Quarry 1 Reclamation Plan

GCC Rio Grande, Inc.

Tijeras Mine and Mills

BE001RE

Date March 10, 2020

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1. Introduction

GCC Rio Grande, Inc. (GCC Rio Grande) owns and operates the Tijeras Mine and Mill, consisting of a Portland cement plant and multiple surface limestone quarries, located near the Village of Tijeras, New Mexico.

GCC Rio Grande is submitting the Quarry 1 Reclamation Plan to the New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division ("MMD") as per MMD Permit #BE001RE, which authorizes mining and reclamation activities on the site. Approval of this plan is required prior to the implementation of reclamation activities in the Quarry 1 area. This plan has been prepared by GCC Rio Grande to meet the requirements of the New Mexico Mining Act, § 69-36-11, New Mexico Statutes Annotated (NMSA) and its implementing regulations including 19.10.5.506, New Mexico Administrative Code (NMAC).

The objective of this plan is to provide for the reestablishment of a "self-sustaining ecosystem" that is consistent with the surrounding area and post-mining land use. This plan describes the measures that will be taken to reclaim the identified disturbances area, establish a self-sustaining ecosystem, and meet environmental standards.

2. Project Description

GCC Rio Grande, Inc. (GCC) proposes to reclaim a portion of Quarry 1 consisting of 27.12 acres shown in Appendix A Figure 1. The following reclamation description follows the standards of the approved 2019 Mine Closeout Plan. GCC is using a phased approach to execute the reclamation. The target date of completion for the reclamation is 2023. The post mining land use for this location is reactional and wildlife habitat.

3.Quarry 1 Engineering Design

GCC will use the Quarry 1 Engineered design from Water & Earth Technologies (WET). Design provides the sloping and contouring for reclaiming the proposed area. The summary also provides information on drainage channels and how those will be lined and incorporated. The Stormwater will continue to be captured by the onsite sediment pond until all operations have ceased.

All reclaimed areas will be stable and exhibit none of the following characteristics:

- Large rills or gullies (greater than 3 inches wide or deep)
- Perceptible soil movement or head cutting in any drainages
- Slope instability on or adjacent to the reclaimed area

See the attached Summary for Quarry 1 Post-Mining Topography (PMT) Design at GCC Tijeras Plant in Appendix B for the additional information of the reclamation design.

4. Reclamations Activities

4.1 Reclamation Preparation

To prepare for the approval of the reclamation work plan, GCC has proceeded with removing the slope failure in Quarry 1 to stabilize the location and generate additional material to use in the reclamation process. Reclamation of Quarry 1 will occur as follows:

- Surface Re-contouring and Seedbed Preparation
    - Backfill of excavated areas with stockpiled subsurface overburden materials
    - Contouring of reclaimed subsurface to 3H:1V or flatter

- Even placement of stockpiled topsoil over area to be reclaimed
- Harrowing of final topsoil grade for seedbed preparation

- Seeding and Mulching
  - Seed application by broadcast or drill seeding (preferred)
  - Application of mulch
  - Stabilizing mulch through punching or crimping
- Monitoring
  - Monitoring will follow the approved method per the 2019 Mine Closeout Plan

4.2 Surface Re-contouring

Excavated areas will be backfilled with stockpiled subsurface materials only; topsoil will not be placed as backfill. Subsurface soils will then be contoured (graded) to match design plan closely as practicable, with no slopes exceeding 3H:1V. The material needed to complete the contouring will be obtained primarily from Quarry 1. In the event that the material in Quarry 1 is not sufficient, GCC has determined Quarry 7 will be the additional source of material. The materials to be used are limestone and Redbed material. GCC will use dozers and excavators for the primary contouring work. The facility Stormwater BMP's will remain in place while the reclamation is in progress.

4.3 Seed Bed Preparation

The geomorphic methods described in Section 5.3.1 of the 2019 Mine Closeout Plan result in range of slopes reflective of the original pre-mining topography with a two-foot deep Redbed topdressing. The 2008 test plot study indicated that the application of fertilizer or organic amendments is not cost effective and that the native Redbed soils is a suitable, effective plant growth medium (Habitat Management 2009). Thus, the re-contoured surface will be conditioned only by surface roughening. A rough final surface facilitates seed entrapment, moisture retention, and erosion control. Surface roughening operations can be conducted either immediately before (contour furrowing) or after (land imprinting) broadcast seeding. Seed will be adequately covered and the seedbed firmed up through the land imprinting process. Localized and natural sloughing, and movement of the soil will also assist in "setting" the seedbed if contour furrowing is used. All sites with a final geomorphic grade will be scarified using a bulldozer equipped with small harrowers. Scarification will be done in two perpendicular passes with the final pass on the contour for added erosion control.

4.4 Seeding

Seed will be sowed across the mine reclamation areas using broadcast. Seed will be as locally-sourced as possible and weed-free certified, with each seed bag tagged and labeled with certification information. If primary plant species are not available at time of purchase, replacement species will be also native to the area. All revegetation areas will be broadcast seeded as soon as practicable after Redbed materials have been prepared for planting with three native seed mixtures at a rate of 40 pure live seeds per square foot Due to seed size variability and slope variability, most areas will be hand-seeded. Rice hulls will be used as a seed extender to allow for the even application of the seed. Smooth, medium and large sized seeds that are easily broadcast will be placed in one sub-mixture. Species with small seeds will be placed in their own sub-mixture to avoid differential settling during planting. This sub-mixture will be applied separately (different broadcasters or at different times) from sub-mixtures 1 and 2 in an effort to ensure the even distribution of plant seeds across the reclamation areas. Seed will be applied during the summer before monsoon rains establish, likely in June. A second window of opportunity exists in early November to seed.

GCC will use the approved seed mixture from the 2019 Mine Closeout Plan shown in Table 1.

Table 1- Reclamation Seed Mixture

Species	Common Name	Desired %	PLS/ SqFt	Lbs. PLS/ Acre
	Grasses			
Pascopyrum smithii	Western wheatgrass	5	1	.396
Pseudoroegneria spicata	bluebunch wheatgrass	5	2	0.622
Andropogon hallii	sand bluestem	5	1	0.385
Bouteloua curtipendula	sideoats grama	5	2	0.456
Bouteloua gracilis	blue grama	5	2	0.106
Pleuraphis jamesii	James's galleta	5	1	0.274
Achnatherum hymenoides	Indian ricegrass	5	1	0.309
Sporobolus cryptandrus	sand dropseed	5	2	0.016
Stipa neomexicana	New Mexican feathergrass	5	1	0.379
	Grass Total	**45**	**9**	**2.94**
	Forbs			
Achillea millifolium	western yarrow	3.5	2	0.031
Dalea purpurea	Purple Prairie Clover	3.5	1	0.207
Gaillardia aristata	Indian blanket flower	3.5	1	0.104
Linum lewisii	Lewis (Blue) flax	3.5	2	0.66
Lupinus argenteus	silver mountain lupine	3.5	2	4.760
Fallugia paradoxa	Apache Plume	3.5	2	0.224
Penstemon angustifolia	narrow-leaf penstemon	3.5	2	0.224
Ratibida columnifera	coneflower	3.5	1	0.0354
Sphaeralcea coccinea	scarlet globemallow	3	2	0.174
	Forb Total	**31**	**6.2**	**6.49**
	Shrubs			
Atriplex canescens	four-wing saltbush	3	1	0.837
Krascheninnikovia lanata	winterfat	3	1	0.768
Cercocarpus montanus	mountain mahogany	3	2	1.476
Ericameria nauseosa	rubber rabbitbrush	3	1	0.109
Chrysothamnus viscidiflorus	yellow rabbitbrush	3	1	0.056
Purshia mexicana	New Mexico cliffrose	3	2	1.348
Purshia tridentata	antelope bitterbrush	3	2	5.808
Rosa woodsii	Wood's rose	3	2	1.923
	Shrub Total	**24**	**4.8**	**12.326**
	Seed Mixture Total	**100**	**40**	**21.764**

Notes: pure live seeds = PLS; % = percent

4.4 Revegetation Monitoring

Revegetation monitoring will occur throughout the bonding period.

4.5 Monitor Method

GCC will follow the approved monitoring method per the 2019 Mine Closeout Plan.

4.5 Evaluation of Success Criteria

Per the 2019 Mine Closeout Plan at the beginning in the 10th year after seeding, revegetation success will be tested against the approved performance standard. The parameters to be measured on the reclaimed sites shall be equal to or greater than the approved performance standard. The appropriate test is a one-tailed *t* test with a 90% confidence interval. The test statistic is:

$$X_r - 0.90\ (x_h)$$

$$t = \frac{S_r}{\sqrt{n_r}}$$

Where

x_r	is the reclamation mean
x_h	is the approved performance standard
s_r	is the reclamation standard deviation
n_r	is the reclamation sample size

If the mean values of the sample parameters from the reclaimed sites are equal to or greater than those of the historical record with the appropriate confidence level, the revegetation shall be deemed successful. To use the above test, the assumptions must be valid that the data is drawn from a normal population. Fortunately, the *t* test remains relatively valid for non-normal populations which possess a mound shaped probability distribution.

5. Bond Release

Once the FA bond period is attained and the re-vegetation has been deemed successful by meeting the standards, GCC will prepare and submit a letter requesting release from financial responsibility for the reclaimed area.

Appendix A Maps


GCC
TOTAL AREA = 27.12 ac.

Appendix B Quarry 1 Design Summary

Engineering Summary for Quarry 1
Post-Mining Topography (PMT) Design at the GCC Tijeras Plant

Prepared for:

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February 12, 2020

I, Richard Spotts, state that the information presented in the report entitled “Engineering Summary for Quarry 1 PMT Design at the GCC Tijeras Plant” prepared for GCC Rio Grande Inc. dated February 12, 2020, was prepared by me or a person(s) under my supervision and is correct to the best of my knowledge and information.

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Introduction

Water & Earth Technologies, Inc. (WET) has prepared this post-mining topography (PMT) design for Quarry 1 at the GCC Rio Grande Inc. Tijeras Plant (GCC). WET used a geomorphic design approach for development of the PMT at Quarry 1. The PMT consists of an undulating surface created by numerous small ridges and drains. The result is a complex topography with short concave slopes and numerous slope aspects. The goal of this PMT design is to create a stable landform that blends into the surrounding terrain, supporting revegetation diversity, and optimizing geomorphic stability.

Quarry 1 has a predominant aspect of east-northeast and drains directly into Sediment Pond 1. There is still some limestone that will be mined in Quarry 1 before reclamation activities can proceed. GCC provided WET with a projected surface at the end of mining that was the basis for development of the PMT.

PMT Design

The Quarry 1 reclamation area comprises about 27.2 acres with a relatively steep mean gradient of 22.8 percent. There is no upgradient watershed that runs onto Quarry 1. Stormwater runoff for the entire area is ephemeral and is routed through small drains into Sediment Pond 1. The Quarry 1 PMT design uses short slope lengths to minimize surface erosion.

Consideration was given to the final tie in of Quarry 1 drainages into the conceptual Corral Canyon drainage alignment presented in the final closeout plan. At mine closeout, Quarry 1 reclamation is expected to be well established as a stable landform. During the final stages of reclamation at mine closeout, Corral Canyon will be restored adjacent to Sediment Pond 1 and reconnected with the intact reach of Corral Canyon near the permit boundary. During, or shortly after reconstructing Corral Canyon, Quarry 1 drainages can be modified to flow into the reconstructed reach of Corral Canyon. The Corral Canyon reconstruction is currently permitted as a conceptual design; accordingly, this discussion to modify Quarry 1 at closeout is also conceptual.

The majority of reclaimed land in Quarry 1 will not require modification at closeout. It is proposed that Channel D1 be modified to flow directly into the reconstructed reach of Corral Canyon, and that Sediment Pond 1 be backfilled and reclaimed. For instance, Channel D1 can be modified from its confluence with Channel D24 (immediately above Sediment Pond 1) and extended by about 630 feet to connect with the conceptual Corral Canyon reconstruction. This would result in a 6.8 percent longitudinal slope for the extended reach of Channel D1 (Figure 1). Channel D25 and Channel D26 could be extended to flow into the reconstructed Channel D1 during mine closeout. Or, given that these watershed areas are so small, Channel D25 and Channel 26 could be joined into a single channel that flows off-site. A schematic of this tie in and connection is shown in Figure 1.

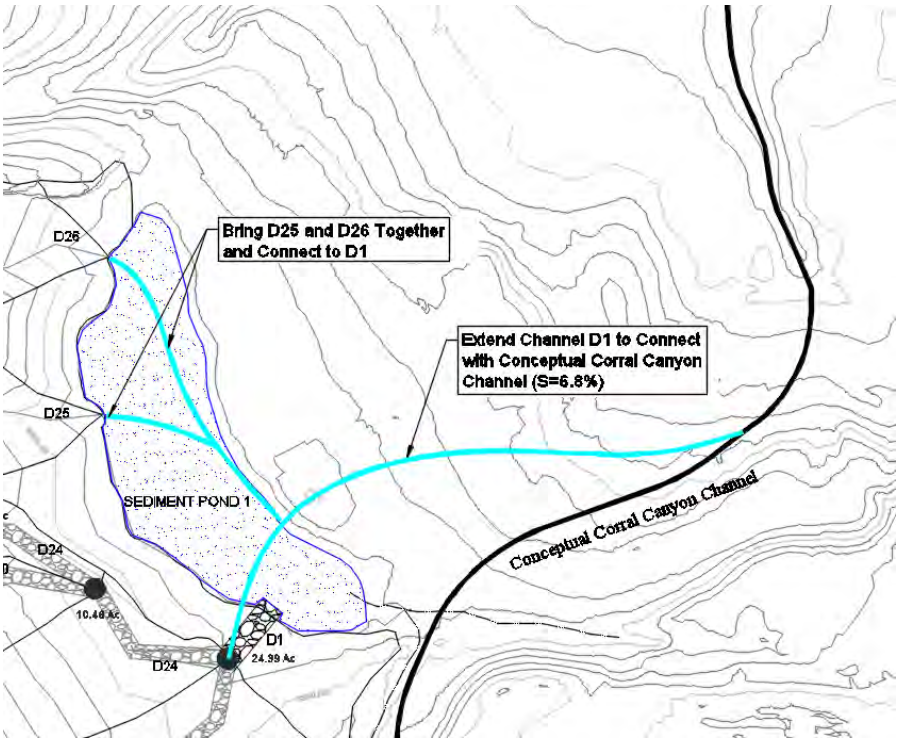


Figure 1. Conceptual Channel D1 Alignment that Flows into Corral Canyon at Mine Closeout

Maximum Slope Length and Drainage Density

The Revised Universal Soil Loss Equation (RUSLE) was used to predict soil detachment rates with a not-to-exceed limit of 4.4 tons/ac/year. This value is associated with background conditions. Inputs for RUSLE included an R-Factor of 27, a K-Factor of 0.33 for topdressing, a C-Factor for reclamation of 0.12, with LS-Factors calculated for 13 site-specific slope locations (S1-S13) and five different slope gradients (associated with the maximum slope length) that are encountered in the Quarry 1 PMT design. The K-factor of 0.33 assumes the top-dressing material ("Redbed") will be used in the top 2 feet for the PMT construction. These input parameters have previously been used successfully for geomorphic reclamation in Quarry 4 at GCC Tijeras Plant. Maximum slope lengths for slope gradients ranging from 15 percent through 50 percent are presented below (Table 1). Further detail on the location of the representative slopes can be found in the figure provided in Appendix A. Screen shots of the RUSLE analysis have also been provided.

Table 1. Maximum Slope Lengths for Slope Gradients to Limit Hillslope Erosion

Slope	Maximum Slope Length (ft)
50%	30 ft
33%	54 ft
25%	87 ft
20%	137 ft
15%	273 ft

Drainage density is the measurement of the total length of all streams per unit area of drainage basin. The Quarry 1 PMT was designed with a high drainage density to accommodate steep slopes, local soils, and worst-case conditions. The drainage density for Quarry 1 is 451 linear feet/acre.

Hydrology and Hydraulics

The Quarry 1 PMT drains are designed to safely pass the 100-year, 24-hour storm event. The Quarry 1 PMT design has Small Drains, Medium Drains, and one Large Drain. The Small Drains have watershed areas of about 1 to 2 acres with steep channel gradients between 15 and 25 percent. As two or more Small Drains combine, they become Medium Drains. At the lower end of the PMT design, two Medium Drains combine to form a Large Drain.

SEDCAD 4.0 was used for hydrologic and hydraulic modeling of the designed drains. Peak discharges during the 100-year, 24-hour storm were modeled for incremental watershed sizes from 0.5 acres up to 1.8 acres, which encompasses the size range of all the Small Drains. Similarly, peak discharge was modeled for seven additional watersheds ranging in size from 2.0 acres up to 10.5 acres that correspond with Medium Drains. Peak discharge for the 100-year, 24-hour storm was modeled as a single watershed for the Large Drain. SEDCAD output representing the 12 separate analysis points corresponding to the various sub-watershed areas for the 27.2-acre PMT area are included in Appendix B.

The hydrologic input parameters included: 1) the 100-year, 24-hour rainfall depth of 3.55 inches as specified in NOAA Atlas 14, 2) a New Mexico Type II-65 rainfall distribution, 3) a curve number of 77, and 4) watershed areas as measured from the PMT at various design points. Results of the hydrologic analysis are summarized below (Table 2). The Channel Utility feature within SEDCAD 4.0 was used for hydraulic analysis for the designed drains. Peak discharge for the 100-year, 24-hour storm was applied to the drains at various channel gradients occurring within the PMT.

Drain Design

This PMT design follows geomorphic reclamation principles that emphasize concave drainage gradient profiles. As drainage area and flow rate increases, the channel gradient decreases; this design approach serves to balance erosional and depositional forces and optimize topographic stability. To achieve adequate landform stability, twenty-six drains are included in the Quarry 1 PMT design. Two small drains flow directly into Sediment Pond 1, with the remaining sub-watersheds and their respective drains forming a dendritic complex watershed network that flows into Sediment Pond 1 at the opposite end from its outlet. This larger watershed includes Small, Medium, and Large Drains.

The Small Drains have a 3-foot bottom width, are least 2-feet deep and have sideslopes that are 4h:1v or flatter. The Small Drains will be constructed from a compacted rocky soil that consists of 70% 6-inch minus rock, by volume, and 30% soil, by volume. The largest Small Drain is D1 with an area of 1.8 acres. Sub-watershed D1 was used for channel design in the SEDCAD Channel Utility to ensure at least 1 foot of freeboard above the peak water surface elevation and for calculating rock size (Table 2).

As the Small Drains flow together, they become Medium Drains. The SEDCAD Channel Utility was used to model six medium drainage locations, ranging in watershed area from 2.0 acres up to 10.5 acres. These drain designs have sideslopes 4h:1v or flatter, a 5-foot bottom width and at least 2 feet of depth. The Medium Drains will be constructed from a compacted rocky soil that consists of 70% 6-inch minus rock, by volume, and 30% soil, by volume.

The Large Soil Riprap Drain will be constructed for one short reach, approximately 70-feet long, beginning at the confluence of drains D1 and D24 and ending in Sediment Pond 1. This is the largest drain with a total watershed area of 24.4 ac. It has a moderate gradient of 5.3 percent. The Large Soil Riprap Drain has an 8-foot bottom width with at least 2 feet of depth and 4h:1v sideslopes. Soil Riprap consists of a mixture of 65% riprap and 35% native soil. The riprap will have a D_{50} of 6-inches as specified in the drawings. Soil Riprap will be placed and compacted into the subgrade to achieve a dense mass that is virtually free of voids.

All drains are designed to pass the 100-year, 24-hour peak discharge with at least 1 foot of freeboard. Peak discharge was calculated for 12 different watershed sizes. Hydraulic analyses were performed using the SEDCAD Channel Utility for each of the 26 drains using their respective peak discharge. A safety factor (S.F.) was calculated for the drains as shown in Equation 1:

$$S.F. = \frac{Total\ Drain\ Depth\ (ft)}{Q100\ Flow\ Depth\ (ft)}$$

The SEDCAD Channel Utility was also used to calculate riprap size based on peak discharge from the 100-year, 24-hour storm. When SEDCAD calculations specified a riprap gradation of either D_{min} = 2 inches, D_{50} = 3 inches, and D_{max} = 4.5 inches, or a smaller gradation, then a compacted rocky soil was specified for the drains. The compacted rocky soil specification is a mixture of 70 percent stone and 30 percent soil, by volume. The stone specified for compacted rocky soil will be 6-inch minus material which corresponds well with the calculated riprap size of D_{max} = 4.5 inches. The downstream-most reach of Drain D1 has a relatively large discharge; thus, while SEDCAD computed a riprap size with a 4.5-inch D_{50}, the riprap specified for this design was up-sized to a 6-inch D_{50} for extra stability. The rock and riprap for these drains is intended to be sourced locally from the Tijeras Limestone Mine, and from excavation of Quarry 1, if possible. If bedrock or gravelly material is encountered during excavation of the drains at final grade, then over-excavation and replacement with riprap is not required. Significant voids in channel linings are not permitted. A site Engineer will observe and approve channel lining placement during construction.

Topography

The final PMT design controls erosion by limiting slope length and including many small topographic undulations formed by drains, ridges, sub-ridges and sub-valleys. The ridges and drains form the general PMT, while the sub-ridges and sub-valleys are subtle grading features that are intended to direct overland flow into the drains and limit slope length. The final drawings specify that all drains, ridges, sub-ridges, and sub-valleys must be present in the final constructed surface. A minimum of 2 feet of topdressing (suitable plant growth medium) shall be placed in all areas, except directly in the drains. If 2 feet of topdressing is already present when final grade is excavated, it will be ripped to a minimum depth of 1 foot prior to seeding and mulching.

Grading Tolerances

Machine control is specified for subgraded and final graded surfaces. Digital files of the surfaces will be provided to the party responsible for construction. Tolerance for the final grade is plus or minus 1 foot which includes the 2 feet of top-dressing material. A close tolerance is required due to the importance of achieving slope gradients and lengths, and smooth channel profiles. Deviations outside of the grading tolerance must be approved by a site Engineer. In addition to topographic tolerances, the final graded surface must include all topographic features including drains, ridges, sub-ridges and sub-valleys.

Table 2. Summary of Hydrologic and Hydraulic Analysis from SEDCAD Channel Utility

Drain ID	Station (ft)	Watershed Area (ac)*	Q100 (cfs)	Flow Depth (ft)	Drain Depth (ft)	Freeboard (ft)	Safety Factor	Riprap D50 (in)
D1	0+00 to 6+36	1.83	4.6	0.30	2.0	1.70	6.7	1.5
D1	6+36 to 11+31	10.43	26.3	0.66	2.0	1.34	3.0	3.0
D1	11+31 to 15+31	13.31	33.5	0.74	2.0	1.26	2.7	3.0
D1	15+31 to 16+21	24.39	61.4	0.83	2.0	1.17	2.4	3.0
D2	0+00 to 1+39	0.50	1.3	0.13	2.0	1.87	15.4	1.5
D2	1+39 to 4+21	4.57	11.5	0.39	2.0	1.61	5.1	3.0
D3	0+00 to 1+39	0.50	1.3	0.12	2.0	1.88	16.7	1.5
D4	0+00 to 2+57	1.00	2.5	0.17	2.0	1.83	11.8	1.5
D5	0+00 to 3+48	1.00	2.5	0.18	2.0	1.82	11.1	1.5
D5	3+48 to 4+72	1.83	4.6	0.19	2.0	1.81	10.5	1.5
D6	0+0 to 5+68	1.83	4.6	0.27	2.0	1.73	7.4	1.5
D7	0+00 to 2+44	0.50	1.3	0.13	2.0	1.87	15.4	1.5
D8	0+00 to 2+91	1.00	2.5	0.17	2.0	1.83	11.8	**
D9	0+00 to 3+74	1.00	2.5	0.16	2.0	1.84	12.5	1.5
D10	0+00 to 2+25	0.50	1.3	0.10	2.0	1.90	20.0	**
D11	0+00 to 3+48	1.00	2.5	0.17	2.0	1.83	11.8	1.5
D11	3+48 to 7+28	4.27	10.8	0.34	2.0	1.66	5.9	3.0
D12	0+00 to 4+04	1.00	2.5	0.19	2.0	1.81	10.5	**
D13	0+00 to 4+06	1.00	2.5	0.17	2.0	1.83	11.8	1.5
D13	4+06 to 7+30	4.57	11.5	0.34	2.0	1.66	5.9	3.0
D14	0+00 to 3+89	1.00	2.5	0.16	2.0	1.84	12.5	1.5
D15	0+00 to 3+14	1.00	2.5	0.17	2.0	1.83	11.8	1.5
D16	0+00 to 2+83	1.00	2.5	0.16	2.0	1.84	12.5	1.5
D16	2+83 to 6+09	1.83	4.6	0.18	2.0	1.82	11.1	1.5
D17	0+00 to 3+57	0.50	1.3	0.12	2.0	1.88	16.7	1.5
D18	0+00 to 3+14	0.50	1.3	0.10	2.0	1.90	20.0	**
D18	3+14 to 4+27	1.83	4.6	0.20	2.0	1.80	10.0	1.5
D19	0+00 to 1+95	0.50	1.3	0.13	2.0	1.87	15.4	1.5
D20	0+00 to 2+52	1.83	4.6	0.25	2.0	1.75	8.0	3.0
D20	2+52 to 4+77	7.21	18.2	0.47	2.0	1.53	4.3	3.0
D20	4+77 to 10+18	10.48	26.4	0.59	2.0	1.41	3.4	3.0
D21	0+00 to 4+09	1.00	2.5	0.17	2.0	1.83	11.8	1.5
D22	0+00 to 2+26	0.50	1.3	0.13	2.0	1.87	15.4	1.5
D23	0+00 to 2+89	1.00	2.5	0.17	2.0	1.83	11.8	1.5
D24	0+00 to 4+39	1.00	2.5	0.17	2.0	1.83	11.8	**
D24	4+39 to 6+02	10.48	26.4	0.78	2.0	1.22	2.6	1.5
D24	6+02 to 7+68	13.31	33.5	0.94	2.0	1.06	2.1	1.5
D25	0+00 to 4+05	1.00	2.5	0.19	2.0	1.81	10.5	1.5
D26	0+00 to 2+96	1.00	2.5	0.19	2.0	1.81	10.5	1.5

*Modeled watershed area is displayed in Table. Actual watershed size is equal to, or smaller than modeled watershed size.

**Modeled as an Erodible Channel with the SEDCAD Channel Utility because the discharge is too small to calculate a riprap size. A compacted rocky soil liner is specified for this drain.

Performance Standards

The performance standards presented here will be used to determine when, and if, repairs are necessary to the PMT. The performance standards consider both hillslope stability and channel stability. Repair work, including the method of repair and urgency of repair should be discussed and agreed upon with New Mexico Mining and Minerals Division (MMD) prior to implementation. In the early years following final reclamation (suggested year 1 through year 5), it may be permissible to observe erosion and determine if vegetation is able to mature and stabilize the area without additional management inputs, if determined appropriate by a site Engineer and MMD.

1. If a hillslope contains numerous parallel rills and gullies, at least 6 inches deep, that are clearly systemic with no vegetation colonizing the rilled area, then repairs will become necessary. Isolated rills and gullies do not require repair unless they threaten the integrity of the overall landform.
2. If significant vertical incision occurs in the drains at the reach scale (i.e., greater than 1-foot deep) then repairs will become necessary. The reach scale is defined as a distance equal to 10 times the channel width, measured at the peak water surface elevation for the 100-year, 24-hour storm.
3. If significant lateral erosion occurs in the drains resulting in destabilization of the landform sideslopes, or results in erosion outside of the compacted rocky soil lining, then repairs will become necessary. Destabilizing the landform sideslopes is defined as oversteepening such that vegetation fails to establish on the slope above or below the drain (i.e., Greater than -feet above the drain invert).

