote Pit
Channels G & F Restoration
Culvert F

100-Year, 24-hour

GLA

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Phone: (720) 842-5321
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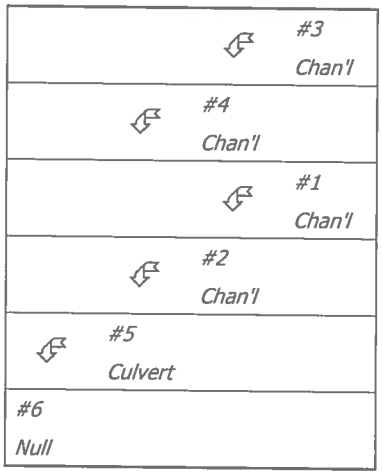
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.420 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.000	Channel F Steep
Channel	#2	==>	#5	0.000	0.000	Channel F Flat
Channel	#3	==>	#4	0.000	0.000	Channel G Steep
Channel	#4	==>	#5	0.000	0.000	Channel G Flat
Culvert	#5	==>	#6	0.000	0.000	
Null	#6	==>	End	0.000	0.000	



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#3	3.000	3.000	2.20	0.22
#4	0.000	3.000	2.20	0.22
#1	16.100	16.100	11.18	1.20
#2	0.000	16.100	11.18	1.20
#5	0.000	19.100	13.37	1.42
#6	0.000	19.100	13.37	1.42

Structure Detail:

Structure #3 (Riprap Channel)

Channel G Steep

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
1.00	3.0:1	3.0:1	66.7	0.50		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.20 cfs	
Depth:	0.06 ft	0.56 ft
Top Width:	1.35 ft	4.35 ft
Velocity*:		
X-Section Area:	0.07 sq ft	
Hydraulic Radius:	0.050 ft	
Froude Number*:		
Manning's n*:		
Dmin:	4.00 in	
D50:	12.00 in	
Dmax:	15.00 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #4 (Riprap Channel)

Channel G Flat

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
1.00	3.0:1	3.0:1	1.0	0.50		

Riprap Channel Results:

Simons/OSM Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.20 cfs	
Depth:	0.50 ft	1.00 ft
Top Width:	3.99 ft	6.99 ft
Velocity:	1.77 fps	
X-Section Area:	1.24 sq ft	
Hydraulic Radius:	0.299 ft	
Froude Number:	0.56	
Manning's n:	0.0377	
Dmin:	2.00 in	
D50:	9.00 in	
Dmax:	12.00 in	

Structure #1 (Riprap Channel)

Channel F Steep

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	3.0:1	3.0:1	33.3	0.50		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	11.18 cfs	
Depth:	0.10 ft	0.60 ft
Top Width:	5.61 ft	8.61 ft
Velocity*:		
X-Section Area:	0.54 sq ft	
Hydraulic Radius:	0.096 ft	
Froude Number*:		
Manning's n*:		
Dmin:	5.00 in	
D50:	15.00 in	
Dmax:	18.75 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #2 (Riprap Channel)

Channel F Flat

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	3.0:1	3.0:1	2.0	0.50		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	11.18 cfs	
Depth:	0.35 ft	0.85 ft
Top Width:	5.10 ft	8.10 ft
Velocity*:		
X-Section Area:	1.41 sq ft	
Hydraulic Radius:	0.272 ft	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #5 (Culvert)

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
30.00	2.00	0.0150	3.00	0.00	0.90

Culvert Results:

Design Discharge = 13.37 cfs

Minimum pipe diameter: 1 - 21 inch pipe(s) required

Structure #6 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#3	1	3.000	0.240	0.054	0.415	85.000	M	2.21	0.224
	∑	**3.000**						**2.20**	**0.224**
#4	∑	**3.000**						**2.20**	**0.224**
#1	1	16.100	0.285	0.068	0.417	85.000	M	11.28	1.196
	∑	**16.100**						**11.18**	**1.196**
#2	∑	**16.100**						**11.18**	**1.196**
#5	∑	**19.100**						**13.37**	**1.420**
#6	∑	**19.100**						**13.37**	**1.420**

Appendix 3 - Maps