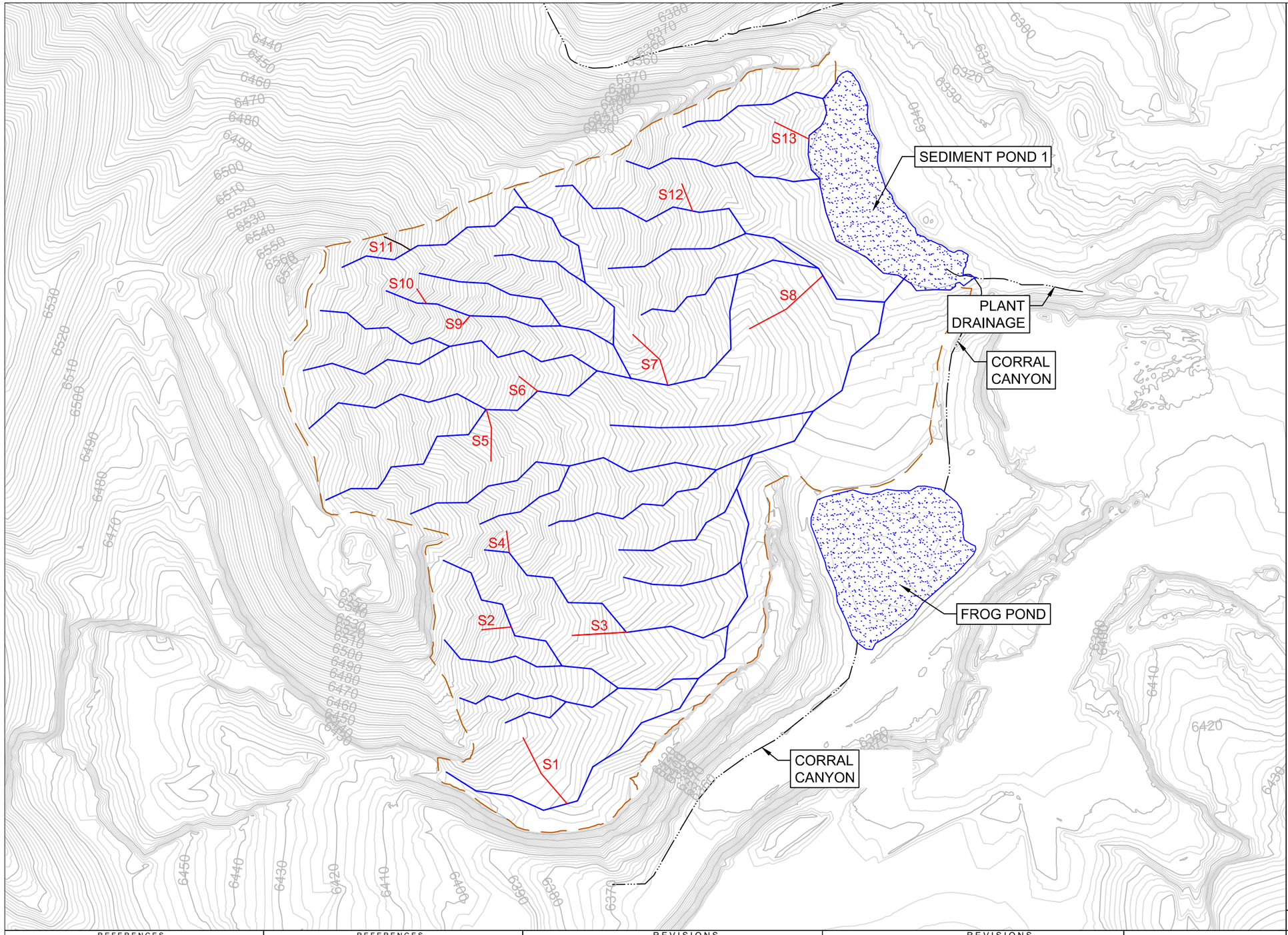
Conclusion

This PMT design package includes final grading topography, drain design, and performance standards. In this PMT design, hydrologic, hydraulic, and erosion analyses were conducted for worst-case conditions. Geomorphic reclamation principles were used to design the PMT for a stable surface with topographic diversity. As the reclaimed area matures and vegetation becomes established, the PMT is expected to function as a natural system without the need for regular maintenance.

APPENDIX A – RUSLE ANALYSIS

This appendix shows the RUSLE output from the 13 slopes indicated on the map figure entitled Appendix A: Representative RUSLE Slopes (S1-S13). The R, K C and P factors have been described in the report and have been previously used in prior deigns at the Tijeras Limestone Quarry. The target for the soil loss parameter (A (tons/acre/year)) was not to exceed 4.4 tons/acre/year. The LS screen shots show the gradient and lengths of the slopes shown on the map.

A secondary analysis was completed for maximum slope lengths at various gradients. These slopes are labeled as G50, G33, G25, G20 and G15, with the number being representative of the grade.



GEOMORPHIC GRADING BOUNDARY
DRAIN CENTERLINE
FINAL GRADE INDEX CONTOUR 10-FT INTERVAL)
FINAL GRADE INTERMEDIATE CONTOUR (2-FT INTERVAL)
RUSLE SLOPE LOCATION
EXISTING EPHEMERAL DRAINAGE
POND LOCATIONS

N

0' 200' 300' 400'

REFERENCES		REFERENCES		REVISIONS							REVISIONS						
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION	NO.	BY	CKD	APP.	CLIENT	DATE	DESCRIPTION

GCC TIJERAS

QUARRY 1 PMT DESIGN

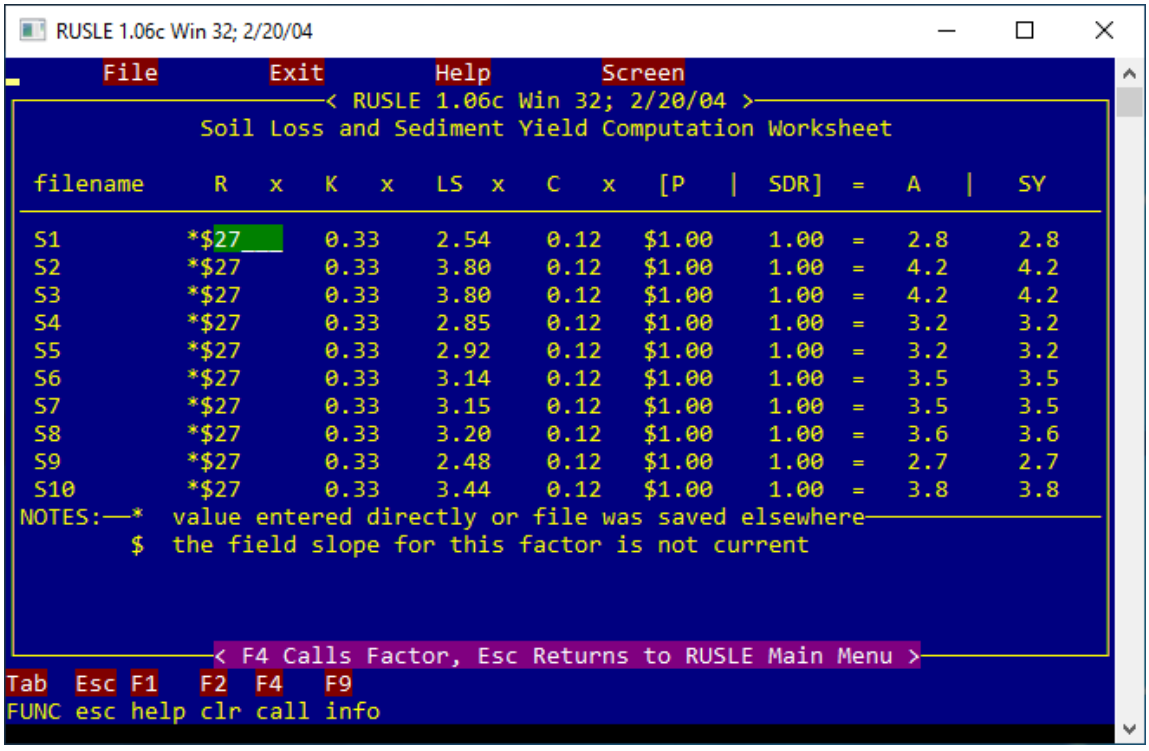
REPRESENTATIVE RUSLE SLOPES (S1-S13)

CONTRACTOR SHEET NO. APPENDIX A

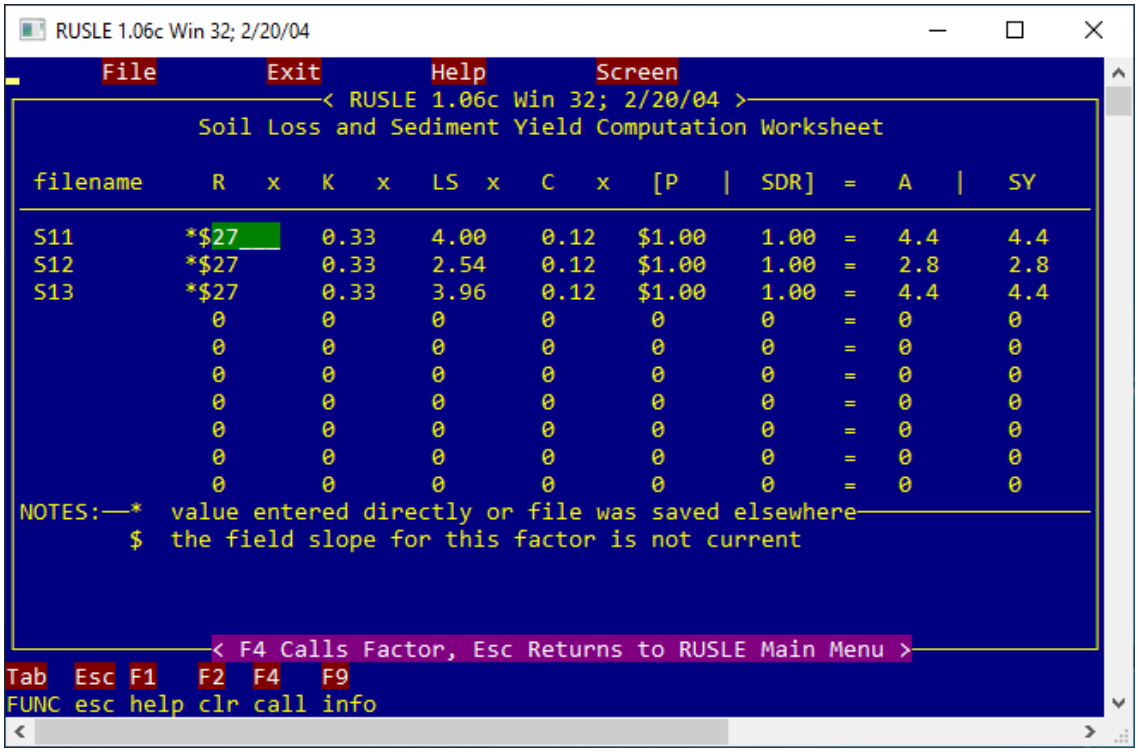
DWG. NO.

REVISION | DATE 2/10/2020

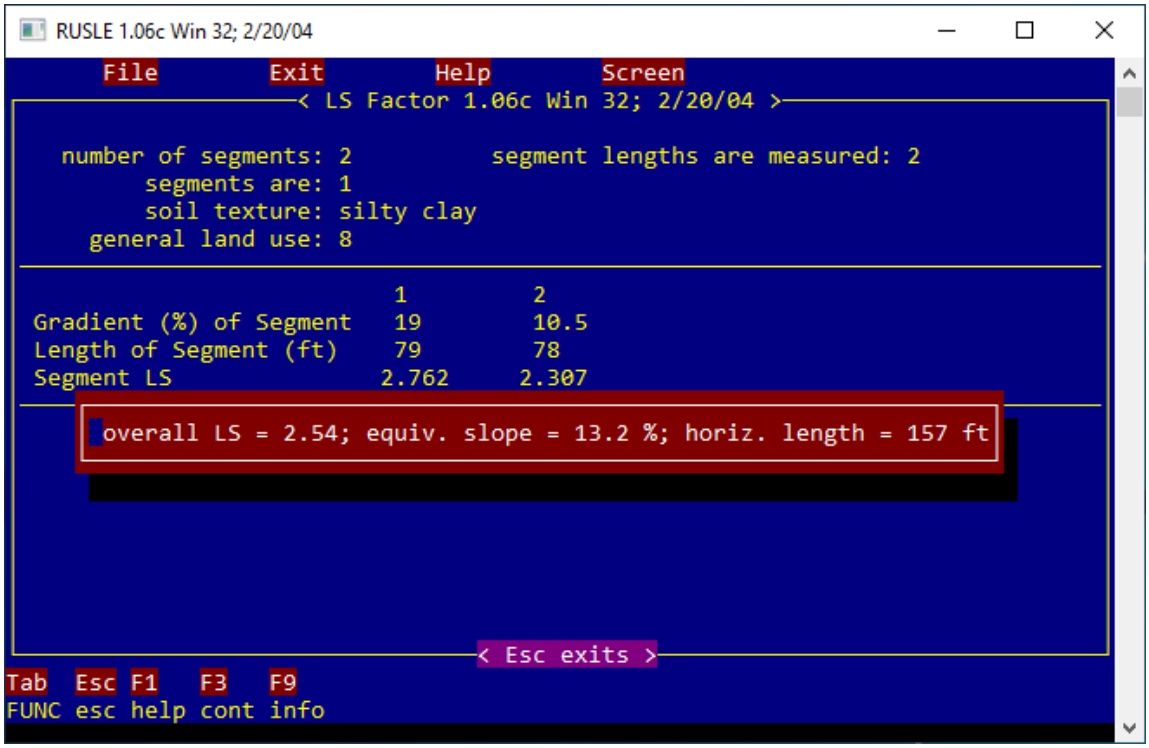
S1-S10 Summary Table



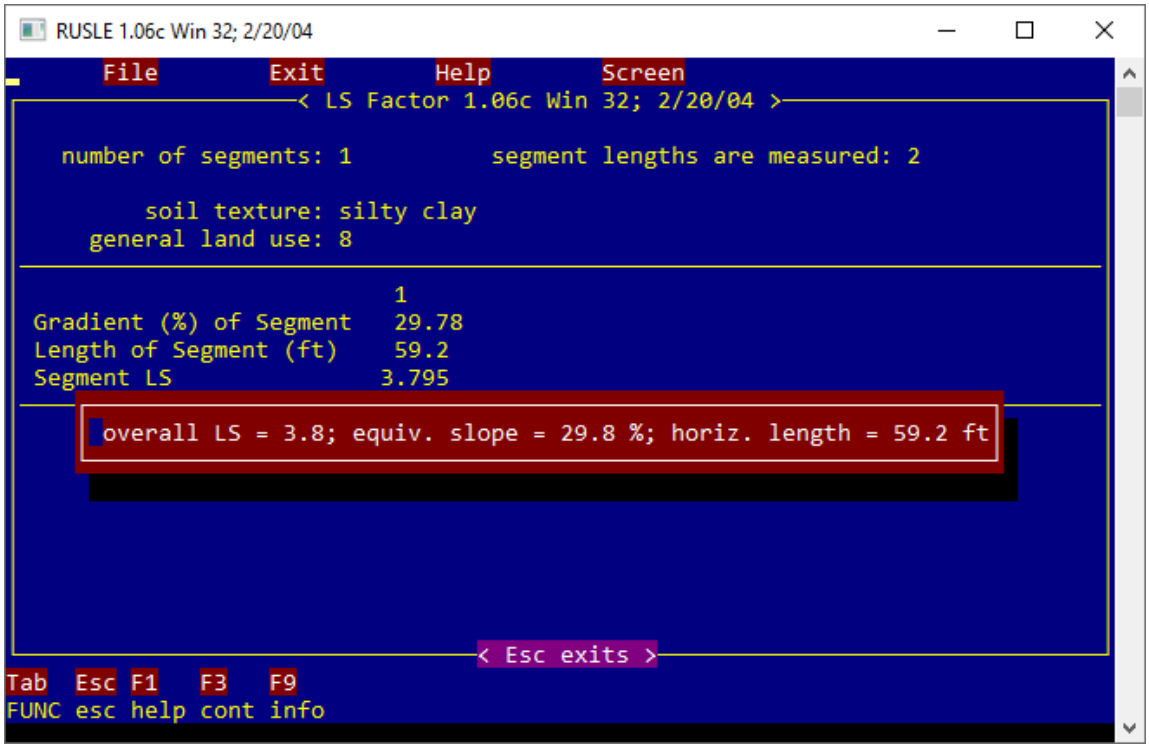
S11-S13 Summary Table



S1


RUSLE 1.06c Win 32; 2/20/04
File Exit Help Screen
< LS Factor 1.06c Win 32; 2/20/04 >
number of segments: 2 segment lengths are measured: 2
segments are: 1
soil texture: silty clay
general land use: 8
1 2
Gradient (%) of Segment 19 10.5
Length of Segment (ft) 79 78
Segment LS 2.762 2.307
overall LS = 2.54; equiv. slope = 13.2 %; horiz. length = 157 ft
< Esc exits >
Tab Esc F1 F3 F9
FUNC esc help cont info

S2


RUSLE 1.06c Win 32; 2/20/04
File Exit Help Screen
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number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 29.78
Length of Segment (ft) 59.2
Segment LS 3.795
overall LS = 3.8; equiv. slope = 29.8 %; horiz. length = 59.2 ft
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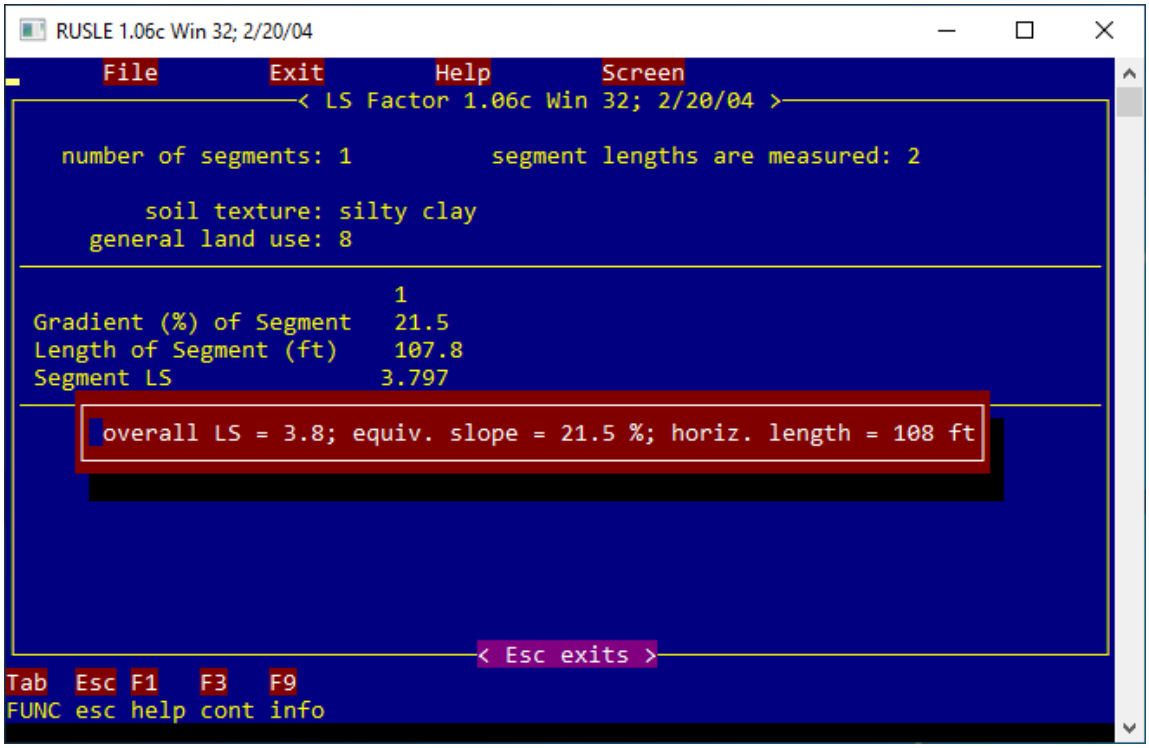
Tab Esc F1 F3 F9
FUNC esc help cont info

S3


RUSLE 1.06c Win 32; 2/20/04
File Exit Help Screen
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number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 21.5
Length of Segment (ft) 107.8
Segment LS 3.797
overall LS = 3.8; equiv. slope = 21.5 %; horiz. length = 108 ft
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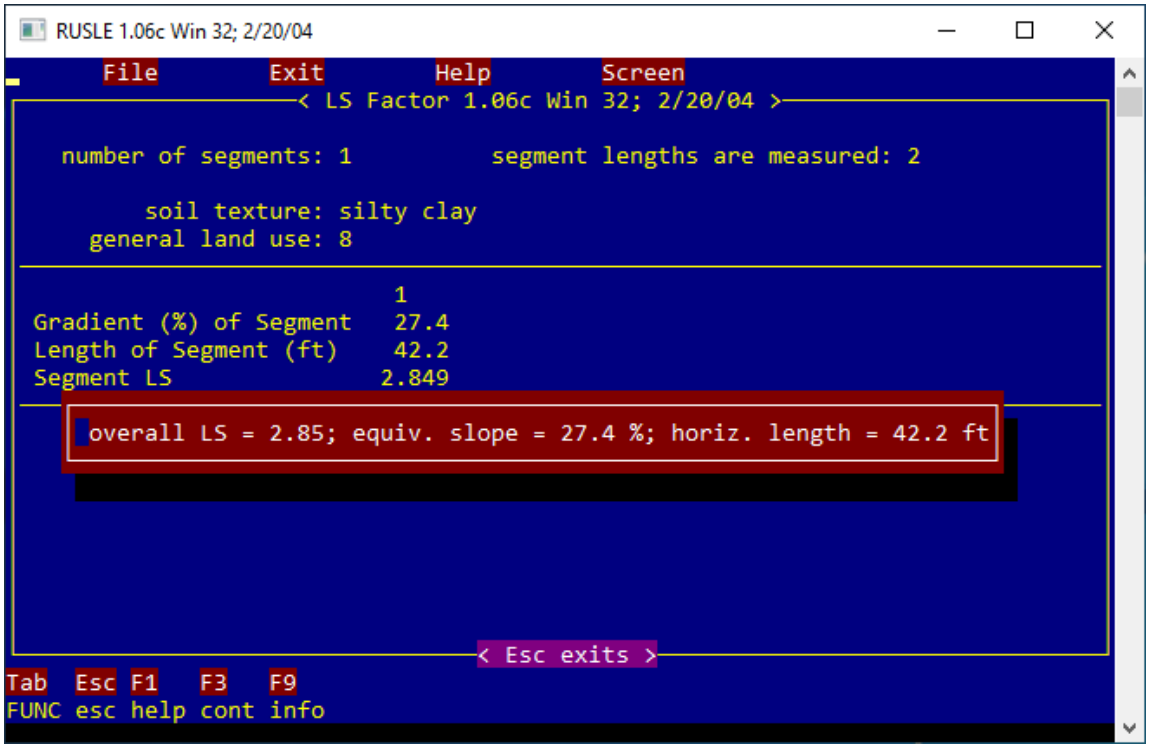
Tab Esc F1 F3 F9
FUNC esc help cont info

S4


RUSLE 1.06c Win 32; 2/20/04
File Exit Help Screen
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number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 27.4
Length of Segment (ft) 42.2
Segment LS 2.849
overall LS = 2.85; equiv. slope = 27.4 %; horiz. length = 42.2 ft
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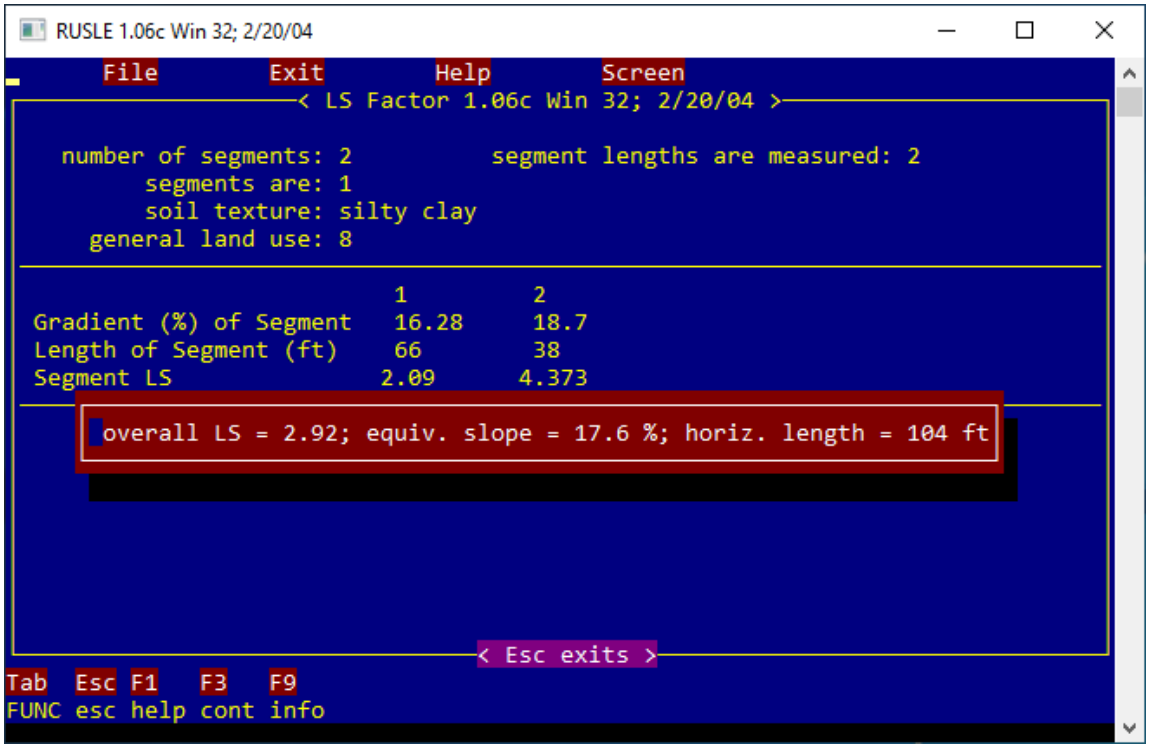
FUNC esc help cont info

S5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File Exit Help Screen
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number of segments: 2 segment lengths are measured: 2
segments are: 1
soil texture: silty clay
general land use: 8
1 2
Gradient (%) of Segment 16.28 18.7
Length of Segment (ft) 66 38
Segment LS 2.09 4.373
overall LS = 2.92; equiv. slope = 17.6 %; horiz. length = 104 ft
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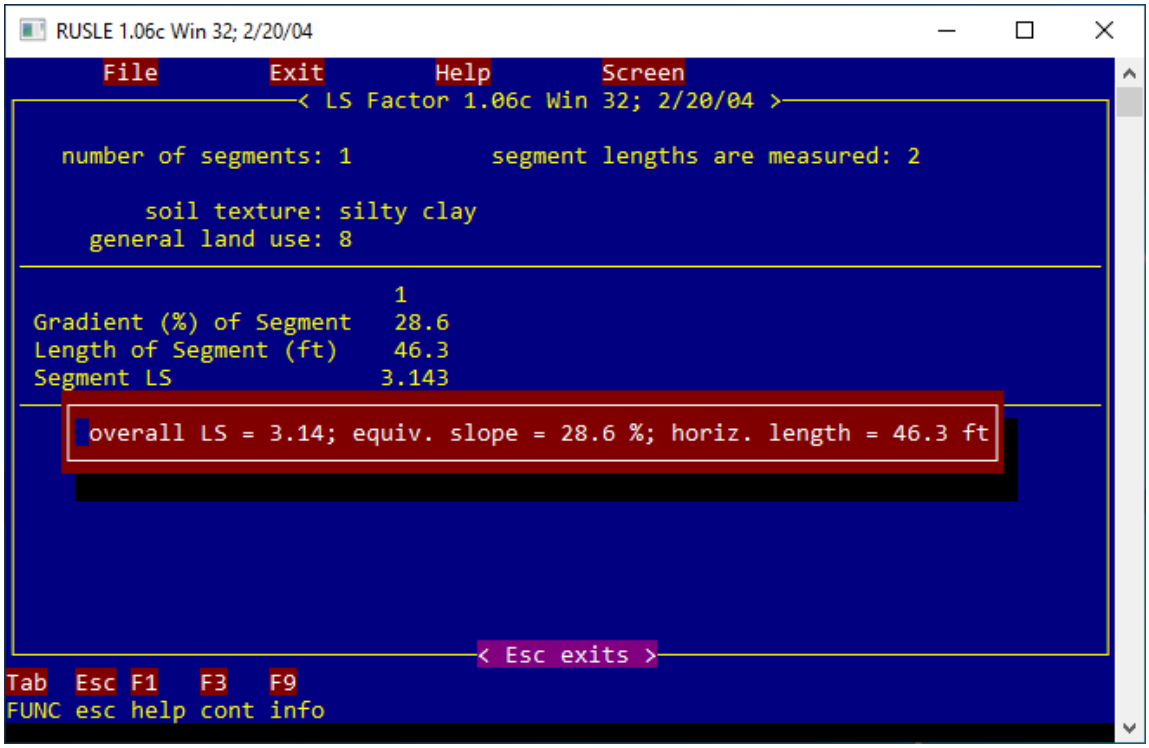
Tab Esc F1 F3 F9
FUNC esc help cont info

S6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File Exit Help Screen
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number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 28.6
Length of Segment (ft) 46.3
Segment LS 3.143
overall LS = 3.14; equiv. slope = 28.6 %; horiz. length = 46.3 ft
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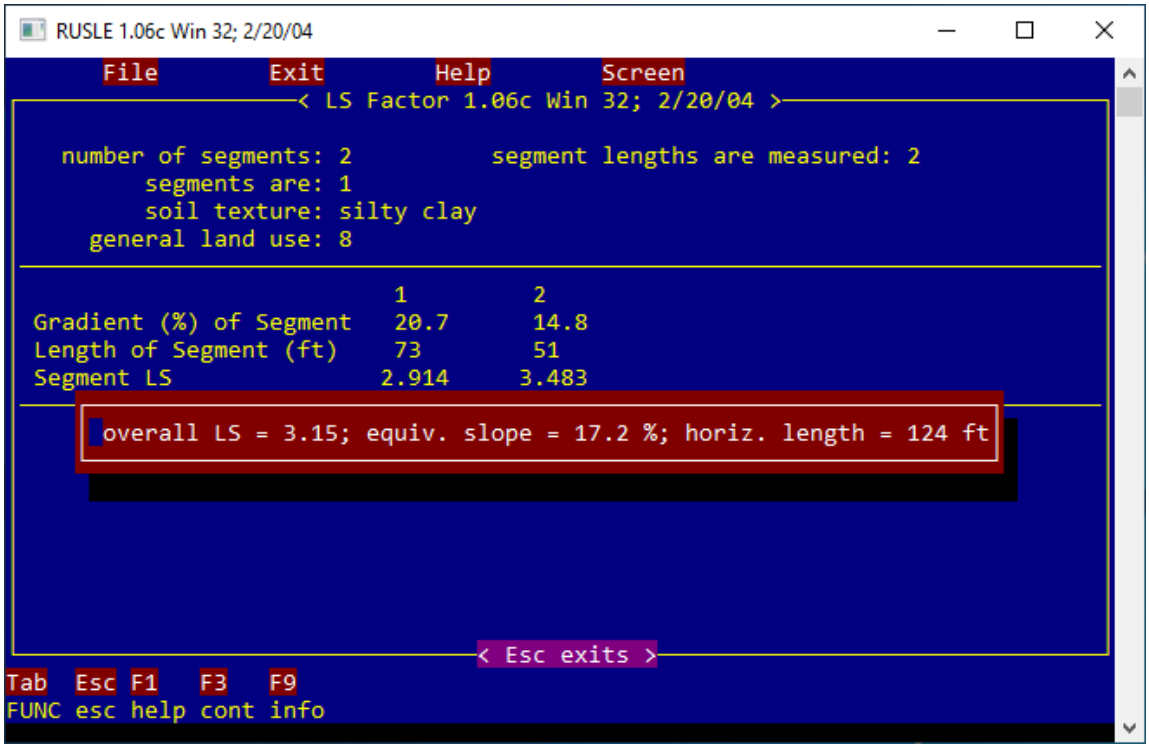
Tab Esc F1 F3 F9
FUNC esc help cont info

S7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File Exit Help Screen
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number of segments: 2 segment lengths are measured: 2
segments are: 1
soil texture: silty clay
general land use: 8
1 2
Gradient (%) of Segment 20.7 14.8
Length of Segment (ft) 73 51
Segment LS 2.914 3.483
overall LS = 3.15; equiv. slope = 17.2 %; horiz. length = 124 ft
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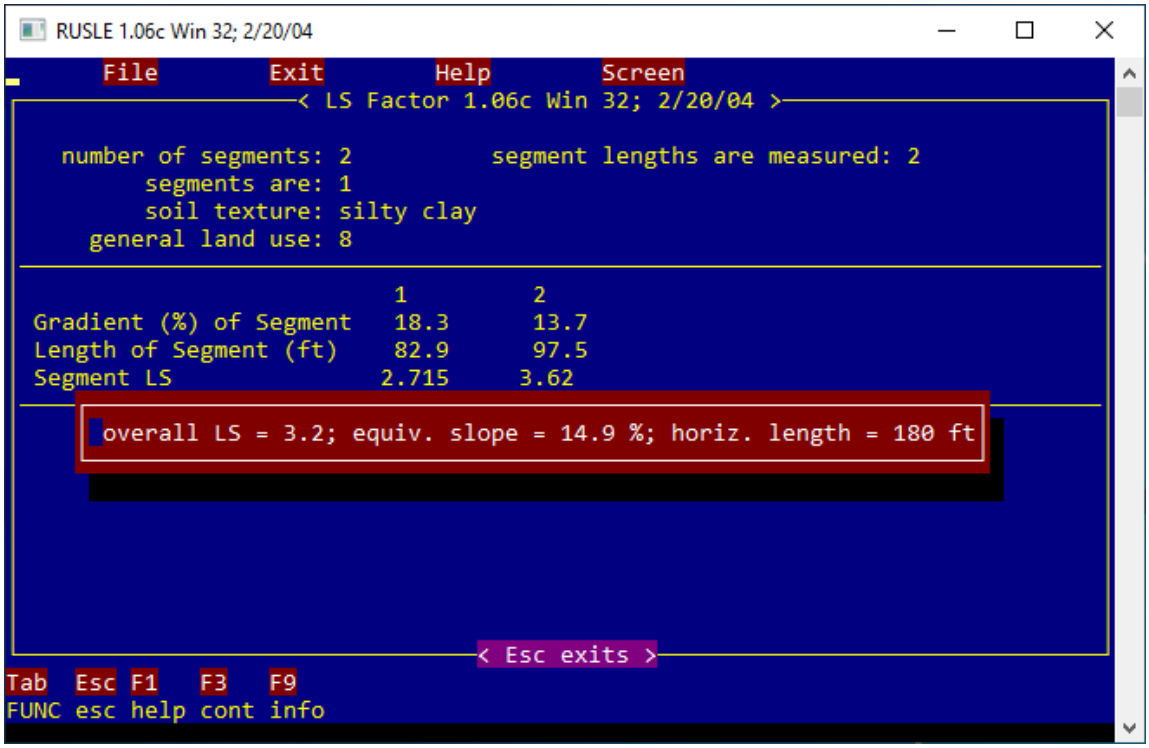
FUNC esc help cont info

S8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number of segments: 2 segment lengths are measured: 2
segments are: 1
soil texture: silty clay
general land use: 8
1 2
Gradient (%) of Segment 18.3 13.7
Length of Segment (ft) 82.9 97.5
Segment LS 2.715 3.62
overall LS = 3.2; equiv. slope = 14.9 %; horiz. length = 180 ft
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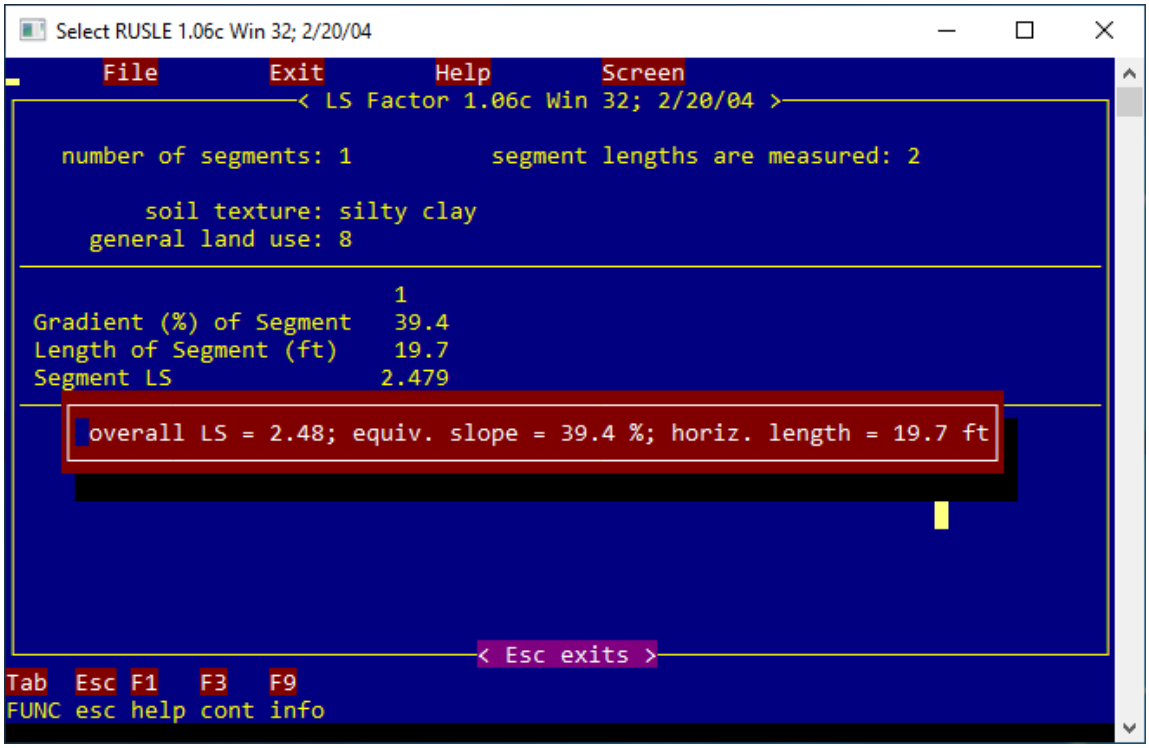
FUNC esc help cont info

S9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File Exit Help Screen
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number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 39.4
Length of Segment (ft) 19.7
Segment LS 2.479
overall LS = 2.48; equiv. slope = 39.4 %; horiz. length = 19.7 ft
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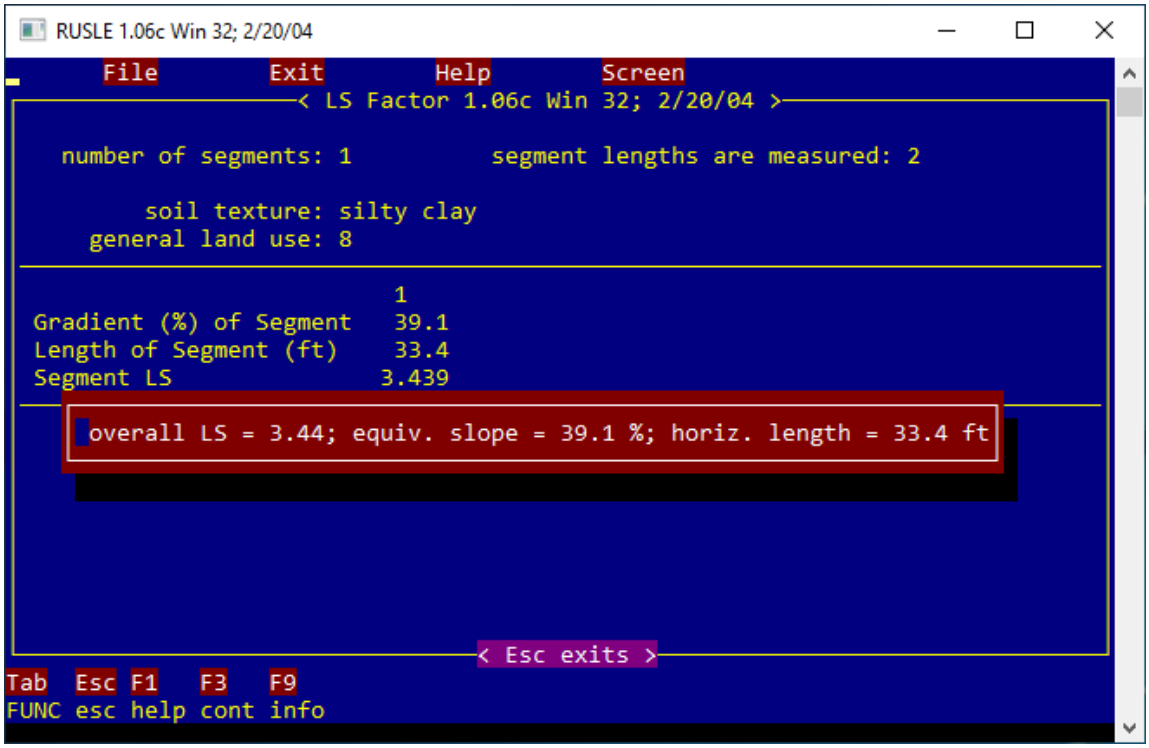
Tab Esc F1 F3 F9
FUNC esc help cont info

S10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File Exit Help Screen
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general land use: 8
1
Gradient (%) of Segment 39.1
Length of Segment (ft) 33.4
Segment LS 3.439
overall LS = 3.44; equiv. slope = 39.1 %; horiz. length = 33.4 ft
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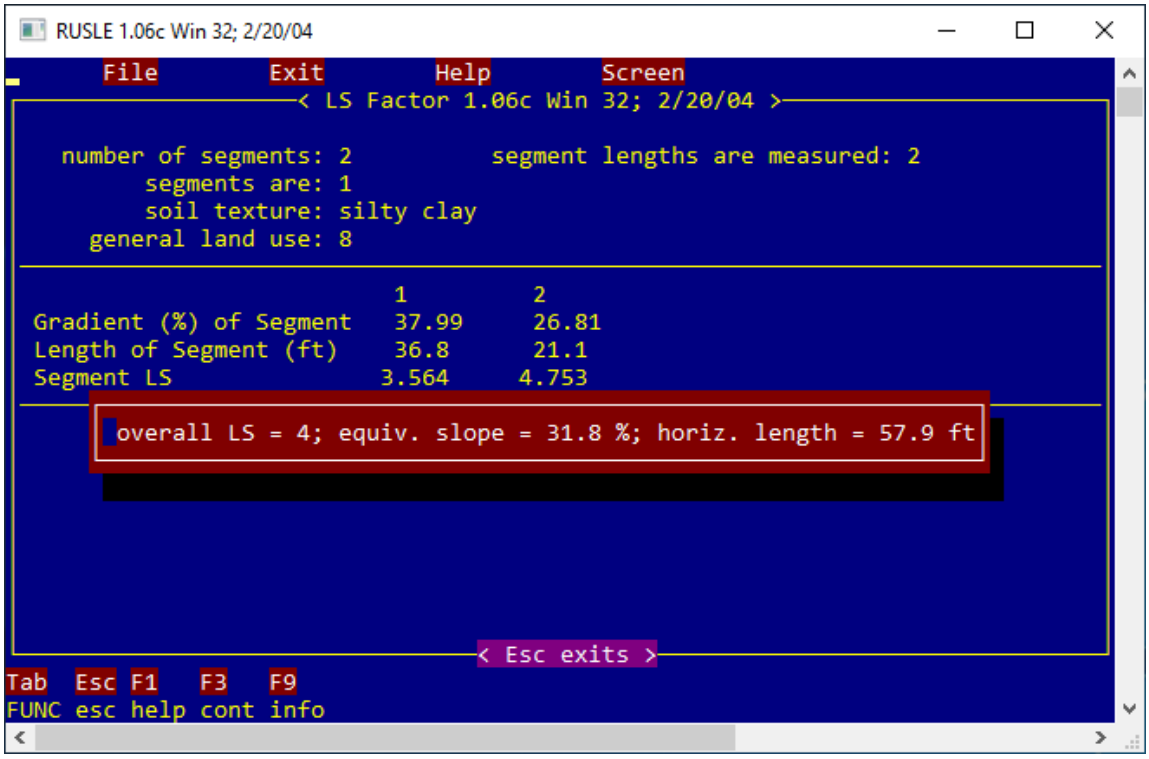
Tab Esc F1 F3 F9
FUNC esc help cont info

S11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File Exit Help Screen
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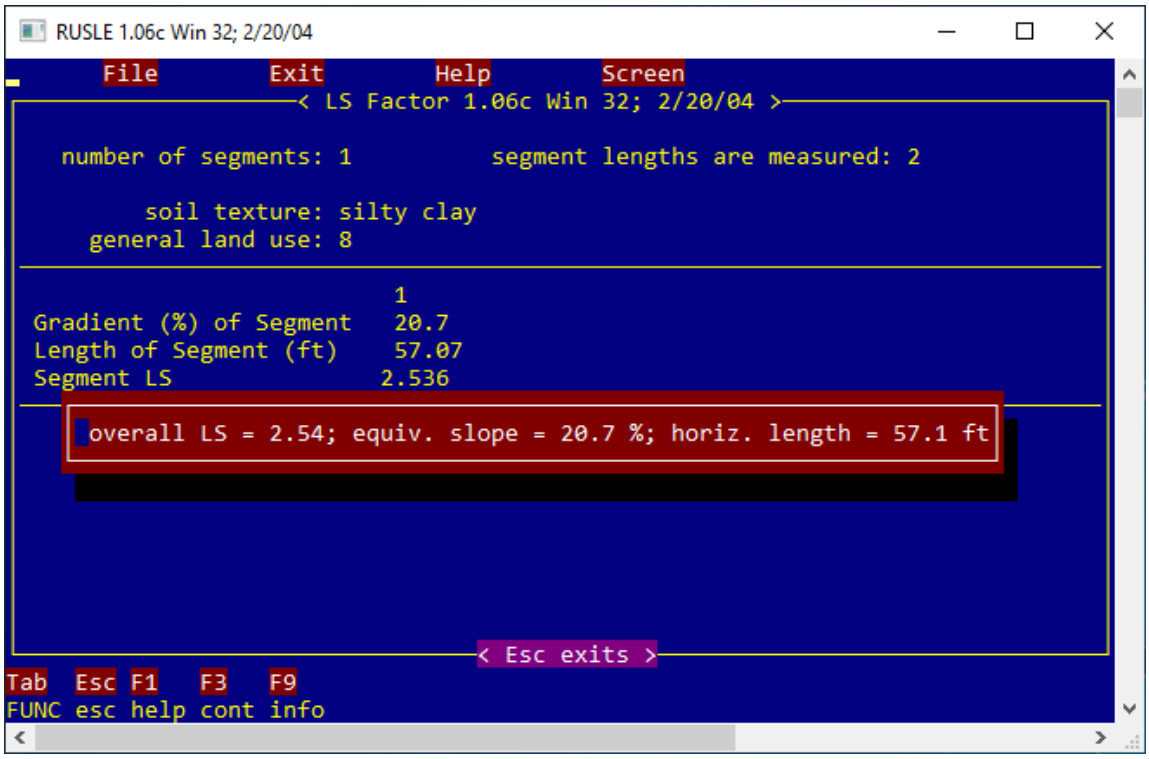
number of segments: 2 segment lengths are measured: 2
segments are: 1
soil texture: silty clay
general land use: 8
1 2
Gradient (%) of Segment 37.99 26.81
Length of Segment (ft) 36.8 21.1
Segment LS 3.564 4.753
overall LS = 4; equiv. slope = 31.8 %; horiz. length = 57.9 ft
< Esc exits >
Tab Esc F1 F3 F9
FUNC esc help cont info

S12


RUSLE 1.06c Win 32; 2/20/04
File Exit Help Screen
< LS Factor 1.06c Win 32; 2/20/04 >
number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 20.7
Length of Segment (ft) 57.07
Segment LS 2.536
overall LS = 2.54; equiv. slope = 20.7 %; horiz. length = 57.1 ft
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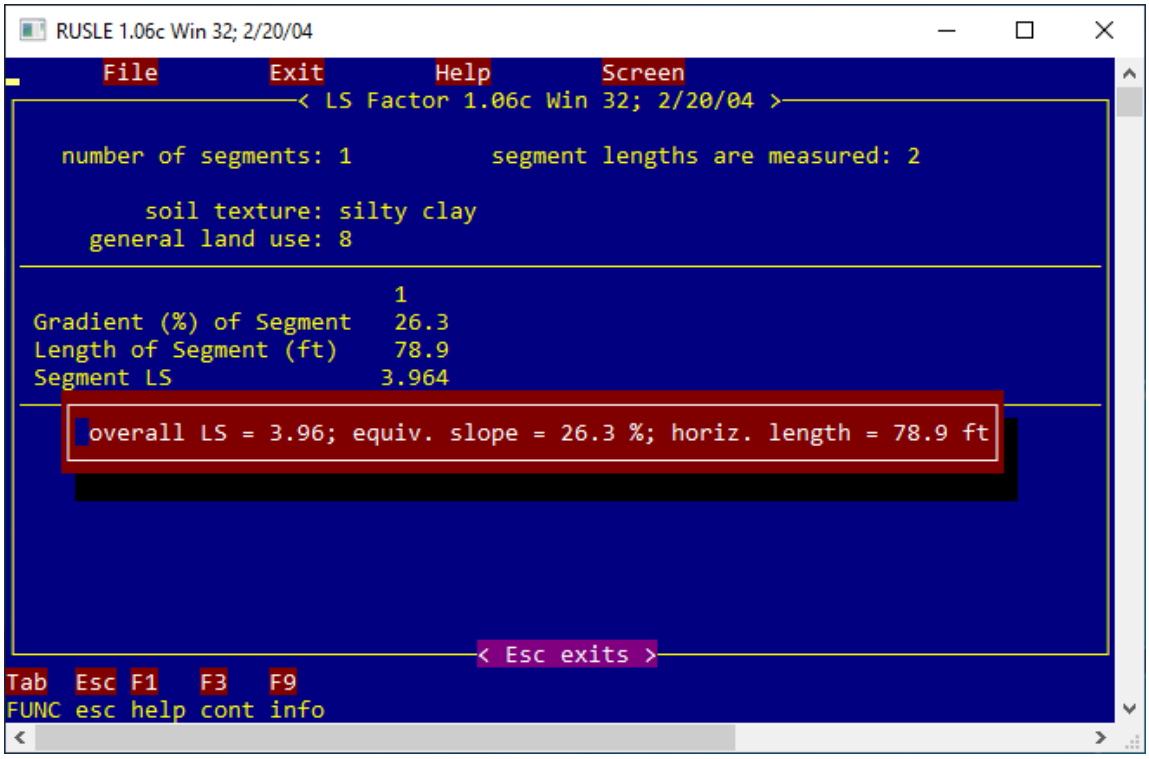
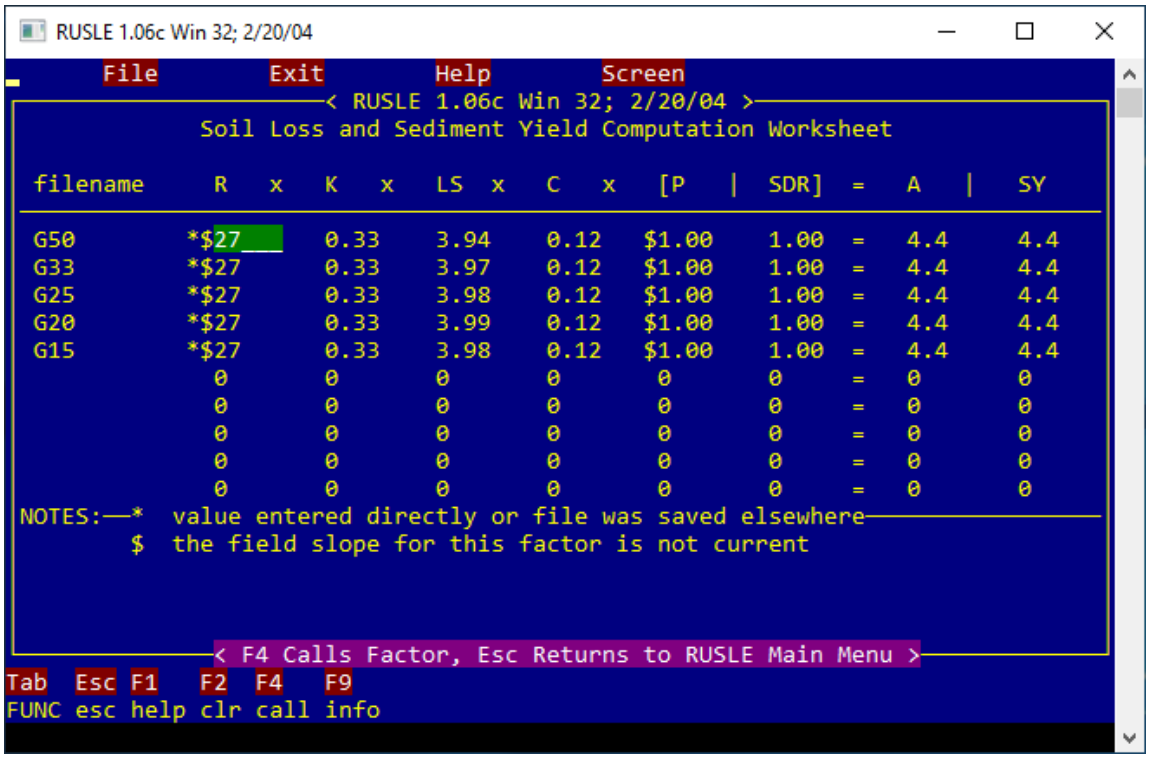
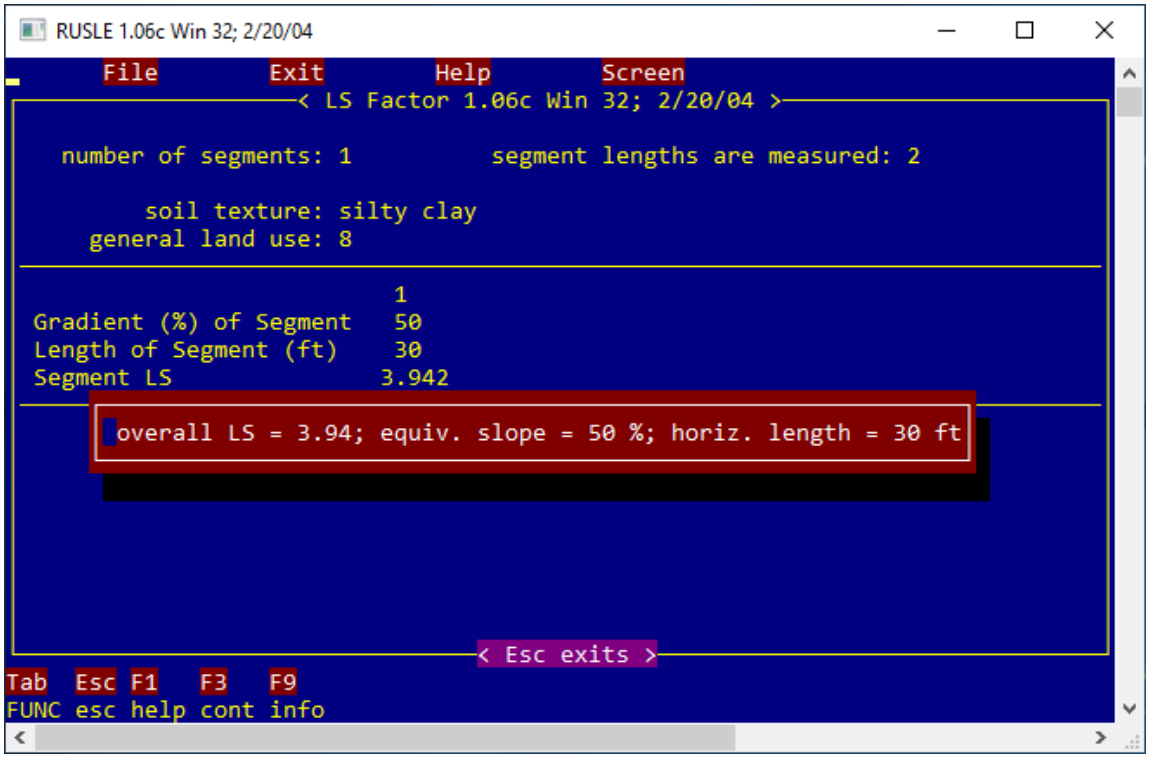
Tab Esc F1 F3 F9
FUNC esc help cont info



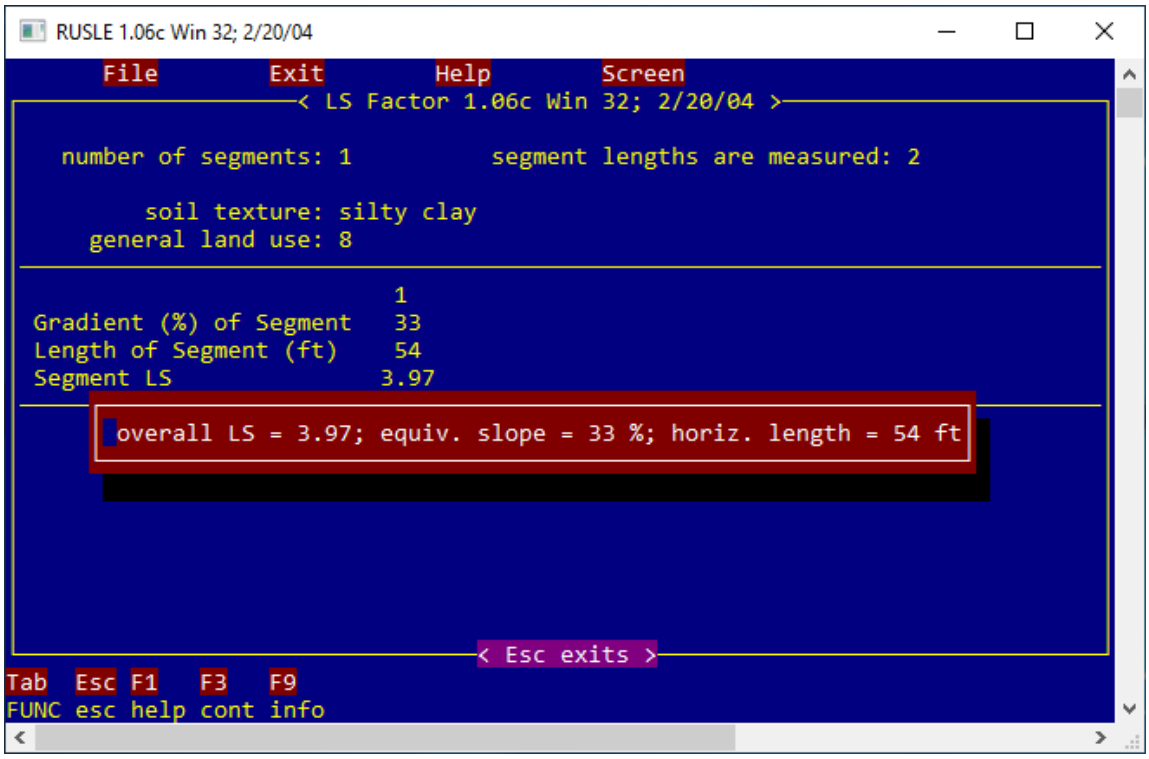
Generic Summary



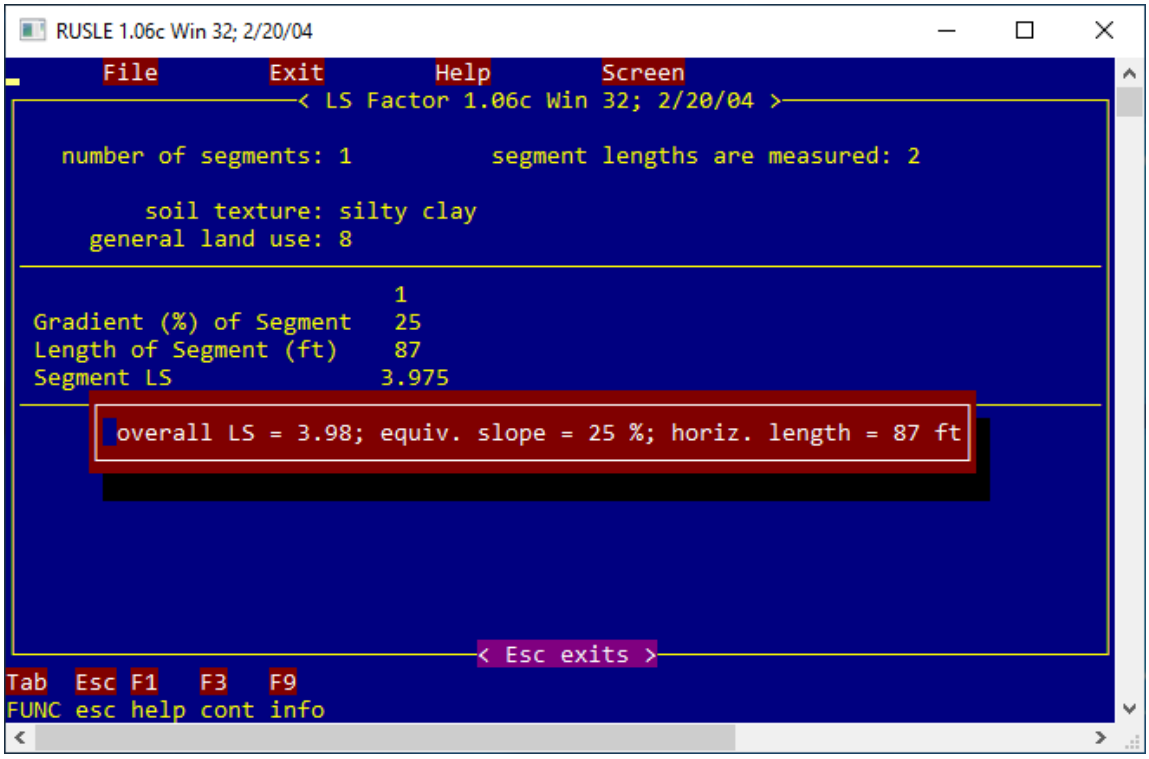
Generic 50



G33



G25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File Exit Help Screen
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number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 25
Length of Segment (ft) 87
Segment LS 3.975
overall LS = 3.98; equiv. slope = 25 %; horiz. length = 87 ft
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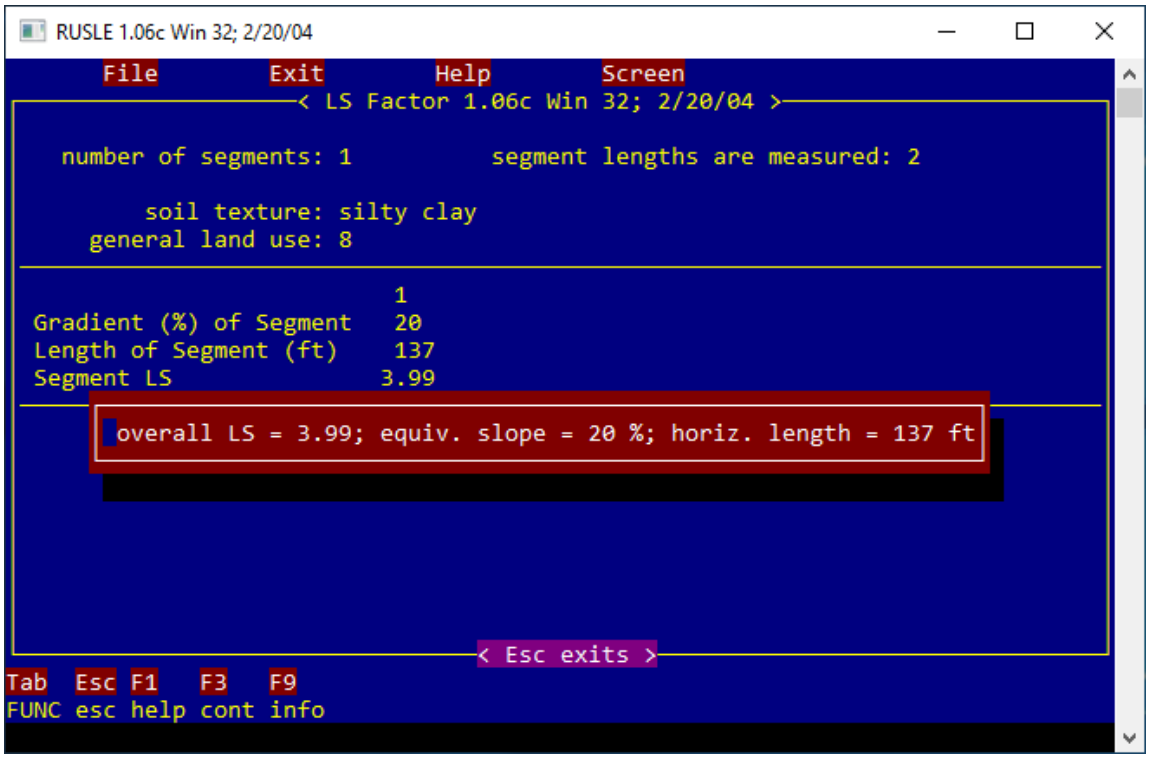
G20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File Exit Help Screen
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number of segments: 1 segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 20
Length of Segment (ft) 137
Segment LS 3.99
overall LS = 3.99; equiv. slope = 20 %; horiz. length = 137 ft
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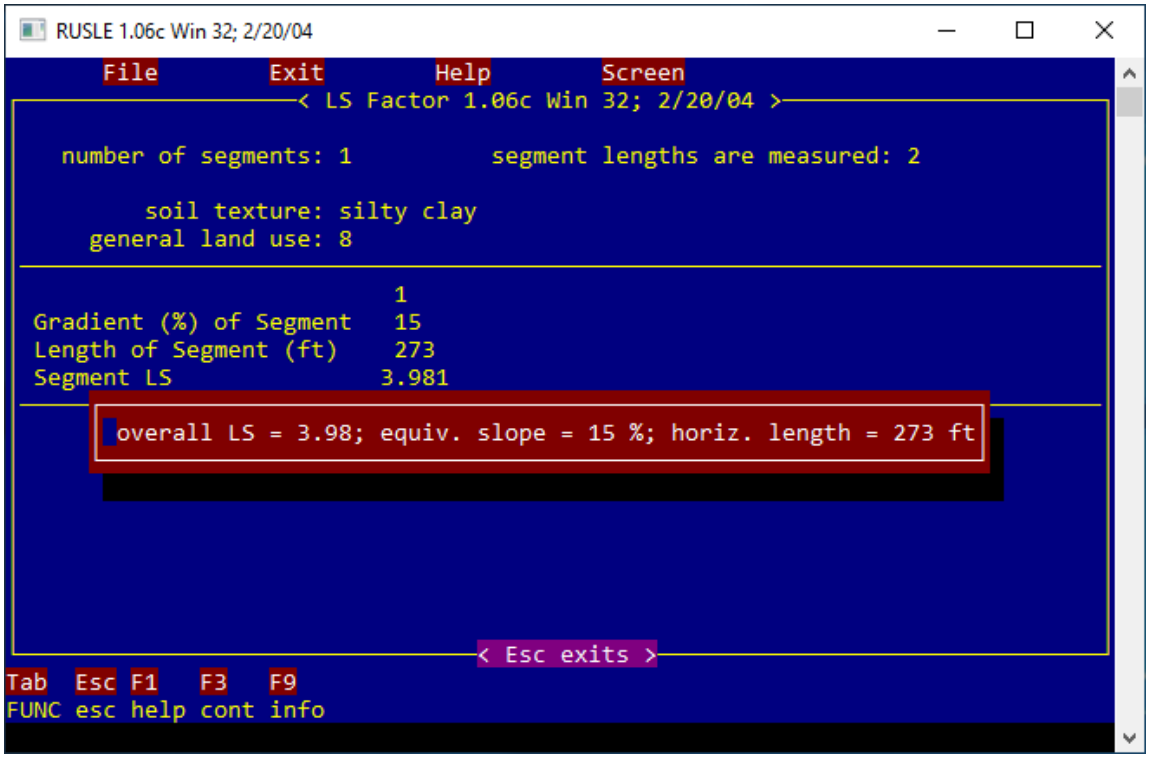
Tab Esc F1 F3 F9
FUNC esc help cont info

G15


RUSLE 1.06c Win 32; 2/20/04
File
Exit
Help
Screen
< LS Factor 1.06c Win 32; 2/20/04 >
number of segments: 1
segment lengths are measured: 2
soil texture: silty clay
general land use: 8
1
Gradient (%) of Segment 15
Length of Segment (ft) 273
Segment LS 3.981
overall LS = 3.98; equiv. slope = 15 %; horiz. length = 273 ft
< Esc exits >
Tab Esc F1 F3 F9
FUNC esc help cont info

APPENDIX B – SEDCAD ANALYSIS

This appendix shows the SEDCAD Output for the watershed analysis (hydrologic) and the hydraulic analysis of each channel for riprap sizing. These two sections have been denoted by page separators.

Section 1: Hydrologic Analysis

Section 2: Hydraulic Analysis

Section 1: Hydrologic Analysis

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GCC Tijeras Mine

Quarry 1 Reclamation

1st Order Channel

0.5 acre watershed Area

Applicable to Small Channel Reach of Channels D2, D3, D7, D10, D17, D18, D19, D20, D22

Brennan/Wade

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General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

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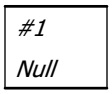
Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	0.5-Acre Watershed (Small Channel)



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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	0.500	0.500	1.26	0.06

Structure Detail:

Structure #1 (Null)

0.5-Acre Watershed (Small Channel)

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	0.500	0.013	0.000	0.000	77.000	M	1.26	0.056
	Σ	**0.500**						**1.26**	**0.056**

Subwatershed Time of Concentration 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	25.00	187.50	750.00	15.000	0.013
#1	**1**	**Time of Concentration:**					**0.013**

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GCC Tijeras Mine
Quarry 1 Reclamation

1.83 Acre Watershed Area

Applicable to Small Channel Reach of Channels D1 and D6

Brennan/Wade

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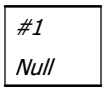
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	1.83-Acre Watershed (Small Channel)



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.830	1.830	4.61	0.22

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Structure Detail:

Structure #1 (Null)

1.83-Acre Watershed (Small Channel)

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	1.830	0.024	0.000	0.000	77.000	M	4.61	0.224
	Σ	**1.830**						**4.61**	**0.224**

Subwatershed Time of Concentration 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	6.00	38.16	636.00	7.340	0.024
#1	**1**	**Time of Concentration:**					**0.024**

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GCC Tijeras Mine

Quarry 1 Reclamation

1.0 Acre Watershed Area

Applicable to Small Channel Reach of Channels D4, D5, D8, D9, D11, D12, D13, D14, D15, D16, D21, D23, D24, D25, D26

Brennan/Wade

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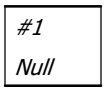
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	1-Acre Watershed (Small Channel)



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.000	1.000	2.52	0.12

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Structure Detail:

Structure #1 (Null)

1-Acre Watershed (Small Channel)

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	1.000	0.008	0.000	0.000	77.000	M	2.52	0.122
	Σ	**1.000**						**2.52**	**0.122**

Subwatershed Time of Concentration 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	21.00	85.05	405.00	13.740	0.008
#1	**1**	**Time of Concentration:**					**0.008**

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GCC Tijeras Mine
Quarry 1 Reclamation

2.0 Acre Watershed Area

Brennan/Wade

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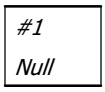
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	2.0-Acre Watershed (Small Channel)



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.000	2.000	5.04	0.24

Structure Detail:

Structure #1 (Null)

2.0-Acre Watershed (Small Channel)

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	2.000	0.024	0.000	0.000	77.000	M	5.04	0.244
	Σ	**2.000**						**5.04**	**0.244**

Subwatershed Time of Concentration 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	6.00	38.16	636.00	7.340	0.024
#1	**1**	**Time of Concentration:**					**0.024**

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GCC Tijeras Mine

Quarry 1 Reclamation

4.27 Acre Watershed Area

Applicable to Medium Channel Reach of Channels: D2, D5, D11, D13, D16, D18, D20, and D24

Brennan/Wade

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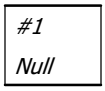
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	4.27 Acre Watershed (Medium Channel)



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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	4.270	4.270	10.75	0.52

Structure Detail:

Structure #1 (Null)

4.27 Acre Watershed (Medium Channel)

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	4.270	0.011	0.000	0.000	77.000	M	10.75	0.522
	Σ	**4.270**						**10.75**	**0.522**

Subwatershed Time of Concentration 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	24.00	145.03	604.30	14.690	0.011
#1	**1**	**Time of Concentration:**					**0.011**

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Quarry 1 Reclamation

4.57 Acre Watershed Area

Applicable to Medium Channel Reach of D1

Brennan/Wade

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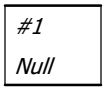
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	4.57-Acre Watershed (Medium Channel)



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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	4.570	4.570	11.51	0.56

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Structure Detail:

Structure #1 (Null)

4.57-Acre Watershed (Medium Channel)

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	4.570	0.014	0.000	0.000	77.000	M	11.51	0.559
	Σ	**4.570**						**11.51**	**0.559**

Subwatershed Time of Concentration 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	16.50	105.00	636.36	12.180	0.014
#1	**1**	**Time of Concentration:**					**0.014**

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GCC Tijeras Mine

Quarry 1 Reclamation

7.21 Acre Watershed Area

Applicable to Medium Channel Reach of Channel D20 (Channel D20/D13 Confluence)

Brennan/Wade

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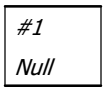
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	7.21-Acre Watershed Area



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	7.210	7.210	18.15	0.88

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Structure Detail:

Structure #1 (Null)

7.21-Acre Watershed Area

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	7.210	0.012	0.000	0.000	77.000	M	18.15	0.881
	Σ	**7.210**						**18.15**	**0.881**

Subwatershed Time of Concentration 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	23.10	155.17	671.73	14.410	0.012
#1	**1**	**Time of Concentration:**					**0.012**

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Quarry 1 Reclamation

8.64 Acre Watershed Area

Applicable to Medium Channel Reach of Channel D20 (Channel D20/D22 Confluence)

Brennan/Wade

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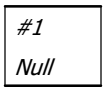
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	8.64-Acre Watershed Area



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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	8.640	8.640	21.75	1.06

Structure Detail:

Structure #1 (Null)

8.64-Acre Watershed Area

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	8.640	0.022	0.000	0.000	77.000	M	21.75	1.056
	Σ	**8.640**						**21.75**	**1.056**

Subwatershed Time of Concentration 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	18.70	195.32	1,044.49	12.970	0.022
#1	**1**	**Time of Concentration:**					**0.022**

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GCC Tijeras Mine

Quarry 1 Reclamation

10.43 Acre Watershed Area

Applicable to Medium Channel Reach of Channel D1 (D1 and D11 Confluence)

Brennan/Wade

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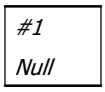
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	10.43-Acre Watershed Area



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	10.430	10.430	26.26	1.28

Structure Detail:

Structure #1 (Null)

10.43-Acre Watershed Area

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	10.430	0.030	0.000	0.000	77.000	M	26.26	1.275
	Σ	**10.430**						**26.26**	**1.275**

Subwatershed Time of Concentration 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	11.50	129.81	1,128.80	10.170	0.030
#1	**1**	**Time of Concentration:**					**0.030**

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GCC Tijeras Mine

Quarry 1 Reclamation

10.48 Acre Watershed Area

Applicable to Medium Channel Reach of Channel D24 (D20 and D24 Confluence)

Brennan/Wade

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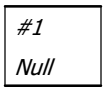
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	10.48-Acre Watershed Area



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	10.430	10.430	26.26	1.28

Structure Detail:

Structure #1 (Null)

10.48-Acre Watershed Area

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	10.430	0.030	0.000	0.000	77.000	M	26.26	1.275
	Σ	**10.430**						**26.26**	**1.275**

Subwatershed Time of Concentration 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	11.50	129.81	1,128.80	10.170	0.030
#1	**1**	**Time of Concentration:**					**0.030**

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GCC Tijeras Mine

Quarry 1 Reclamation

13.31 Acre Watershed Area

Applicable to Medium Channel Reach of Channel D1 above Confluence with Channel D24

Brennan/Wade

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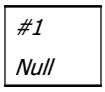
General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	13.31-Acre Watershed Area



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	13.310	13.310	33.51	1.63

Structure Detail:

Structure #1 (Null)

13.31-Acre Watershed Area

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	13.310	0.030	0.000	0.000	77.000	M	33.51	1.627
	Σ	**13.310**						**33.51**	**1.627**

Subwatershed Time of Concentration 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	11.50	129.81	1,128.80	10.170	0.030
#1	**1**	**Time of Concentration:**					**0.030**

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GCC Tijeras Mine

Quarry 1 Reclamation

24.39 Acre Watershed Area

Applicable to Large Channel Reach of Channel D1 from D1/D24 Confluence into Sediment Pond 1

Brennan/Wade

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General Information

Storm Information:

Storm Type:	New Mexico (65)
Design Storm:	100 yr - 24 hr
Rainfall Depth:	3.550 inches

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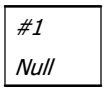
Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	24.39-Acre Watershed



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	24.390	24.390	61.41	2.98

Structure Detail:

Structure #1 (Null)

24.39-Acre Watershed

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	24.390	0.045	0.000	0.000	77.000	M	61.41	2.982
	Σ	**24.390**						**61.41**	**2.982**

Subwatershed Time of Concentration 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	9.90	154.45	1,560.10	9.430	0.045
#1	**1**	**Time of Concentration:**					**0.045**

Section 2: Hydraulic Analysis

Channel D1 Station 0+00 to 6+36

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	6.0	1.70		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.60 cfs	
Depth:	0.30 ft	2.00 ft
Top Width:	5.41 ft	19.01 ft
Velocity:	3.62 fps	
X-Section Area:	1.27 sq ft	
Hydraulic Radius:	0.231 ft	
Froude Number:	1.32	
Manning's n:	0.0380	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D1 Station 6+36 to 11+31

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	5.4	1.34		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	26.30 cfs	
Depth:	0.66 ft	2.00 ft
Top Width:	10.29 ft	21.01 ft
Velocity:	5.20 fps	
X-Section Area:	5.05 sq ft	
Hydraulic Radius:	0.484 ft	
Froude Number:	1.31	
Manning's n:	0.0410	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D1 Station 11+31 to 15+31

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	5.3	1.26		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	33.50 cfs	
Depth:	0.74 ft	2.00 ft
Top Width:	10.96 ft	21.04 ft
Velocity:	5.64 fps	
X-Section Area:	5.94 sq ft	
Hydraulic Radius:	0.533 ft	
Froude Number:	1.35	
Manning's n:	0.0400	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D1 Station 15+31 to 16+21

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
8.00	4.0:1	4.0:1	5.3	1.17		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	61.40 cfs	
Depth:	0.83 ft	2.00 ft
Top Width:	14.67 ft	24.03 ft
Velocity:	6.50 fps	
X-Section Area:	9.45 sq ft	
Hydraulic Radius:	0.635 ft	
Froude Number:	1.43	
Manning's n:	0.0390	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channe D2 Station 0+00 to 1+39

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	15.5	1.87		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.13 ft	2.00 ft
Top Width:	4.06 ft	19.02 ft
Velocity:	2.77 fps	
X-Section Area:	0.47 sq ft	
Hydraulic Radius:	0.115 ft	
Froude Number:	1.44	
Manning's n:	0.0500	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channe D2 Station 1+39 to 4+21

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	6.0	1.61		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	11.50 cfs	
Depth:	0.39 ft	2.00 ft
Top Width:	8.11 ft	20.99 ft
Velocity:	4.52 fps	
X-Section Area:	2.54 sq ft	
Hydraulic Radius:	0.310 ft	
Froude Number:	1.42	
Manning's n:	0.0370	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D3 Station 0+00 to 2+26

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	21.5	1.88		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.12 ft	2.00 ft
Top Width:	3.99 ft	19.03 ft
Velocity:	3.01 fps	
X-Section Area:	0.43 sq ft	
Hydraulic Radius:	0.108 ft	
Froude Number:	1.61	
Manning's n:	0.0520	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D4 Station 0+00 to 2+57

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	19.9	1.83		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.35 ft	18.99 ft
Velocity:	4.01 fps	
X-Section Area:	0.62 sq ft	
Hydraulic Radius:	0.142 ft	
Froude Number:	1.87	
Manning's n:	0.0450	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D5 Station 0+00 to 3+48

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	16.9	1.82		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.18 ft	2.00 ft
Top Width:	4.40 ft	18.96 ft
Velocity:	3.86 fps	
X-Section Area:	0.65 sq ft	
Hydraulic Radius:	0.146 ft	
Froude Number:	1.77	
Manning's n:	0.0440	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D5 Station 3+48 to 4+72

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	15.5	1.81		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.60 cfs	
Depth:	0.19 ft	2.00 ft
Top Width:	6.54 ft	21.02 ft
Velocity:	4.16 fps	
X-Section Area:	1.11 sq ft	
Hydraulic Radius:	0.168 ft	
Froude Number:	1.78	
Manning's n:	0.0430	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D6 Station 0+00 to 5+68

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	9.9	1.73		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.60 cfs	
Depth:	0.27 ft	2.00 ft
Top Width:	5.14 ft	18.98 ft
Velocity:	4.23 fps	
X-Section Area:	1.09 sq ft	
Hydraulic Radius:	0.209 ft	
Froude Number:	1.62	
Manning's n:	0.0390	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D7 Station 0+00 to 2+44

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	15.9	1.87		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.13 ft	2.00 ft
Top Width:	4.06 ft	19.02 ft
Velocity:	2.79 fps	
X-Section Area:	0.47 sq ft	
Hydraulic Radius:	0.114 ft	
Froude Number:	1.45	
Manning's n:	0.0500	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D8 Station 0+00 to 2+91

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	18.1	1.83		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.39 ft	19.03 ft
Velocity:	3.89 fps	
X-Section Area:	0.64 sq ft	
Hydraulic Radius:	0.145 ft	
Froude Number:	1.79	
Manning's n:	0.0450	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

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Channel D9 Station 0+00 to 3+74

Material: Cobbles and shingles

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	4.0:1	4.0:1	14.2	0.0350	1.84			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.16 ft	2.00 ft
Top Width:	4.29 ft	19.01 ft
Velocity:	4.25 fps	
X-Section Area:	0.59 sq ft	
Hydraulic Radius:	0.136 ft	
Froude Number:	2.02	

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Channel D10 Station 0+00 to 2+25

Material: Cobbles and shingles

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	4.0:1	4.0:1	19.2	0.0350	1.90			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.10 ft	2.00 ft
Top Width:	3.81 ft	19.01 ft
Velocity:	3.75 fps	
X-Section Area:	0.35 sq ft	
Hydraulic Radius:	0.090 ft	
Froude Number:	2.19	

Channel D11 Station 0+00 to 3+48

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	20.8	1.83		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.34 ft	18.98 ft
Velocity:	4.07 fps	
X-Section Area:	0.61 sq ft	
Hydraulic Radius:	0.140 ft	
Froude Number:	1.91	
Manning's n:	0.0450	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D11 Station 3+48 to 7+28

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	16.2	1.66		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	10.80 cfs	
Depth:	0.34 ft	2.00 ft
Top Width:	7.69 ft	20.97 ft
Velocity:	5.06 fps	
X-Section Area:	2.13 sq ft	
Hydraulic Radius:	0.274 ft	
Froude Number:	1.69	
Manning's n:	0.0500	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D12 Station 0+00 to 4+04

Material: Cobbles and shingles

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	4.0:1	4.0:1	8.6	0.0350	1.81			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.19 ft	2.00 ft
Top Width:	4.49 ft	18.97 ft
Velocity:	3.58 fps	
X-Section Area:	0.70 sq ft	
Hydraulic Radius:	0.154 ft	
Froude Number:	1.60	

Channel D13 Station 0+00 to 4+06

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	22.4	1.83		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.33 ft	18.97 ft
Velocity:	4.12 fps	
X-Section Area:	0.61 sq ft	
Hydraulic Radius:	0.139 ft	
Froude Number:	1.94	
Manning's n:	0.0460	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D13 Station 4+06 to 7+30

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	17.7	1.66		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	11.50 cfs	
Depth:	0.34 ft	2.00 ft
Top Width:	7.72 ft	21.00 ft
Velocity:	5.33 fps	
X-Section Area:	2.16 sq ft	
Hydraulic Radius:	0.277 ft	
Froude Number:	1.77	
Manning's n:	0.0500	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D14 Station 0+00 to 3+89

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	23.0	1.84		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.16 ft	2.00 ft
Top Width:	4.32 ft	19.04 ft
Velocity:	4.15 fps	
X-Section Area:	0.60 sq ft	
Hydraulic Radius:	0.138 ft	
Froude Number:	1.96	
Manning's n:	0.0460	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D15 Station 0+00 to 3+14

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	18.8	1.83		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.38 ft	19.02 ft
Velocity:	3.94 fps	
X-Section Area:	0.63 sq ft	
Hydraulic Radius:	0.144 ft	
Froude Number:	1.82	
Manning's n:	0.0450	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D16 Station 0+00 to 2+83

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	24.1	1.84		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.16 ft	2.00 ft
Top Width:	4.30 ft	19.02 ft
Velocity:	4.22 fps	
X-Section Area:	0.59 sq ft	
Hydraulic Radius:	0.137 ft	
Froude Number:	2.00	
Manning's n:	0.0460	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D16 Station 2+83 to 6+09

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	19.4	1.82		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.60 cfs	
Depth:	0.18 ft	2.00 ft
Top Width:	6.46 ft	21.02 ft
Velocity:	4.41 fps	
X-Section Area:	1.04 sq ft	
Hydraulic Radius:	0.161 ft	
Froude Number:	1.93	
Manning's n:	0.0440	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D17 Station 0+00 to 3+57

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	21.0	1.82		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.12 ft	1.94 ft
Top Width:	4.00 ft	18.56 ft
Velocity:	2.98 fps	
X-Section Area:	0.44 sq ft	
Hydraulic Radius:	0.108 ft	
Froude Number:	1.59	
Manning's n:	0.0520	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

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Channel D18 Station 0+00 to 3+14

Material: Cobbles and shingles

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	4.0:1	4.0:1	19.4	0.0350	1.90			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.10 ft	2.00 ft
Top Width:	3.81 ft	19.01 ft
Velocity:	3.76 fps	
X-Section Area:	0.34 sq ft	
Hydraulic Radius:	0.090 ft	
Froude Number:	2.20	

Channel D18 Station 3+14 to 4+27

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	13.7	1.80		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.60 cfs	
Depth:	0.20 ft	2.00 ft
Top Width:	6.59 ft	20.99 ft
Velocity:	3.99 fps	
X-Section Area:	1.15 sq ft	
Hydraulic Radius:	0.174 ft	
Froude Number:	1.68	
Manning's n:	0.0430	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D19 Station 0+00 to 1+95

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	19.8	1.87		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.13 ft	2.00 ft
Top Width:	4.00 ft	18.96 ft
Velocity:	2.96 fps	
X-Section Area:	0.44 sq ft	
Hydraulic Radius:	0.109 ft	
Froude Number:	1.58	
Manning's n:	0.0510	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D20 Station 0+00 to 2+52

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	12.5	1.75		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.60 cfs	
Depth:	0.25 ft	2.00 ft
Top Width:	5.03 ft	19.03 ft
Velocity:	4.51 fps	
X-Section Area:	1.02 sq ft	
Hydraulic Radius:	0.200 ft	
Froude Number:	1.76	
Manning's n:	0.0400	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D20 Station 2+52 to 4+77

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	11.1	1.53		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	18.20 cfs	
Depth:	0.47 ft	2.00 ft
Top Width:	8.76 ft	21.00 ft
Velocity:	5.63 fps	
X-Section Area:	3.23 sq ft	
Hydraulic Radius:	0.364 ft	
Froude Number:	1.63	
Manning's n:	0.0450	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D20 Station 4+77 to 10+18

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	8.7	1.41		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	26.40 cfs	
Depth:	0.59 ft	2.00 ft
Top Width:	9.73 ft	21.01 ft
Velocity:	6.06 fps	
X-Section Area:	4.35 sq ft	
Hydraulic Radius:	0.441 ft	
Froude Number:	1.60	
Manning's n:	0.0420	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	

Channel D21 Station 0+00 to 4+09

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	18.7	1.83		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.38 ft	19.02 ft
Velocity:	3.93 fps	
X-Section Area:	0.64 sq ft	
Hydraulic Radius:	0.144 ft	
Froude Number:	1.82	
Manning's n:	0.0450	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D22 Station 0+00 to 2+26

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	18.0	1.87		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.30 cfs	
Depth:	0.13 ft	2.00 ft
Top Width:	4.03 ft	18.99 ft
Velocity:	2.87 fps	
X-Section Area:	0.45 sq ft	
Hydraulic Radius:	0.111 ft	
Froude Number:	1.51	
Manning's n:	0.0510	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D23 Station 0+00 to 2+89

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	18.7	1.83		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.38 ft	19.02 ft
Velocity:	3.93 fps	
X-Section Area:	0.64 sq ft	
Hydraulic Radius:	0.144 ft	
Froude Number:	1.82	
Manning's n:	0.0450	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D24 Station 0+00 to 4+39

Material: Cobbles and shingles

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.00	4.0:1	4.0:1	13.1	0.0350	1.83			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.17 ft	2.00 ft
Top Width:	4.33 ft	18.97 ft
Velocity:	4.13 fps	
X-Section Area:	0.61 sq ft	
Hydraulic Radius:	0.139 ft	
Froude Number:	1.95	

Channel D24 Station 4+39 to 6+02

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	1.8	1.22		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	26.40 cfs	
Depth:	0.78 ft	2.00 ft
Top Width:	11.20 ft	20.96 ft
Velocity:	4.20 fps	
X-Section Area:	6.28 sq ft	
Hydraulic Radius:	0.551 ft	
Froude Number:	0.99	
Manning's n:	0.0320	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D24 Station 6+02 to 7+68

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
5.00	4.0:1	4.0:1	1.3	1.06		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	33.50 cfs	
Depth:	0.94 ft	2.00 ft
Top Width:	12.50 ft	20.98 ft
Velocity:	4.09 fps	
X-Section Area:	8.20 sq ft	
Hydraulic Radius:	0.644 ft	
Froude Number:	0.89	
Manning's n:	0.0310	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D25 Station 0+00 to 4+05

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	11.3	1.81		

PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.19 ft	2.00 ft
Top Width:	4.55 ft	19.03 ft
Velocity:	3.42 fps	
X-Section Area:	0.73 sq ft	
Hydraulic Radius:	0.159 ft	
Froude Number:	1.50	
Manning's n:	0.0430	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

Channel D26 Station 0+00 to 2+96

Material: Riprap

Trapezoidal Channel

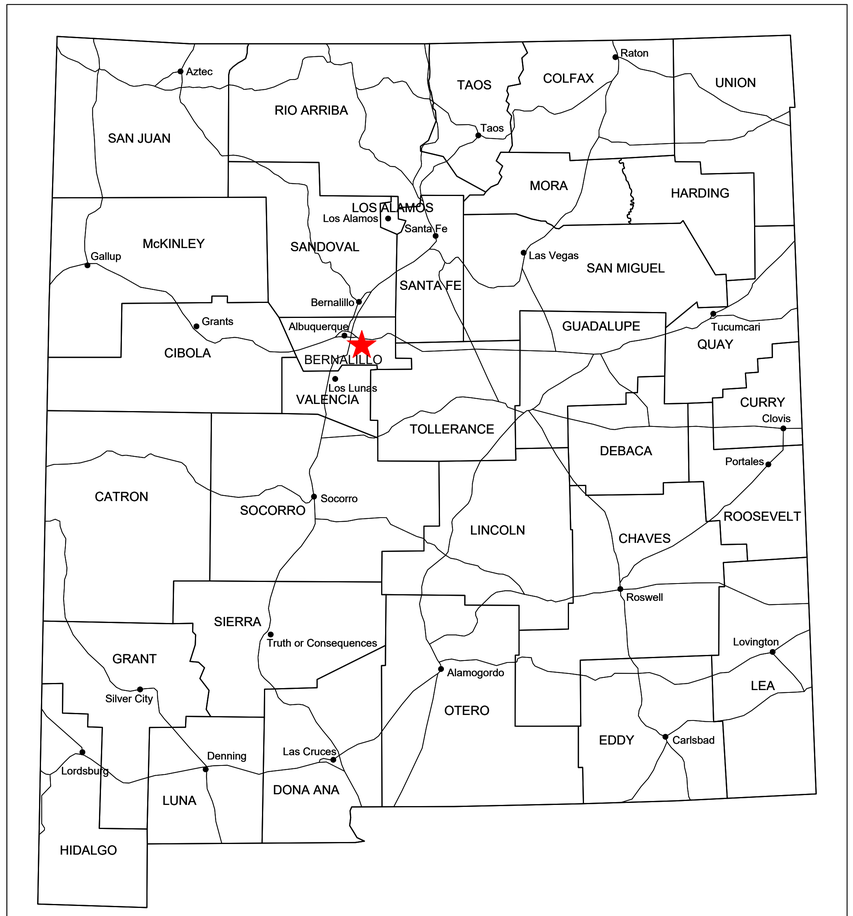
Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	4.0:1	4.0:1	12.0	1.81		

PADER Method - Steep Slope Design

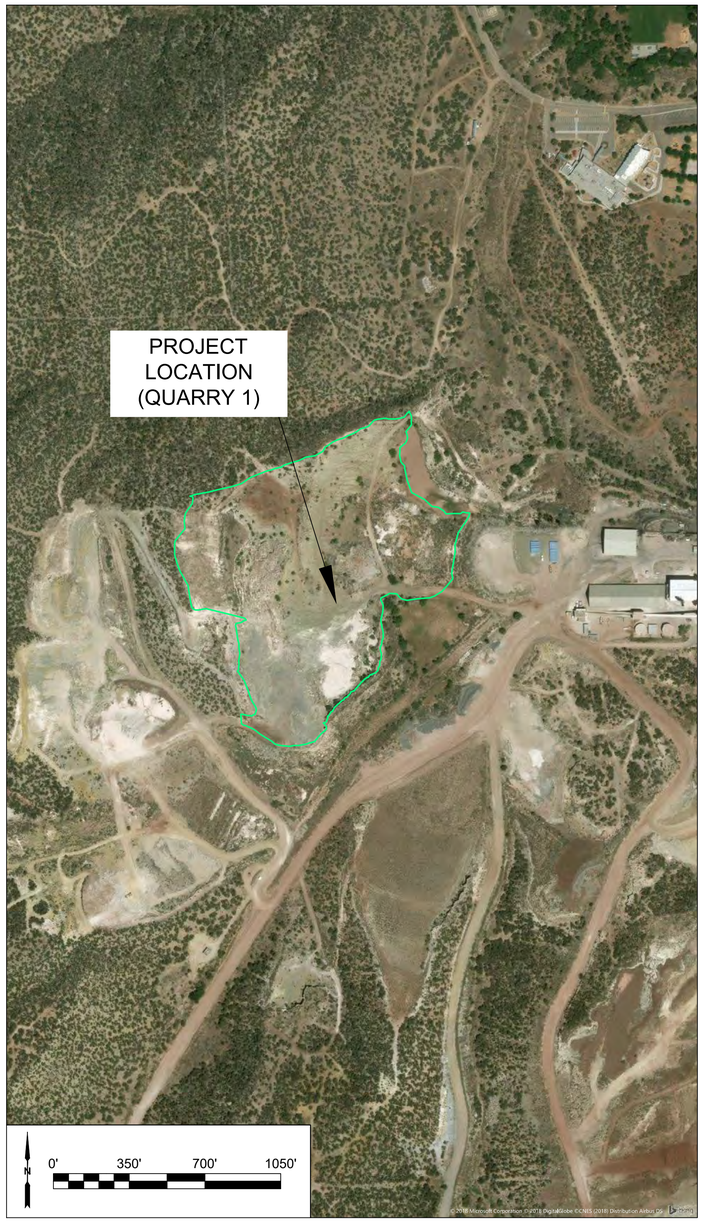
	w/o Freeboard	w/ Freeboard
Design Discharge:	2.50 cfs	
Depth:	0.19 ft	2.00 ft
Top Width:	4.52 ft	19.00 ft
Velocity:	3.49 fps	
X-Section Area:	0.72 sq ft	
Hydraulic Radius:	0.157 ft	
Froude Number:	1.55	
Manning's n:	0.0430	
Dmin:	1.00 in	
D50:	1.50 in	
Dmax:	3.00 in	

QUARRY 1 POST-MINING TOPOGRAPHY (PMT) DESIGN
TIJERAS, BERNALILLO COUNTY, NEW MEXICO
FEBRUARY 12, 2020

STATE OF NEW MEXICO



PROJECT LOCATION



CLIENT:

GCC TIJERAS
11783 HIGHWAY 337 SOUTH
TIJERAS, NM, 87123

ENGINEER:

WATER & EARTH TECHNOLOGIES, INC.
1225 RED CEDAR CIR, SUITE A
FORT COLLINS, COLORADO 80524

DRAWING INDEX:

SHEET #	SHEET TITLE
1	QUARRY 1 COVER SHEET
2	QUARRY 1 SITE OVERVIEW AND FINAL GRADING PLAN
3	QUARRY 1 CUT/FILL MAP & CONSTRUCTION VOLUME SUMMARY
4	QUARRY 1 DRAIN D1 PLAN AND PROFILE
5	QUARRY 1 DRAINS D2, D3, D4 & D5 PLAN AND PROFILE
6	QUARRY 1 DRAINS D6, D7, D8 & D9 PLAN AND PROFILE
7	QUARRY 1 DRAINS D10, D11 & D12 PLAN AND PROFILE
8	QUARRY 1 DRAINS D13, D14 & D15 PLAN AND PROFILE
9	QUARRY 1 DRAINS D16, D17, D18 & D19 PLAN AND PROFILE
10	QUARRY 1 DRAIN D20 PLAN AND PROFILE
11	QUARRY 1 DRAINS D21, D22 & D23 PLAN AND PROFILE
12	QUARRY 1 DRAINS D24, D25 & D26 PLAN AND PROFILE
13	QUARRY 1 DRAIN DESIGN AND CROSS-SECTION DETAILS
14	QUARRY 1 GEOMORPHIC GRADING DETAILS

RICHARD SPOTTS
NEW MEXICO
15772
REGISTERED PROFESSIONAL ENGINEER
02/12/2020

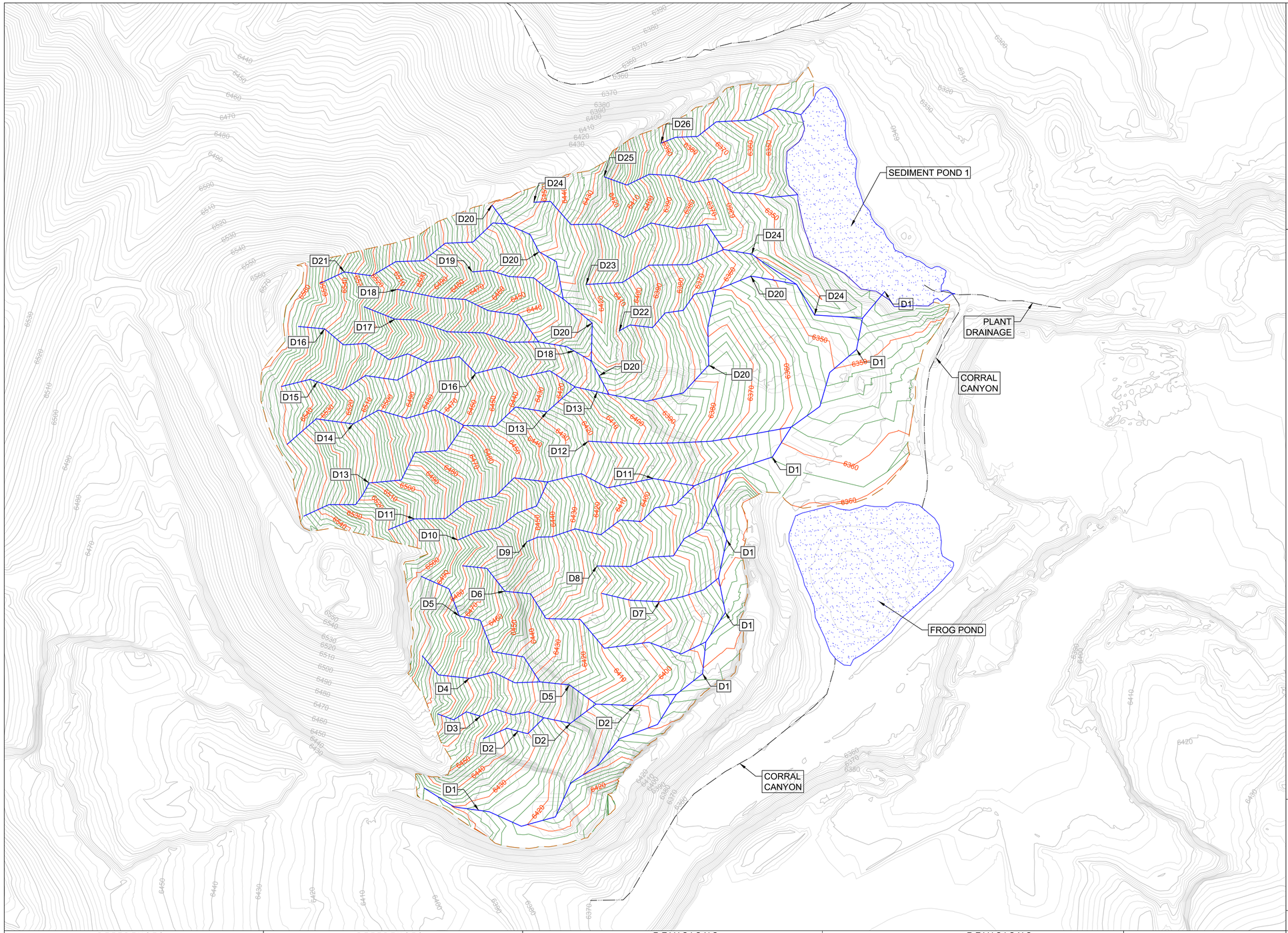
QUARRY 1 PMT DESIGN

QUARRY 1 COVER SHEET

CONTRACTOR SHEET NO.
WET 1 OF 14

DWG. NO.

REVISION | DATE
02/12/2020



GEOMORPHIC GRADING BOUNDARY
DRAIN CENTERLINE
EXISTING INDEX CONTOUR (10-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (2-FT INTERVAL)
PROPOSED INDEX CONTOUR (10-FT INTERVAL)
PROPOSED INTERMEDIATE CONTOUR (2-FT INTERVAL)
EXISTING EPHEMERAL DRAINAGE
POND LOCATIONS

N

0' 100' 200' 300'

NOTES

1. FINAL SURFACE CONFIGURATION SHOWN. THIS INCLUDES A MINIMUM 2-FT COVER OF SUITABLE PLANT GROWTH MEDIUM.
2. CONSTRUCTION OF FINAL GRADED AND SUBGRADED SURFACE TO BE COMPLETED WITH MACHINE CONTROL EQUIPMENT.
3. DIGITAL DATA SHALL BE PROVIDED BY THE ENGINEER IN A FORMAT THAT IS COMPATIBLE WITH MACHINE CONTROL TECHNOLOGY FOR BOTH FINAL AND SUBGRADE.
5. FINAL REGRADED LANDFORM TOPOGRAPHY SHALL BE WITHIN +/- 1 FT OF THE DESIGNED TOPOGRAPHY (VERTICAL AND HORIZONTAL ELEVATIONS).
6. THE FINAL GRADE SURFACE SHALL BE DEEP RIPPED ON THE CONTOUR PRIOR TO SEEDING AND MULCHING.
7. SURFACE ROUGHENING AND RIPPING OF FINAL COMPACTED SURFACE SHALL NOT OCCUR IN CHANNEL BOTTOMS OR ON SIDE SLOPES.

Water & Earth TECHNOLOGIES
1225 RED CEDAR CIRCLE, SUITE A
FORT COLLINS, CO 80524
(970) 225-6080
WWW.WETEC.US

SEAL
RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
02/12/2020

QUARRY 1 PMT DESIGN

REFERENCES		REFERENCES	
DWG. NO.	TITLE	DWG. NO.	TITLE

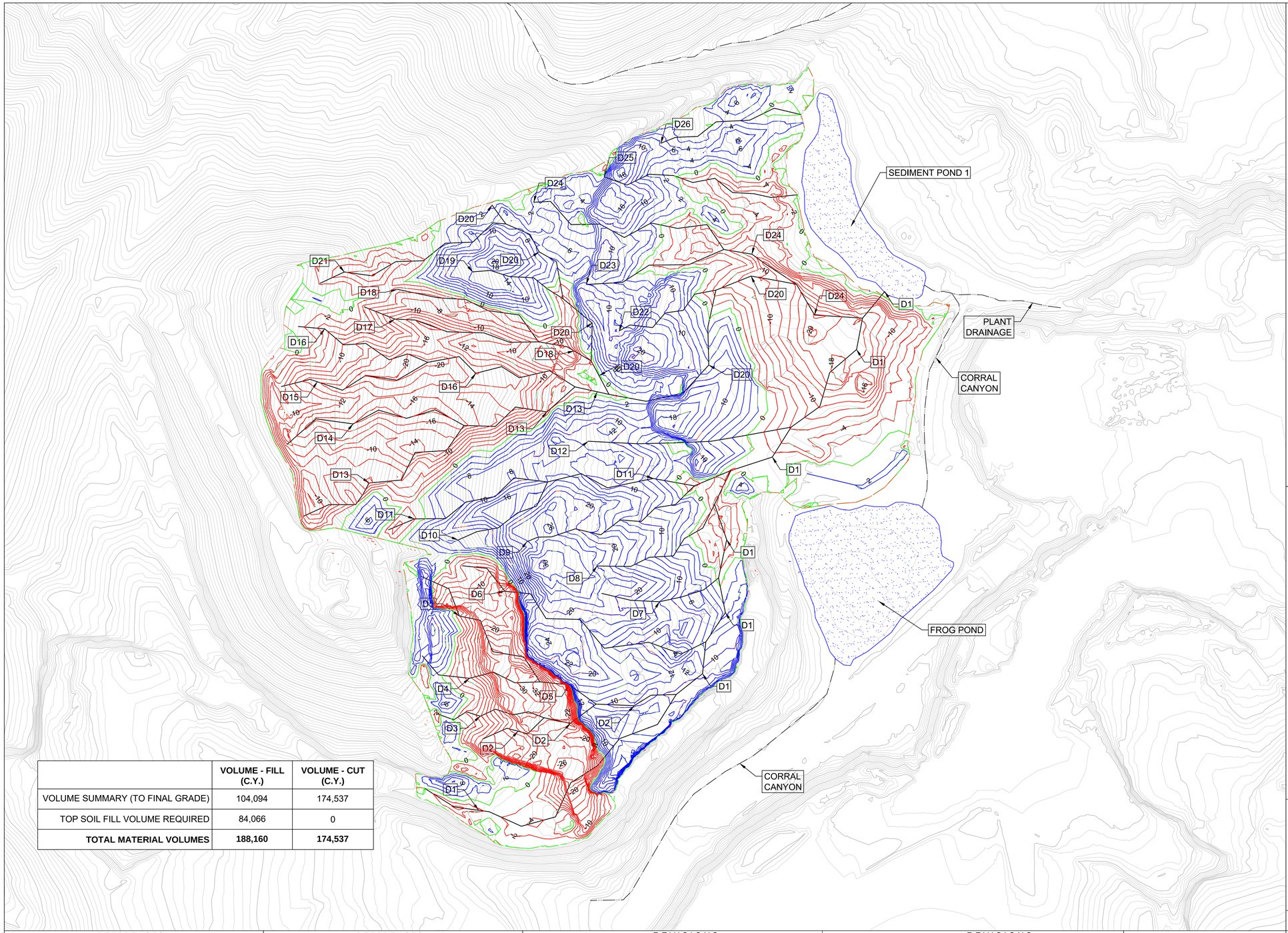
REVISIONS						
NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION

REVISIONS						
NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION

GCC TIJERAS

QUARRY 1 SITE OVERVIEW AND FINAL GRADING PLAN

CONTRACTOR SHEET NO. WET 2 OF 14
DWG. NO.
REVISION | DATE 02/12/2020



GEOMORPHIC GRADING BOUNDARY
DRAIN CENTERLINE
EXISTING INDEX CONTOUR (10-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (2-FT INTERVAL)
ISOMETRIC CUT DEPTH LINES
ISOMETRIC FILL DEPTH LINES
DAYLIGHT LOCATIONS (0' DEPTH CUT/FILL)
EXISTING EPHEMERAL DRAINAGE
POND LOCATIONS

N

0' 100' 200' 300'

	VOLUME - FILL (C.Y.)	VOLUME - CUT (C.Y.)
VOLUME SUMMARY (TO FINAL GRADE)	104,094	174,537
TOP SOIL FILL VOLUME REQUIRED	84,066	0
TOTAL MATERIAL VOLUMES	**188,160**	**174,537**

NOTES

1. CUT-FILL REPRESENTATIVE OF FINAL SURFACE CONFIGURATION. SUBGRADE (NO TOPSOIL) GRADING WILL REQUIRE 2 FEET OF ADDITIONAL CUT TO ALLOW FOR PROPER COVER MATERIAL PLACEMENT ON TOP (NOT REFLECTED IN VOLUMES OR MAGNITUDE OF CUTS AND FILLS).

   IF TOPSOIL MATERIAL WITH A MINIMUM DEPTH OF 2' IS ENCOUNTERED DURING CONSTRUCTION, FURTHER EXCAVATION IS NOT REQUIRED IN THESE LOCATIONS. THIS CONDITION IS ANTICIPATED IN SOME LOCATIONS.

2. EXISTING GROUND CONFIGURATION ASSUMES THAT LIMESTONE HAS BEEN REMOVED (AS INDICATED BY GCC). VOLUMES ARE BASED ON POST LIMESTONE REMOVAL

3. CONSTRUCTION OF FINAL GRADED AND SUBGRADED SURFACE TO BE COMPLETED WITH MACHINE CONTROL EQUIPMENT.

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RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
Richard Spotts 02/12/2020

QUARRY 1 PMT DESIGN

REFERENCES DWG. NO.	REFERENCES TITLE	REFERENCES DWG. NO.	REFERENCES TITLE

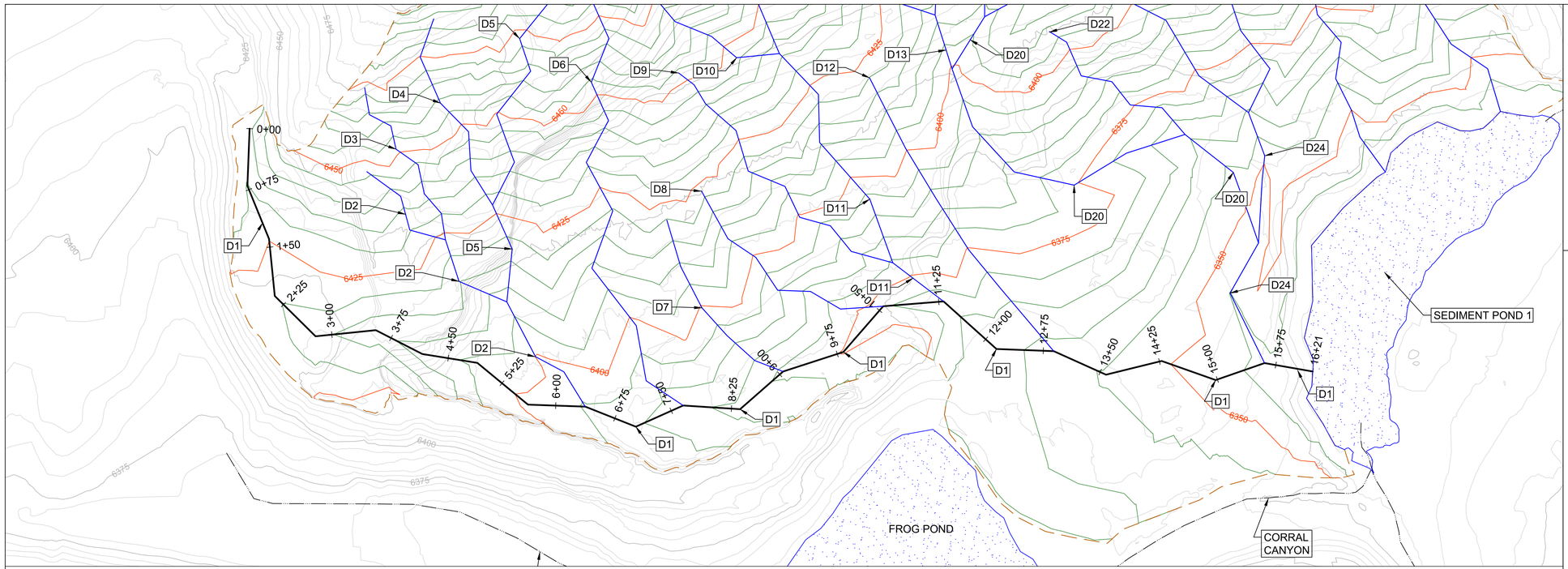
REVISIONS NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION

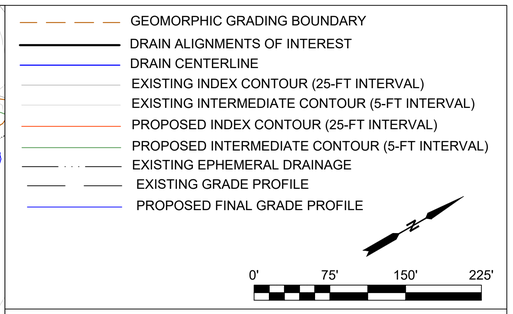
REVISIONS NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION

GCC TIJERAS

QUARRY 1
CUT/FILL MAP & CONSTRUCTION VOLUME SUMMARY

CONTRACTOR SHEET NO. WET 3 OF 14
DWG. NO.
REVISION | DATE 02/12/2020





NOTES

1. FINAL SURFACE TOPOGRAPHY SHOWN. THIS INCLUDES A MINIMUM 2-FOOT COVER OF SUITABLE PLANT GROWTH MEDIUM.

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3. THE TYPICAL LARGE RIPRAP DRAIN SHALL BE CONSTRUCTED WITH SOIL RIPRAP. SOIL RIPRAP SHALL CONSIST OF APPROXIMATELY 65% RIPRAP AND 35% SOIL, BY VOLUME.
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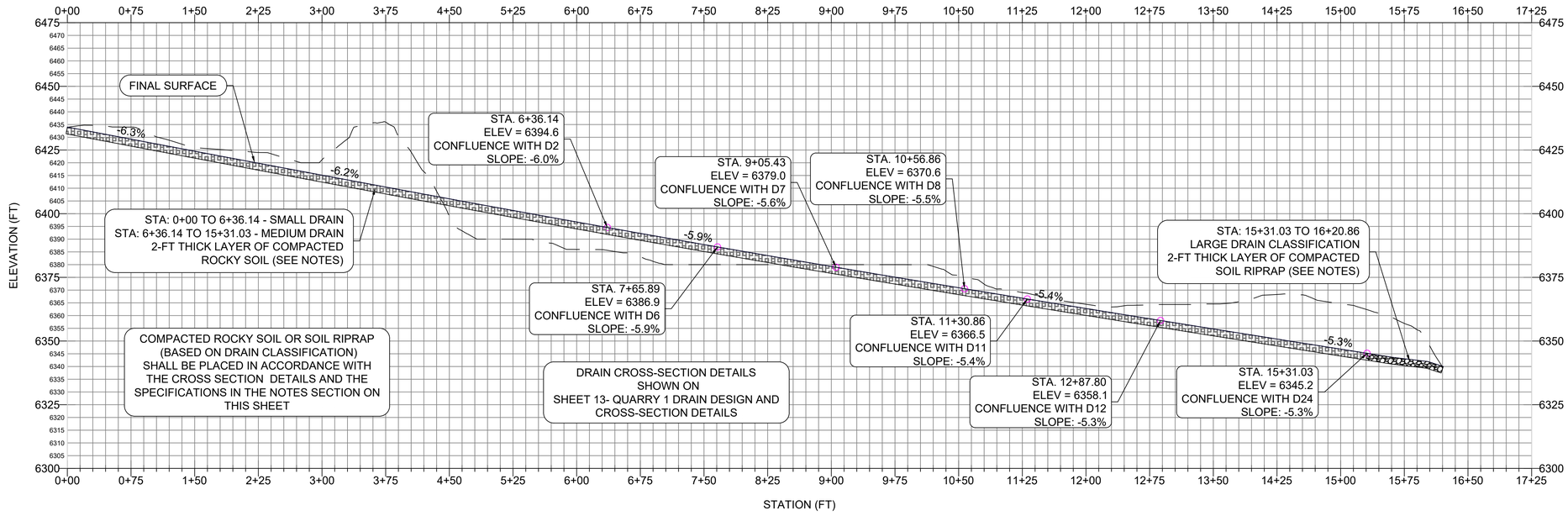
D1 PROFILE



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SEAL

RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
02/12/2020

QUARRY 1 PMT DESIGN

REFERENCES		REFERENCES	
DWG. NO.	TITLE	DWG. NO.	TITLE

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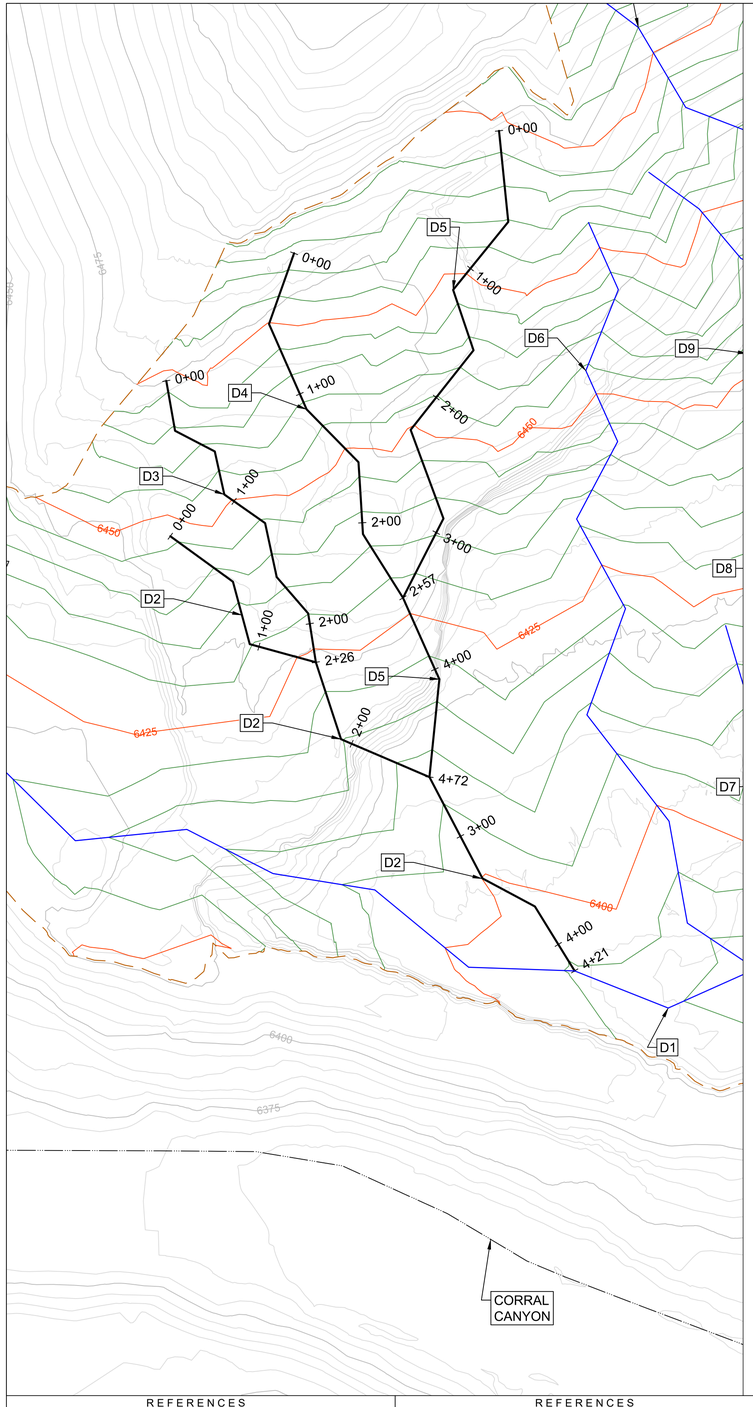
GCC TIJERAS

QUARRY 1
DRAIN D1 PLAN AND PROFILE

CONTRACTOR SHEET. NO.
WET 4 OF 14

DWG. NO.

REVISION	DATE
	02/12/2020



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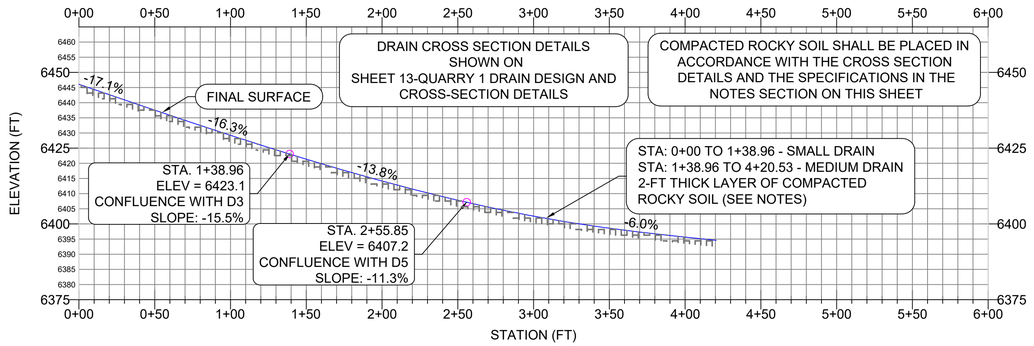

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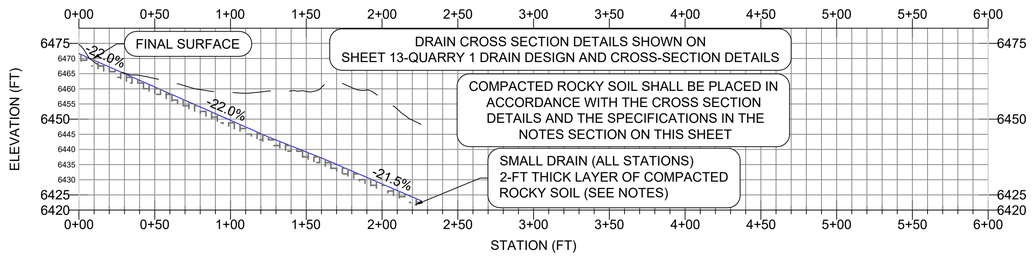

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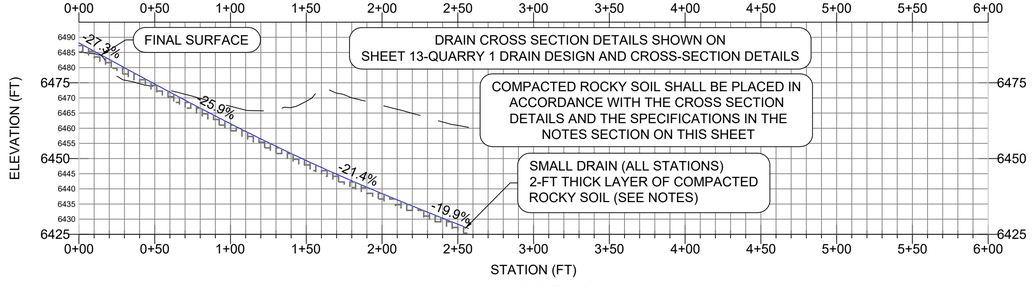

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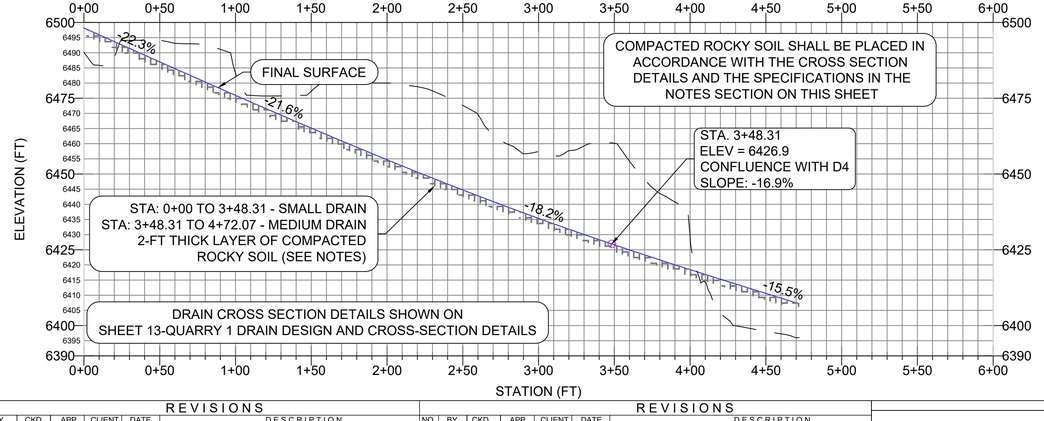

GEOMORPHIC GRADING BOUNDARY
DRAIN ALIGNMENTS OF INTEREST
DRAIN CENTERLINE
EXISTING INDEX CONTOUR (25-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (5-FT INTERVAL)
PROPOSED INDEX CONTOUR (25-FT INTERVAL)
PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
EXISTING EPHEMERAL DRAINAGE
EXISTING GRADE PROFILE
PROPOSED FINAL GRADE PROFILE

N

0' 50' 100' 150'

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WWW.WETEC.US

SEAL
RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
02/12/2020

QUARRY 1 PMT DESIGN

REFERENCES		REFERENCES	
DWG. NO.	TITLE	DWG. NO.	TITLE

REVISIONS						
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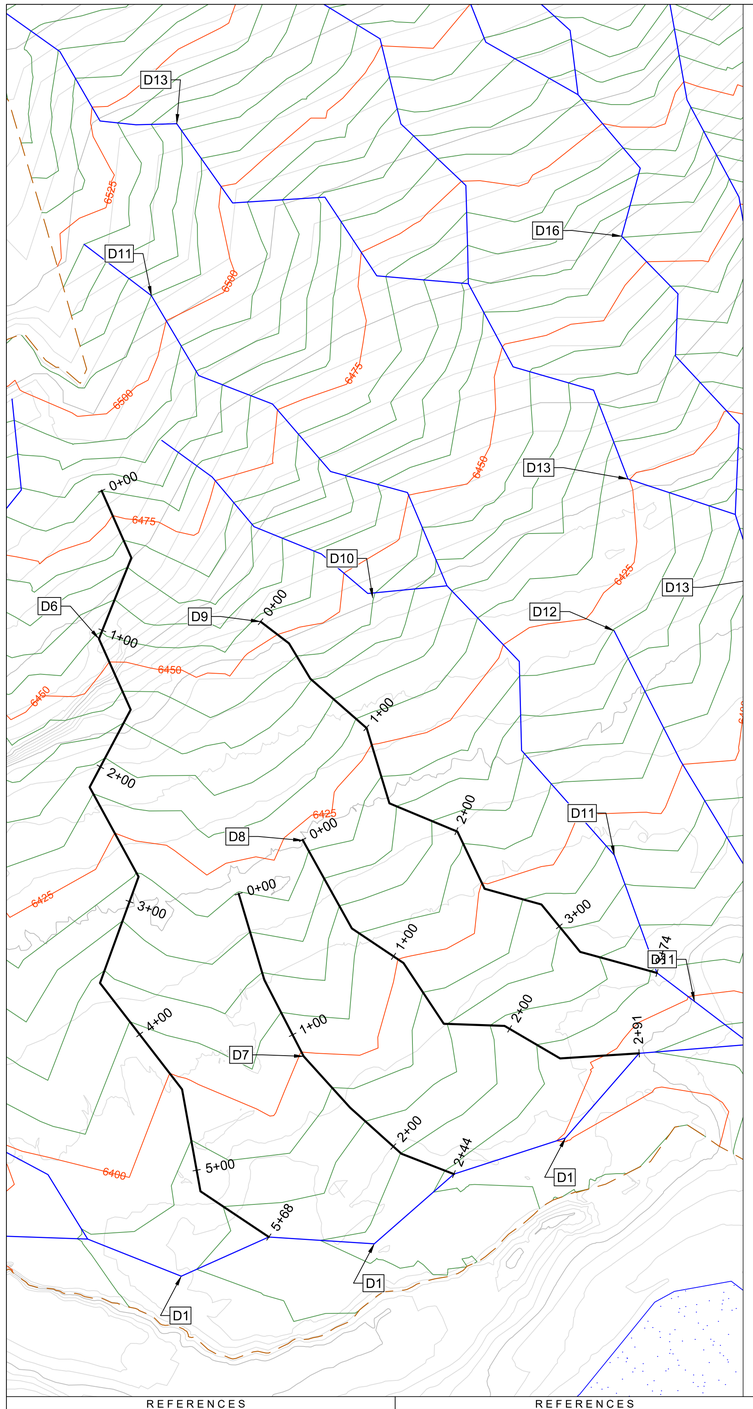
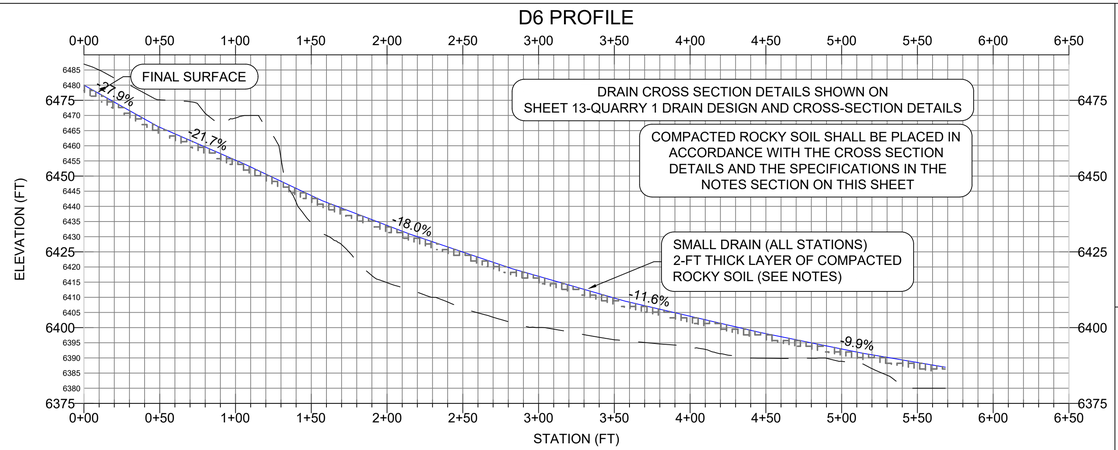
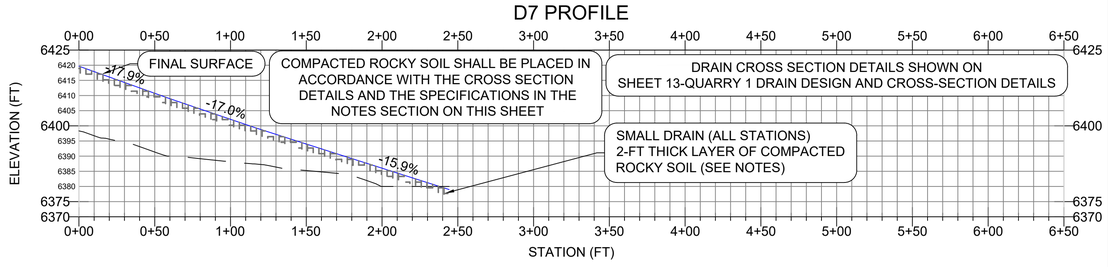
GCC TIJERAS

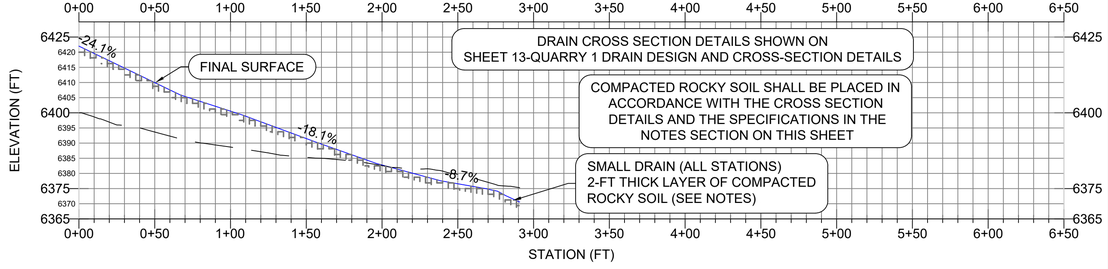
QUARRY 1
DRAINS D2, D3, D4 & D5 PLANS AND PROFILES

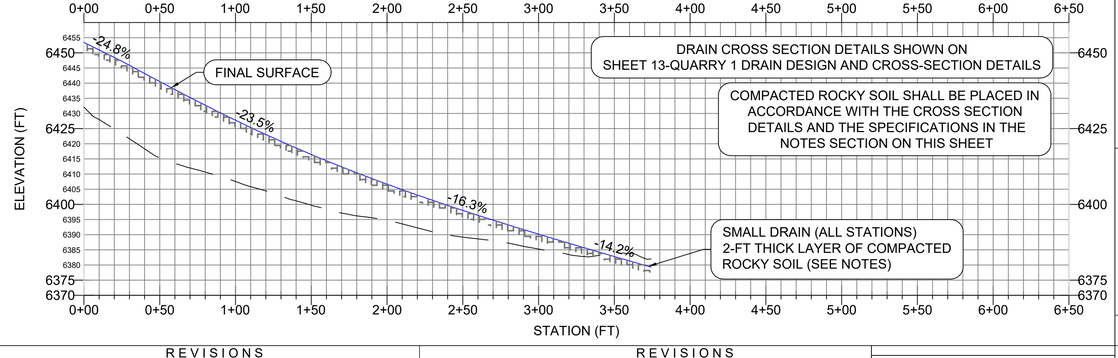
CONTRACTOR SHEET. NO. WET 5 OF 14
DWG. NO.
REVISION | DATE 02/12/2020











GEOMORPHIC GRADING BOUNDARY
DRAIN ALIGNMENTS OF INTEREST
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EXISTING INDEX CONTOUR (25-FT INTERVAL)
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PROPOSED INDEX CONTOUR (25-FT INTERVAL)
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EXISTING GRADE PROFILE
PROPOSED FINAL GRADE PROFILE

N

0' 50' 100' 150'

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GCC TIJERAS

QUARRY 1
DRAINS D6, D7, D8 & D9 PLANS AND PROFILES

CONTRACTOR SHEET. NO. WET 6 OF 14
DWG. NO.
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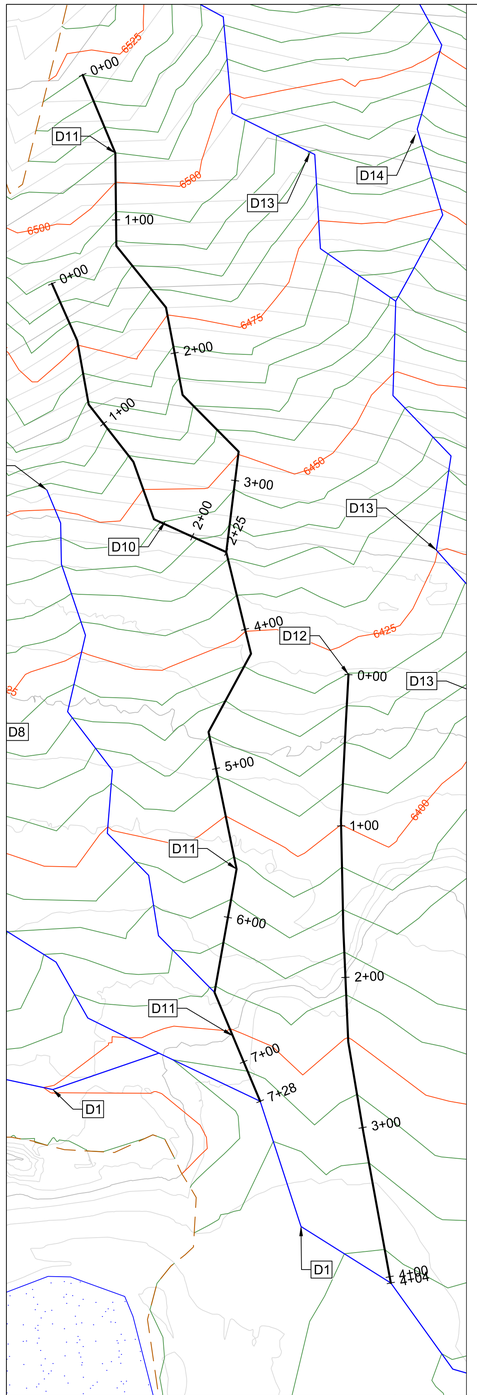

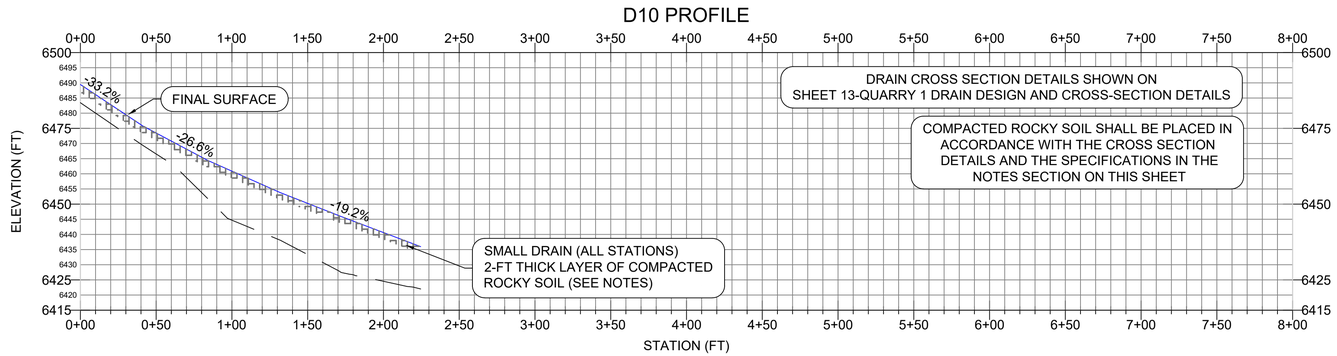

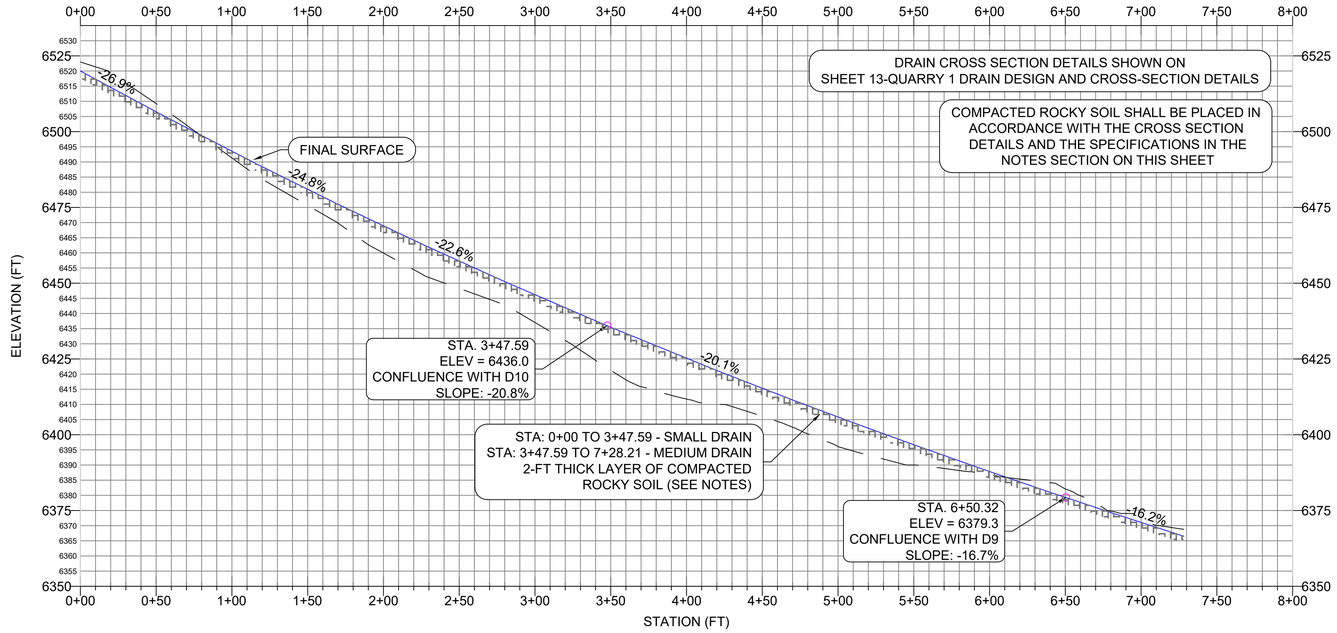

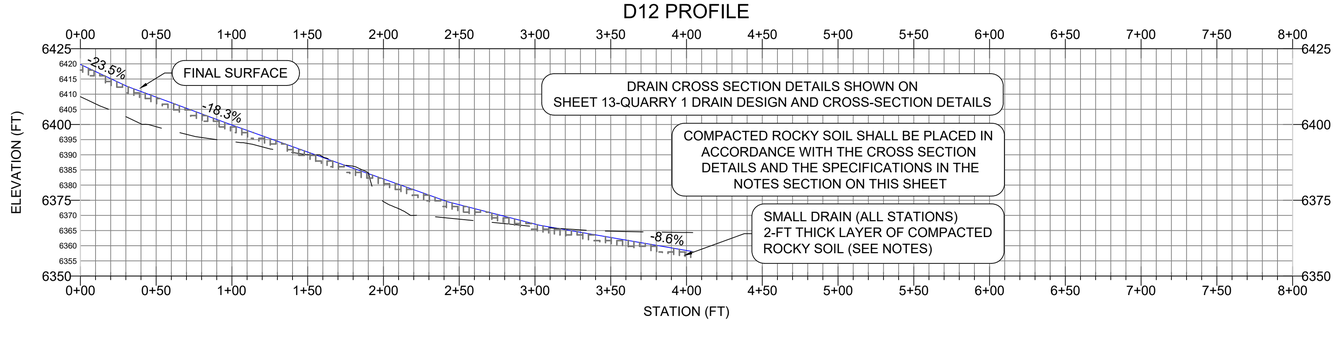

GEOMORPHIC GRADING BOUNDARY
DRAIN ALIGNMENTS OF INTEREST
DRAIN CENTERLINE
EXISTING INDEX CONTOUR (25-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (5-FT INTERVAL)
PROPOSED INDEX CONTOUR (25-FT INTERVAL)
PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
EXISTING EPHEMERAL DRAINAGE
EXISTING GRADE PROFILE
PROPOSED FINAL GRADE PROFILE

N

0' 50' 100' 150'

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1. FINAL SURFACE TOPOGRAPHY SHOWN. THIS INCLUDES A MINIMUM 2-FOOT COVER OF SUITABLE PLANT GROWTH MEDIUM.

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SEAL
RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
02/12/2020

QUARRY 1 PMT DESIGN

REFERENCES		REFERENCES	
DWG. NO.	TITLE	DWG. NO.	TITLE

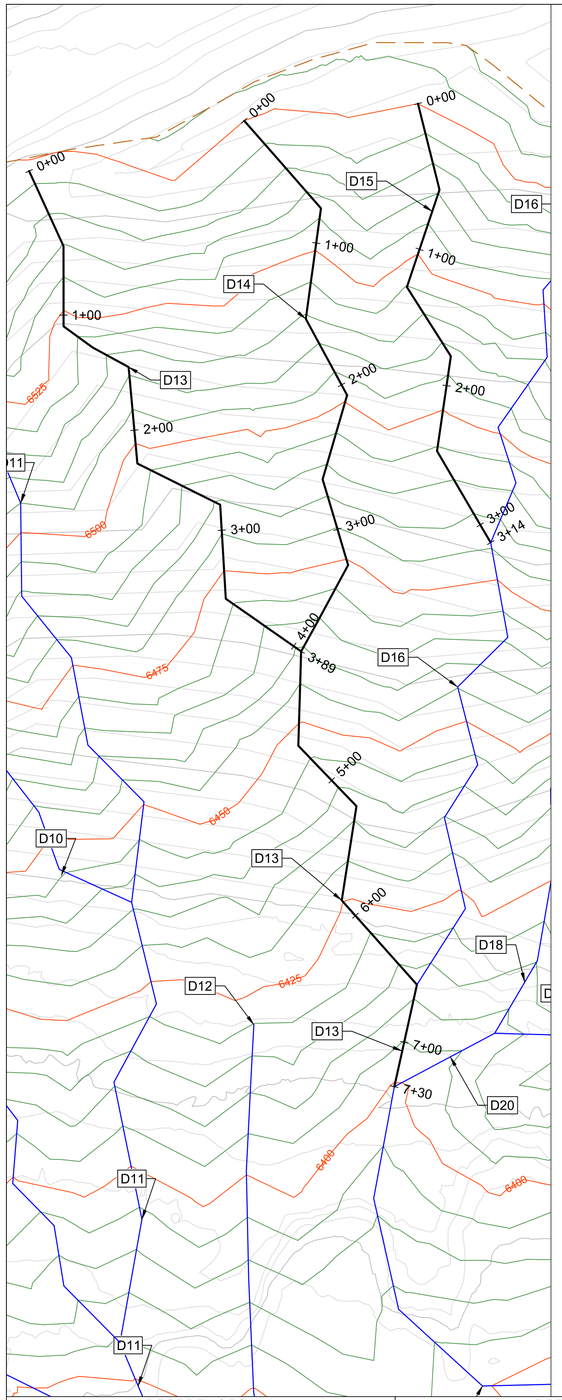
REVISIONS						
NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION

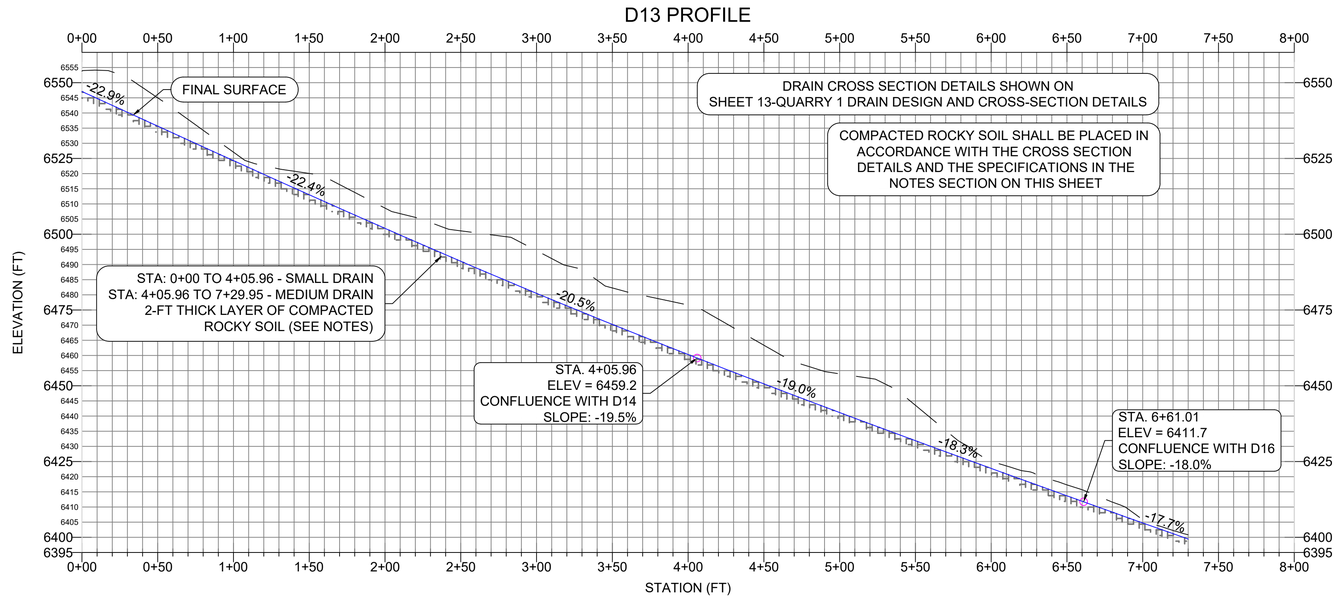
REVISIONS						
NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION

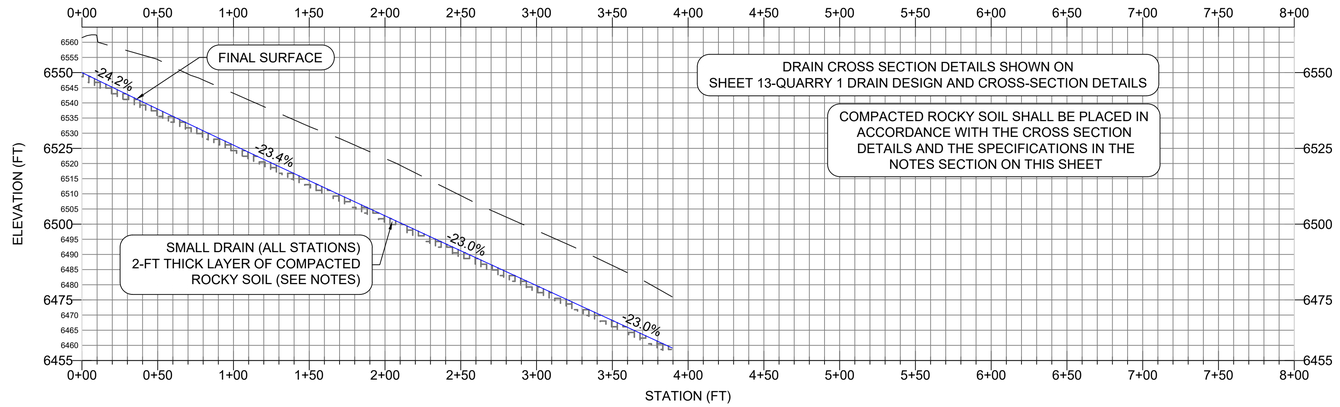
GCC TIJERAS

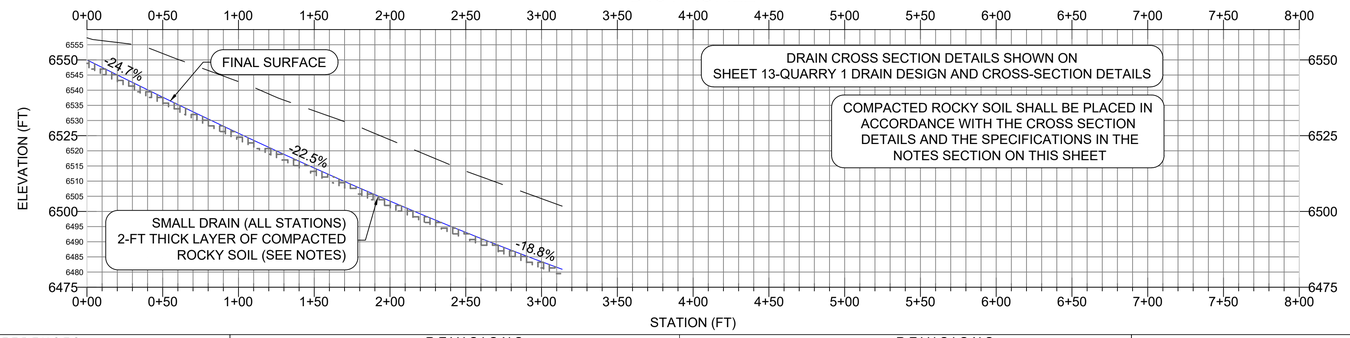
QUARRY 1
DRAINS D10, D11 & D12 PLANS AND PROFILES

CONTRACTOR SHEET. NO.
WET 7 OF 14
DWG. NO.
REVISION | DATE
02/12/2020









GEOMORPHIC GRADING BOUNDARY
DRAIN ALIGNMENTS OF INTEREST
DRAIN CENTERLINE
EXISTING INDEX CONTOUR (25-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (5-FT INTERVAL)
PROPOSED INDEX CONTOUR (25-FT INTERVAL)
PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
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EXISTING GRADE PROFILE
PROPOSED FINAL GRADE PROFILE

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0' 50' 100' 150'

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SEAL
RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
02/12/2020

QUARRY 1 PMT DESIGN

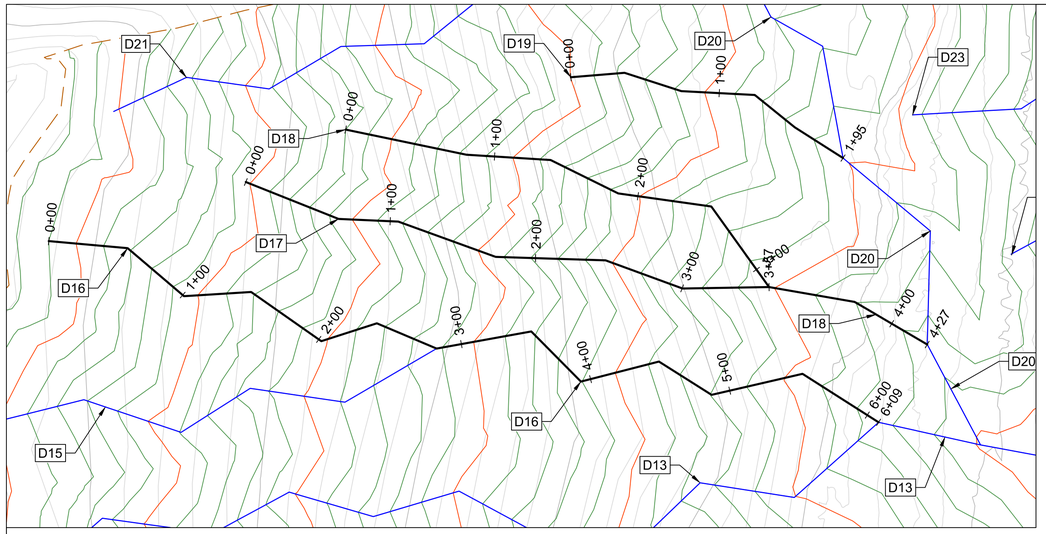
REFERENCES		REFERENCES	
DWG. NO.	TITLE	DWG. NO.	TITLE

REVISIONS							REVISIONS						
NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION	NO.	BY	CKD	APP.	CLIENT	DATE	DESCRIPTION

GCC TIJERAS

QUARRY 1
DRAINS D13, D14 & D15 PLANS AND PROFILES

CONTRACTOR SHEET. NO.
WET 8 OF 14
DWG. NO.
REVISION | DATE
02/12/2020



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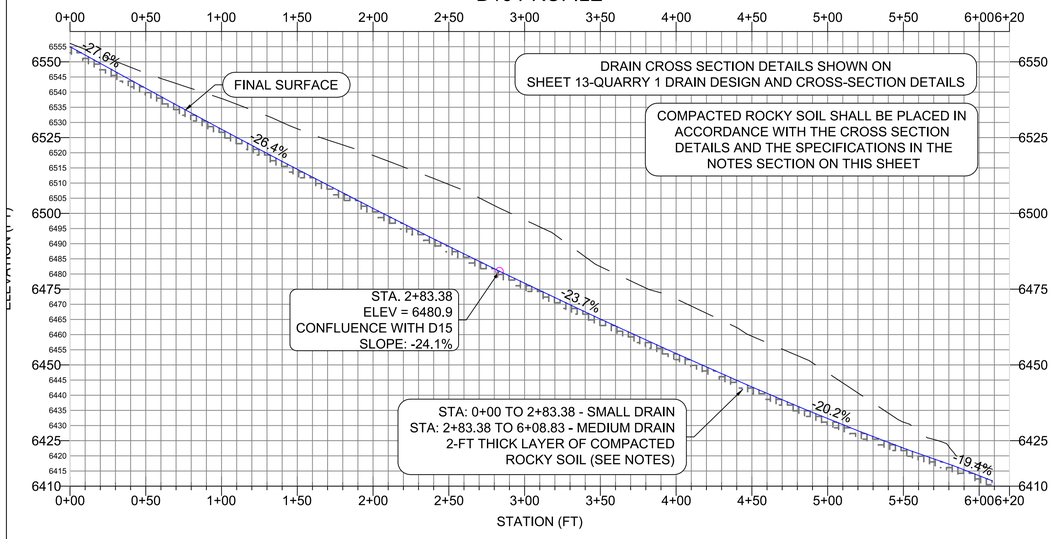

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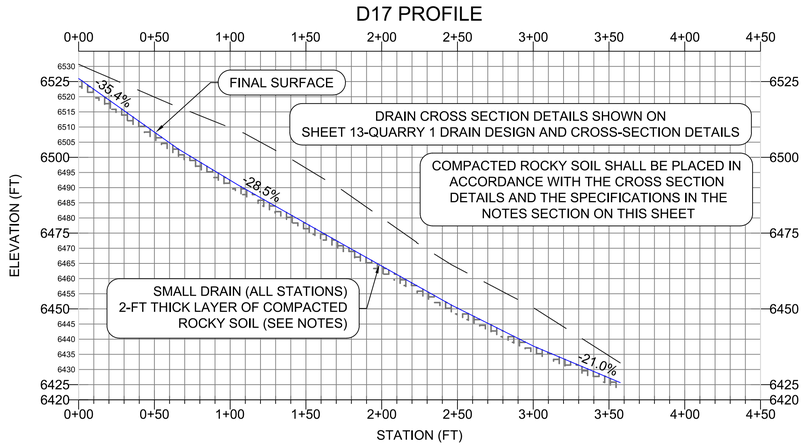

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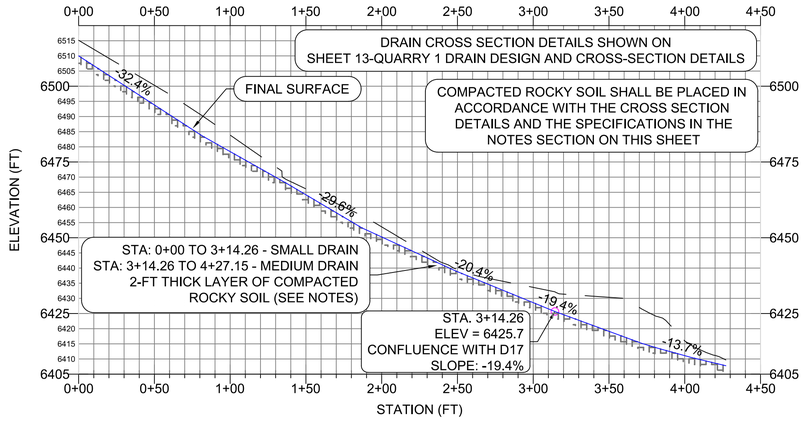

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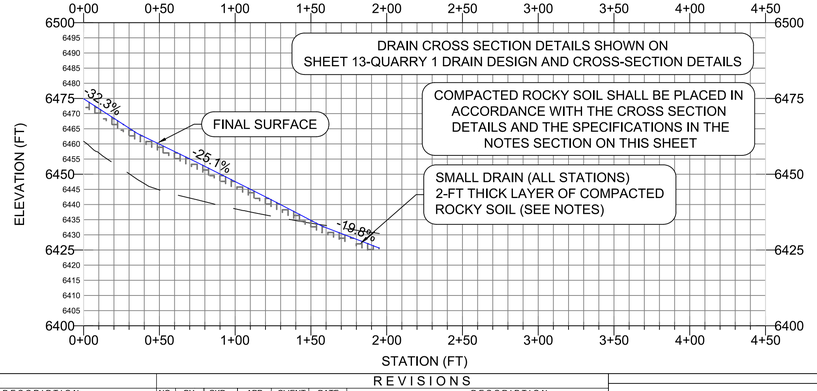

GEOMORPHIC GRADING BOUNDARY
DRAIN ALIGNMENTS OF INTEREST
DRAIN CENTERLINE
EXISTING INDEX CONTOUR (25-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (5-FT INTERVAL)
PROPOSED INDEX CONTOUR (25-FT INTERVAL)
PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
EXISTING EPHEMERAL DRAINAGE
EXISTING GRADE PROFILE
PROPOSED FINAL GRADE PROFILE

0' 50' 100' 150'

N

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SEAL
RICHARD SPOTTS
NEW MEXICO
15772
LICENSED PROFESSIONAL ENGINEER
02/12/2020

QUARRY 1 PMT DESIGN

REFERENCES		REFERENCES		REVISIONS							REVISIONS						
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION	NO.	BY	CKD	APP.	CLIENT	DATE	DESCRIPTION

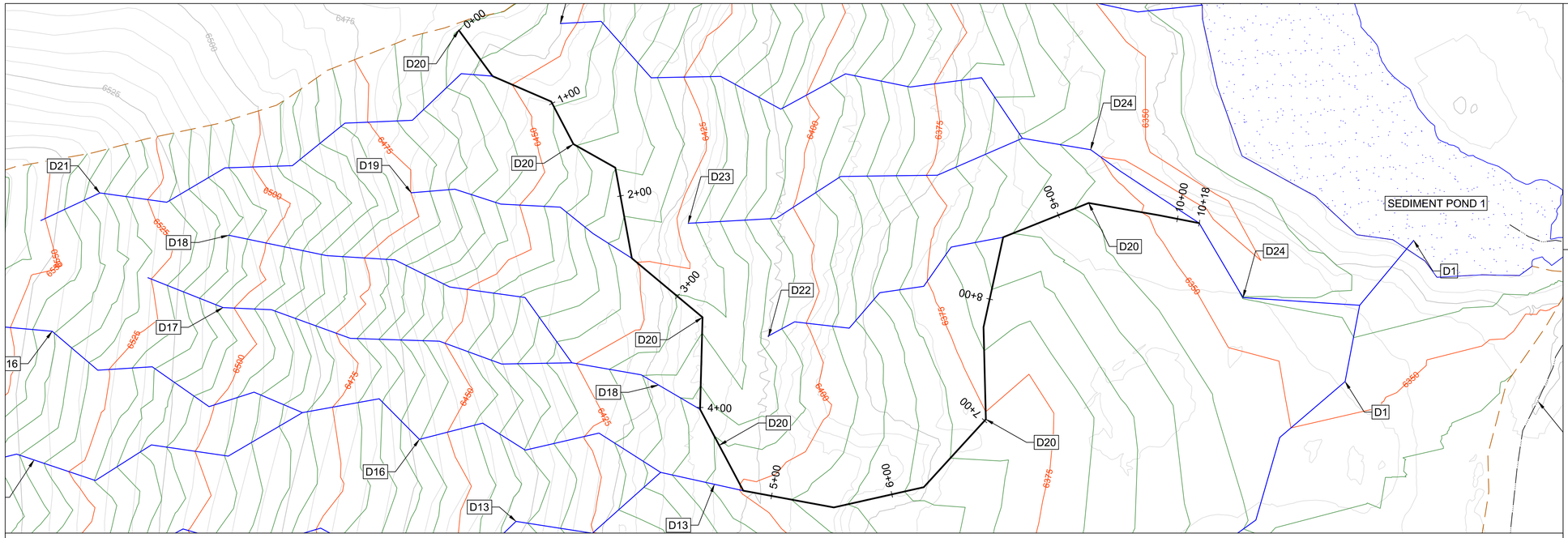
GCC TIJERAS

QUARRY 1
DRAINS D16, D17, D18 & D19
PLANS AND PROFILES

CONTRACTOR SHEET. NO.
WET 9 OF 14

DWG. NO.

REVISION | DATE
02/12/2020



- GEOMORPHIC GRADING BOUNDARY
- DRAIN ALIGNMENTS OF INTEREST
- DRAIN CENTERLINE
- EXISTING INDEX CONTOUR (25-FT INTERVAL)
- EXISTING INTERMEDIATE CONTOUR (5-FT INTERVAL)
- PROPOSED INDEX CONTOUR (25-FT INTERVAL)
- PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
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- PROPOSED FINAL GRADE PROFILE

0' 50' 100' 150'

N

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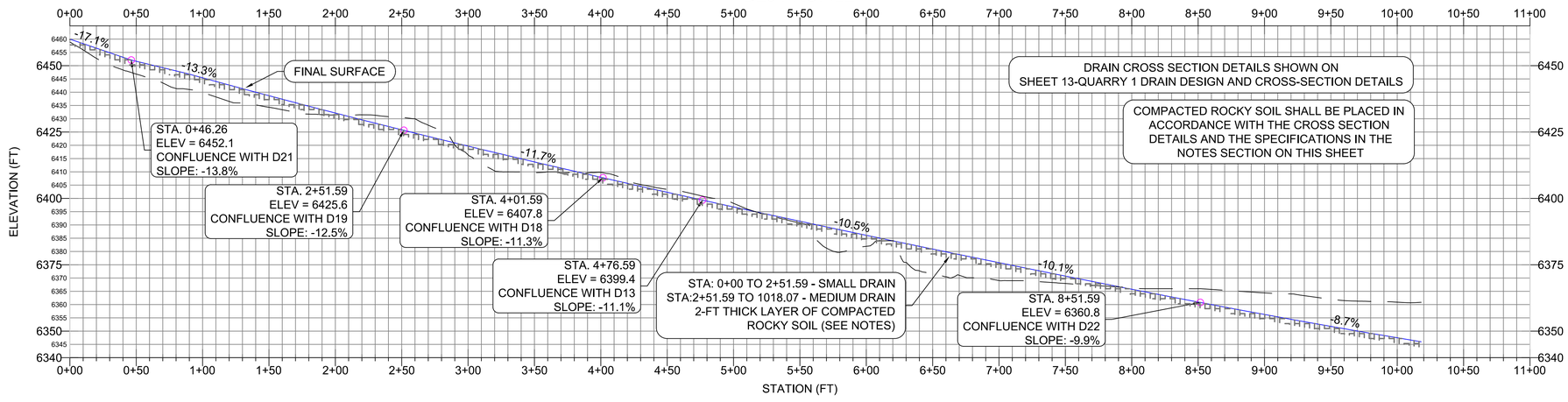
D20 PROFILE



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SEAL

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02/12/2020

QUARRY 1 PMT DESIGN

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REVISIONS						
NO.	BY	CKD	APP	CLIENT	DATE	DESCRIPTION

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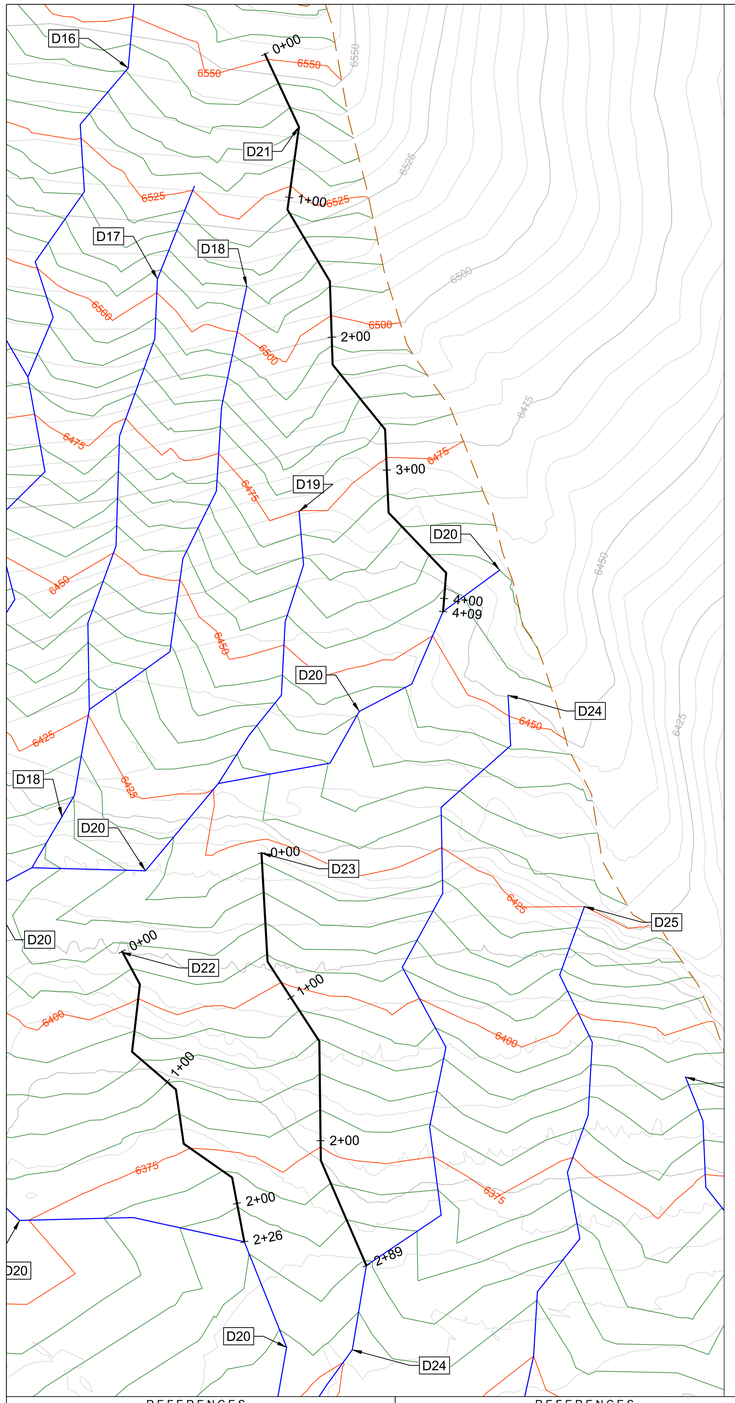
GCC TIJERAS

QUARRY 1
DRAIN D20
PLAN AND PROFILE

CONTRACTOR SHEET. NO.
WET 10 OF 14

DWG. NO.

REVISION	DATE
	02/12/2020



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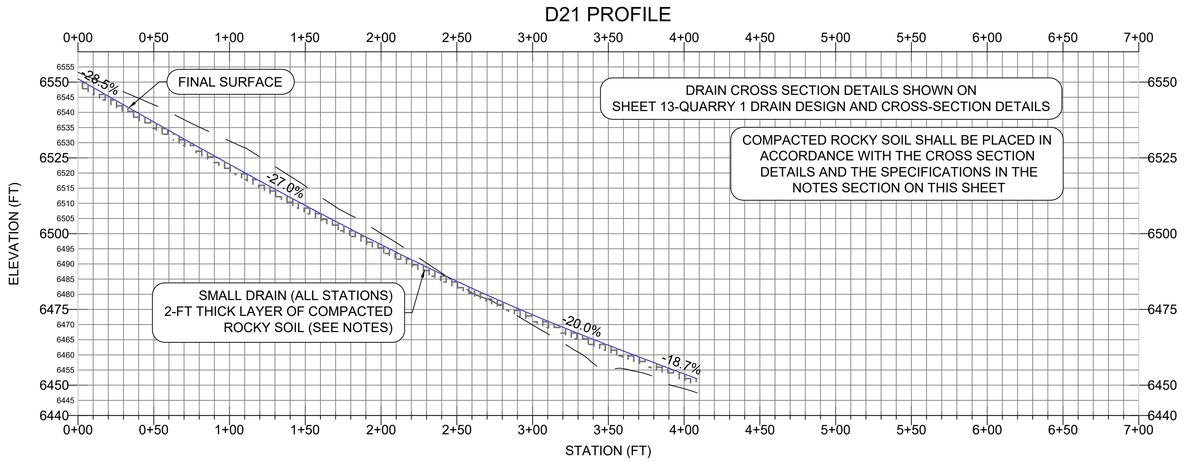

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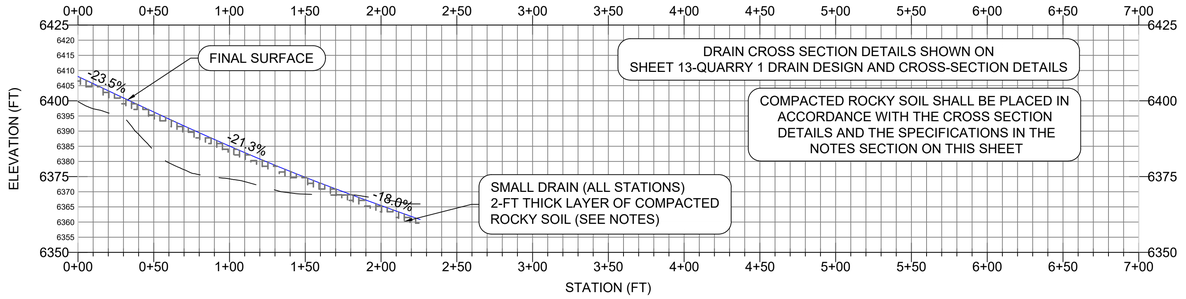
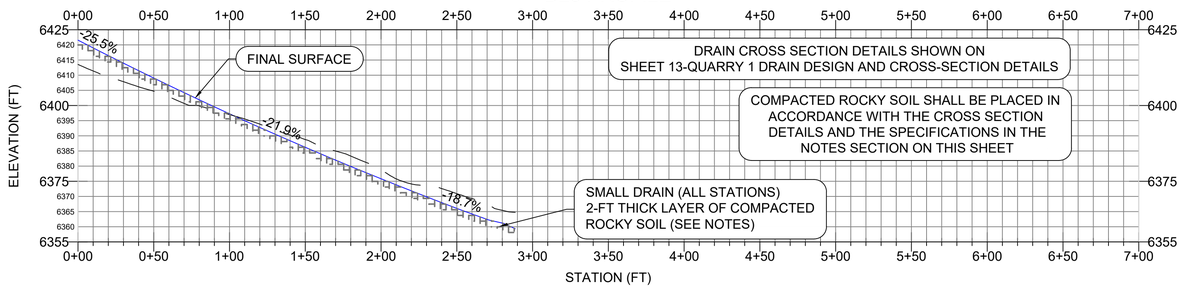


D23 PROFILE



GEOMORPHIC GRADING BOUNDARY
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   - 2.4. THE SUBGRADE SHALL BE ROUGHENED PRIOR TO ROCKY SOIL LINER PLACEMENT. THE ROCKY SOIL LINER SHALL BE PLACED AND THEN COMPACTED INTO THE SUBGRADE WITH SUITABLE EQUIPMENT TO ACHIEVE A DENSE MASS OF THAT IS VIRTUALLY FREE OF VOIDS.
   - 2.5. MOISTURE CONDITIONING SHALL BE USED TO INCREASE COMPACTION IF NATIVE SOILS ARE RELATIVELY DRY. THE COMPACTED ROCKY SOIL LINER SHALL NOT BE COVERED WITH TOPSOIL. SURFACE ROUGHENING OF THE FINAL COMPACTED SURFACE SHALL NOT OCCUR IN CHANNEL BOTTOMS OR SIDESLOPES.

3. THE TYPICAL LARGE RIPRAP DRAIN SHALL BE CONSTRUCTED WITH SOIL RIPRAP. SOIL RIPRAP SHALL CONSIST OF APPROXIMATELY 65% RIPRAP AND 35% SOIL, BY VOLUME.
   - 3.1. THE RIPRAP SHALL CONSIST OF A WELL-GRADED MIXTURE OF STONE. LARGER STONE SHALL PREDOMINATE, WITH SUFFICIENT SMALLER SIZES TO FILL VOIDS BETWEEN STONES.
   - 3.2. THE DIAMETER OF THE LARGEST STONE SIZES SHOULD BE NO GREATER THAN 2 TIMES THE D50 SIZE.
   - 3.3. PRIOR TO MIXING WITH NATIVE SOILS, THE RIPRAP SHALL HAVE THE FOLLOWING GRADATION:
     - DMIN = 3 INCHES
     - D50 = 6 INCHES
     - DMAX = 9 INCHES
   - 3.4. THE RIPRAP SHALL BE HARD, ANGULAR AND HIGHLY WEATHER RESISTANT. THE RATIO OF LENGTH TO THICKNESS OF ANGULAR STONES SHALL NOT EXCEED 2.
   - 3.5. RIPRAP AND NATIVE SOIL MATERIAL SHALL BE MIXED PRIOR TO PLACEMENT.
   - 3.6. THE SUBGRADE SHALL BE ROUGHENED PRIOR TO SOIL RIPRAP PLACEMENT. SOIL RIPRAP SHALL BE PLACED AND THEN COMPACTED INTO THE SUBGRADE WITH SUITABLE EQUIPMENT TO ACHIEVE A DENSE MASS OF SOIL RIPRAP THAT IS VIRTUALLY FREE OF VOIDS.
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SEAL
RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
02/12/2020

QUARRY 1 PMT DESIGN

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REVISIONS						
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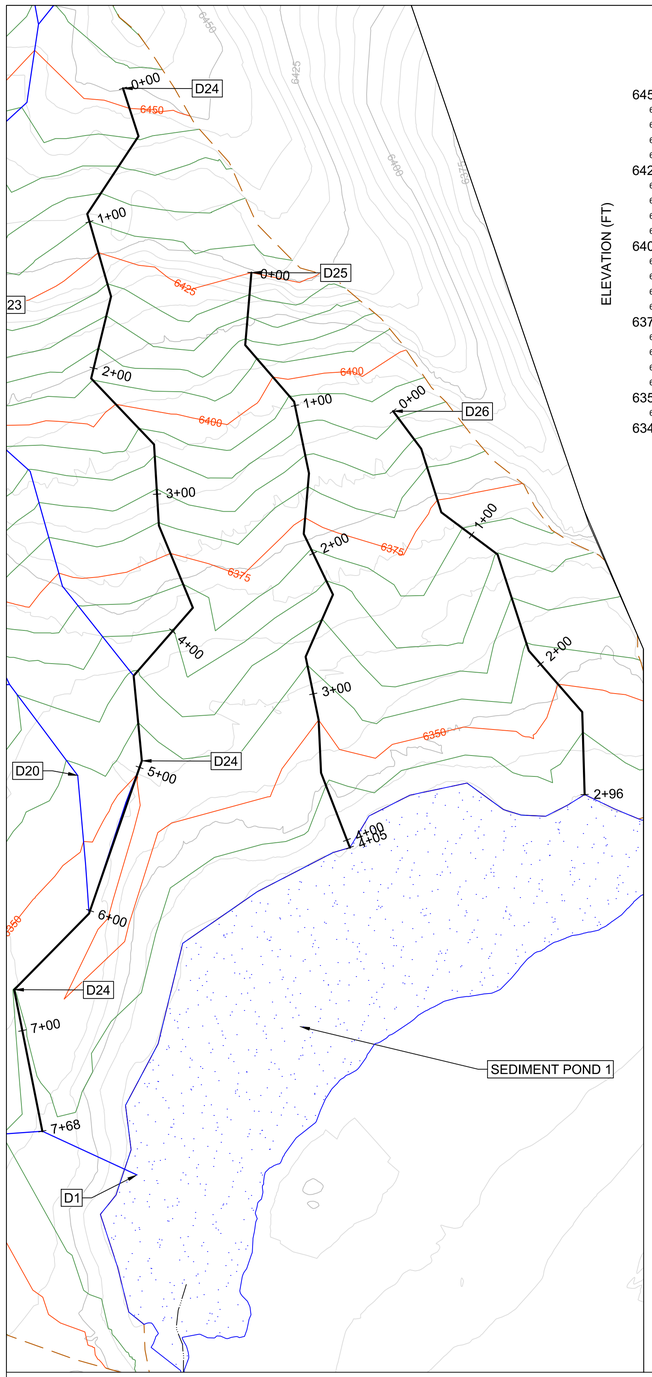
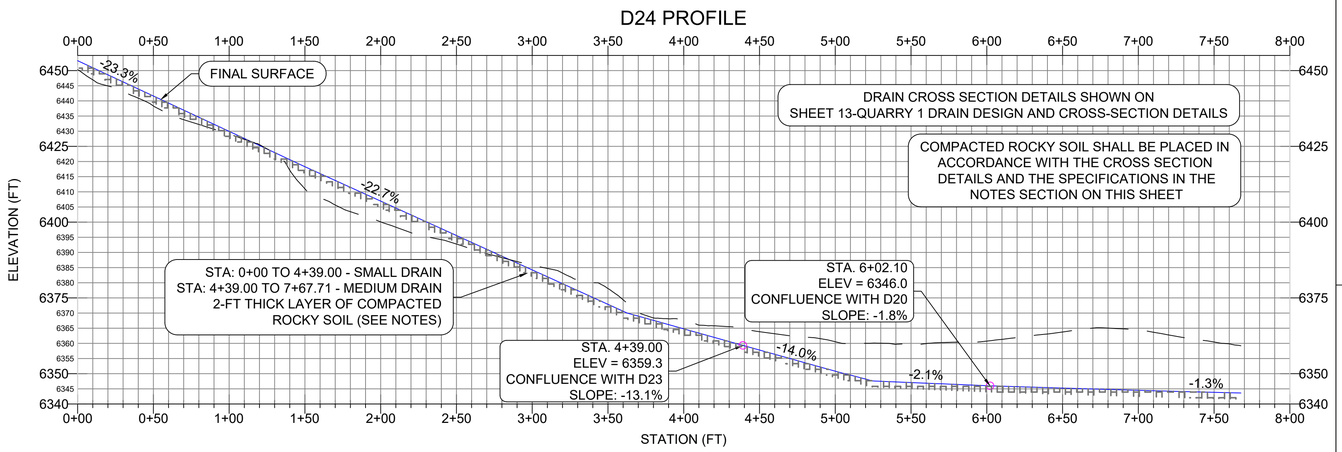
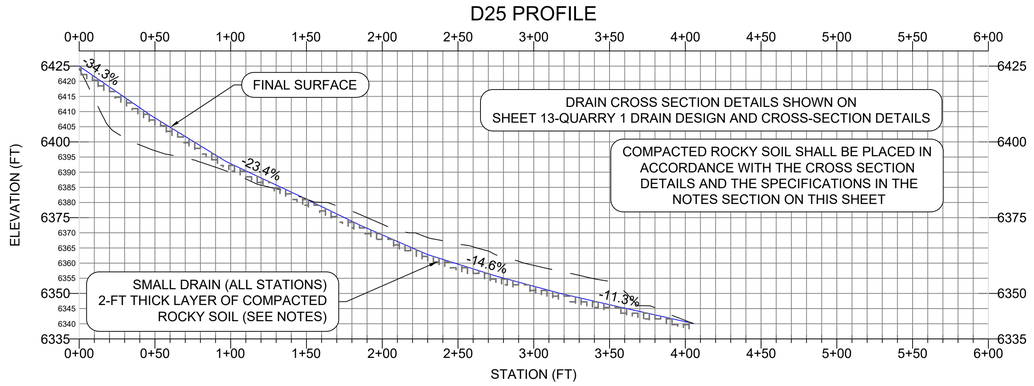
GCC TIJERAS

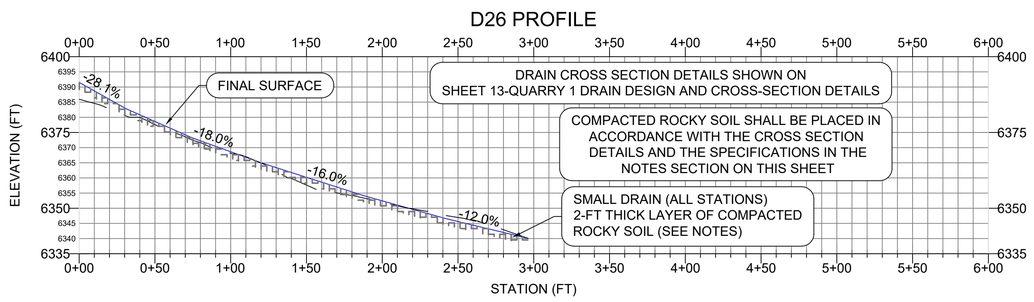
QUARRY 1
DRAINS D21, D22 & D23 PLANS AND PROFILES

CONTRACTOR SHEET. NO.
WET 11 OF 14
DWG. NO.
REVISION | DATE
02/12/2020









GEOMORPHIC GRADING BOUNDARY
DRAIN ALIGNMENTS OF INTEREST
DRAIN CENTERLINE
EXISTING INDEX CONTOUR (25-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (5-FT INTERVAL)
PROPOSED INDEX CONTOUR (25-FT INTERVAL)
PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
EXISTING EPHEMERAL DRAINAGE
EXISTING GRADE PROFILE
PROPOSED FINAL GRADE PROFILE

N

0' 50' 100' 150'

NOTES

1. FINAL SURFACE TOPOGRAPHY SHOWN. THIS INCLUDES A MINIMUM 2-FOOT COVER OF SUITABLE PLANT GROWTH MEDIUM.

2. THE TYPICAL SMALL DRAIN AND TYPICAL MEDIUM DRAIN SHALL BE CONSTRUCTED FROM A COMPACTED ROCKY SOIL. THE ROCKY SOIL LINER WILL CONSIST OF AT LEAST 70% STONE, BY VOLUME, AND MAY INCLUDE UP TO 30% SOIL, BY VOLUME.
   - 2.1. THE STONE IN THE ROCKY SOIL LINER WILL BE HARD AND HIGHLY WEATHER-RESISTANT.
   - 2.2. THE STONE IN THE ROCKY SOIL LINER WILL BE SIZED AS 6" MINUS.
   - 2.3. THE STONE AND NATIVE SOIL MATERIAL SHALL BE MIXED PRIOR TO PLACEMENT.
   - 2.4. THE SUBGRADE SHALL BE ROUGHENED PRIOR TO ROCKY SOIL LINER PLACEMENT. THE ROCKY SOIL LINER SHALL BE PLACED AND THEN COMPACTED INTO THE SUBGRADE WITH SUITABLE EQUIPMENT TO ACHIEVE A DENSE MASS OF THAT IS VIRTUALLY FREE OF VOIDS.
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SEAL
RICHARD SPOTTS NEW MEXICO 15772 LICENSED PROFESSIONAL ENGINEER
Richard Spotts 02/12/2020

QUARRY 1 PMT DESIGN

REFERENCES		REFERENCES	
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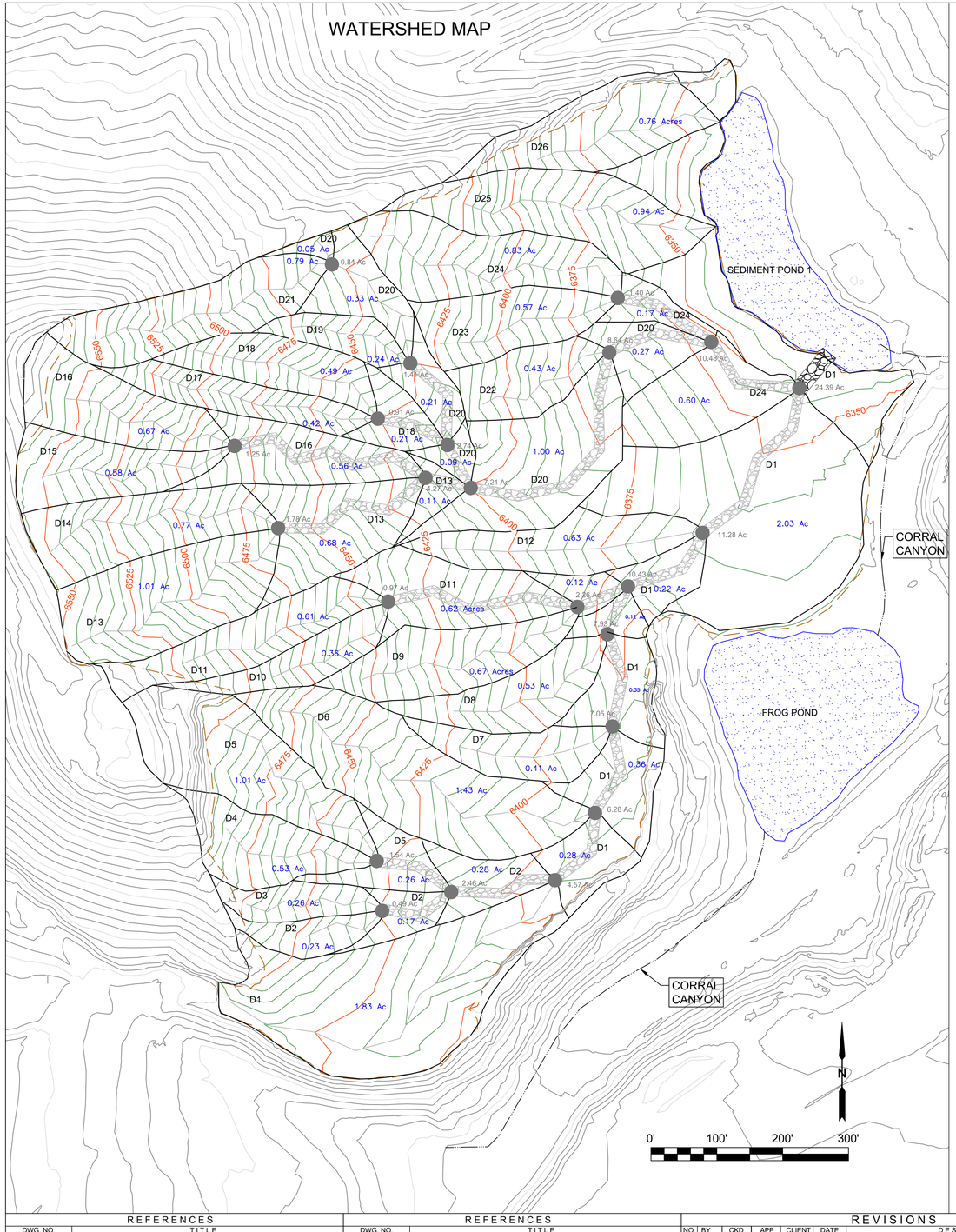
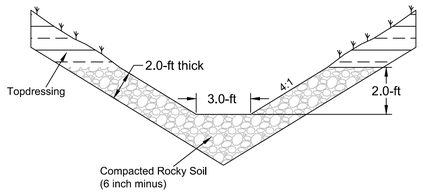
GCC TIJERAS

QUARRY 1
DRAINS D24, D25 & D26 PLANS AND PROFILES

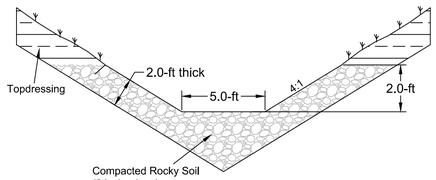
CONTRACTOR SHEET. NO. WET 12 OF 14
DWG. NO.
REVISION | DATE 02/12/2020



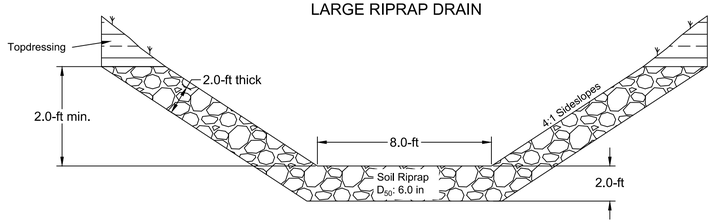
TYPICAL SMALL DRAIN



TYPICAL MEDIUM DRAIN



LARGE RIPRAP DRAIN



Hydrologic Parameters		Drain Parameters					
Watershed Area (ac)	Q100 (cfs)	Bottom Width (ft)	Flow Depth (ft)	Channel Depth (ft)	Sideslope (Z:1)	Drain Protection	Drain Size
0.50	1.3	3.0	0.14	2.0	4.0	Rocky Mixture	Small
1.00	2.5	3.0	0.17	2.0	4.0	Rocky Mixture	Small
1.83	4.6	3.0	0.30	2.0	4.0	Rocky Mixture	Small
2.00	5.0	3.0	0.35	2.0	4.0	Rocky Mixture	Small
4.27	10.8	5.0	0.33	2.0	4.0	Rocky Mixture	Medium
4.57	11.5	5.0	0.39	2.0	4.0	Rocky Mixture	Medium
7.21	18.2	5.0	0.47	2.0	4.0	Rocky Mixture	Medium
8.64	21.8	5.0	0.53	2.0	4.0	Rocky Mixture	Medium
10.43	26.3	5.0	0.66	2.0	4.0	Rocky Mixture	Medium
10.48	26.4	5.0	0.69	2.0	4.0	Rocky Mixture	Medium
24.39	61.4	8.0	0.83	2.0	4.0	6-inch Soil Riprap	Large

EXISTING INDEX CONTOUR (25-FT INTERVAL)
EXISTING INTERMEDIATE CONTOUR (5-FT INTERVAL)
PROPOSED INDEX CONTOUR (25-FT INTERVAL)
PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
GEOMORPHIC GRADING BOUNDARY
SUBWATERSHED BOUNDARY
2.57 Ac SUBWATERSHED AREA (ACRES)
2.57 Ac CHANNEL CONFLUENCE AREA (ACRES)

SMALL DRAIN
MEDIUM DRAIN
LARGE RIPRAP DRAIN

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SEAL
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02/12/2020

QUARRY 1 PMT DESIGN

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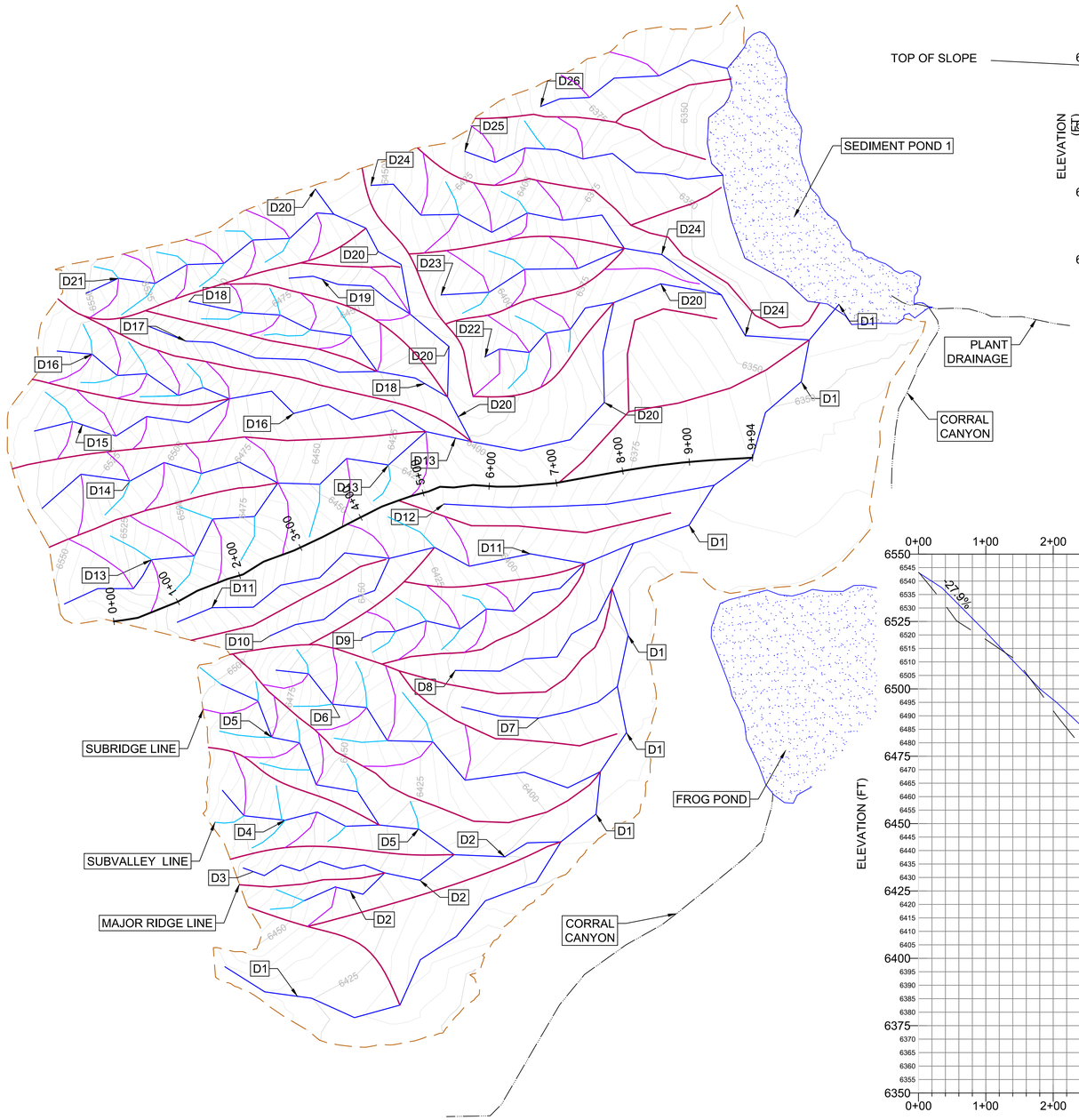
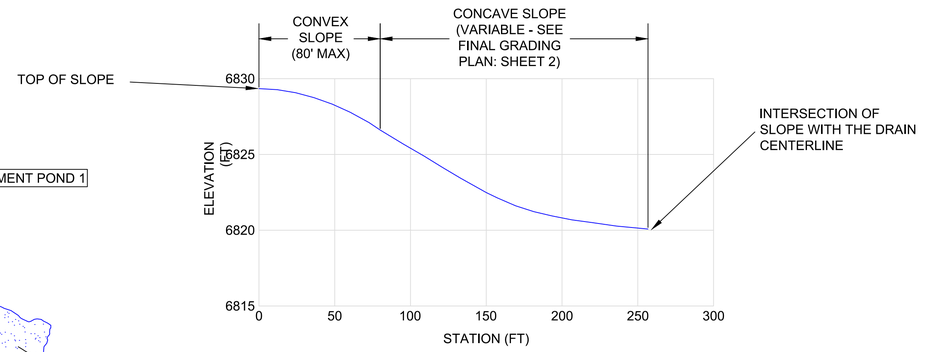
GCC TIJERAS

QUARRY 1 DRAIN DESIGN & CROSS-SECTION DETAILS

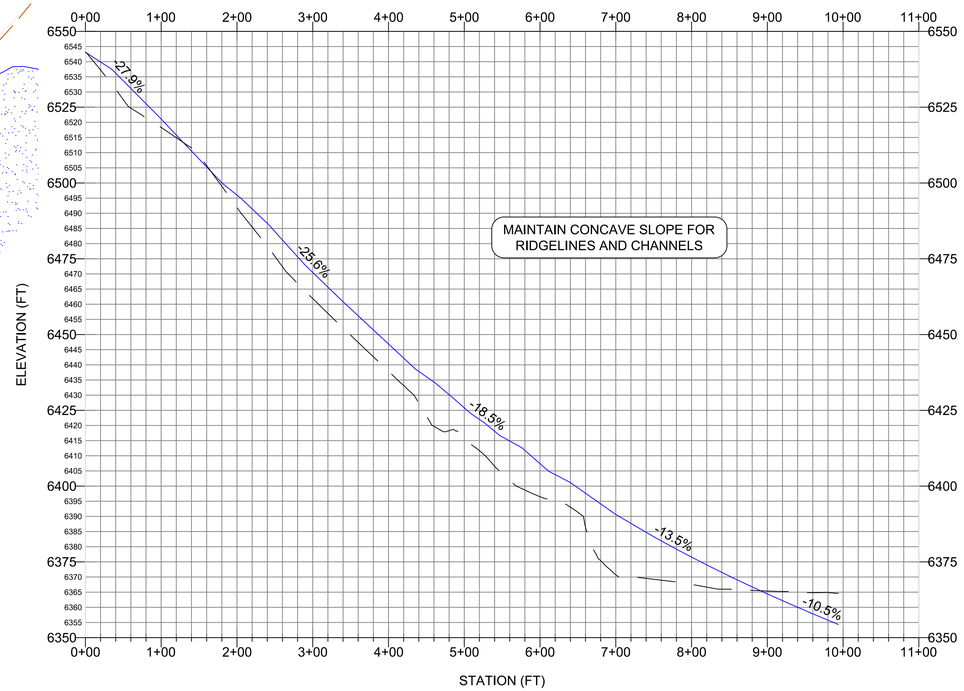
CONTRACTOR SHEET. NO. WET 13 OF 14
DWG. NO.
REVISION | DATE 02/12/2020



GRADED SLOPE PROFILE DETAIL



MAIN RIDGELINE PROFILE



- GEOMORPHIC GRADING BOUNDARY
- DRAIN CENTERLINE
- MAJOR RIDGE LINES
- SUBRIDGES
- SUBVALLEYS
- PROPOSED INDEX CONTOUR (25-FT INTERVAL)
- PROPOSED INTERMEDIATE CONTOUR (5-FT INTERVAL)
- EXISTING EPHEMERAL DRAINAGE
- POND LOCATIONS

N

0' 100' 200' 300'

NOTES

1. ALL MAIN RIDGELINES MAY HAVE A CONVEX PROFILE FOR UP TO 80 FEET MEASURED FROM THE REGRADED LANDFORM BOUNDARY. BEYOND 80 FEET, MAIN RIDGELINES SHALL HAVE A CONCAVE PROFILE.
2. SUBRIDGES SHALL BE CONSTRUCTED AS SHOWN TO DEFINE THE OUTSIDE BEND POINTS FOR THE CHANNEL ALIGNMENT. SUBVALLEYS SHALL BE CONSTRUCTED AS SHOWN TO DEFINE THE INSIDE BEND POINTS FOR THE CHANNEL ALIGNMENT.
3. SUBRIDGES AND SUBRIDGE VALLEYS CAN HAVE A CONVEX PROFILE FOR UP TO 80 FEET MEASURED FROM THE MAIN RIDGE OR REGRADED LANDFORM BOUNDARY. BEYOND 80 FEET, SUBRIDGES AND SUBRIDGE VALLEYS SHALL HAVE A CONCAVE PROFILE.
4. GRADED SLOPE PROFILE DETAIL IS A TYPICAL PROFILE, FOLLOW FINAL GRADE GRADING PLAN FOR LANDFORM CONFIGURATION.
5. FINAL REGRADED LANDFORM TOPOGRAPHY SHALL BE WITHIN +/- 1-FT OF THE DESIGNED TOPOGRAPHY (VERTICAL AND HORIZONTAL ELEVATIONS).
6. SEE SHEETS 4 THROUGH 12 FOR DRAIN PROFILES AND DETAILED INFORMATION.
7. CONSTRUCTION OF FINAL GRADED AND SUBGRADED SURFACE TO BE COMPLETED WITH MACHINE CONTROL.
8. DIGITAL DATA SHALL BE PROVIDED BY THE ENGINEER IN A FORMAT THAT IS COMPATIBLE WITH MACHINE CONTROL TECHNOLOGY.

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QUARRY 1
GEOMORPHIC GRADING
DETAILS

CONTRACTOR SHEET NO.
WET 14 OF 14

DWG. NO.

REVISION | DATE
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