Revise title to Preliminary Drainage Report.

Preliminary ~~& Final~~ Drainage Report

JeniShay Farms

Colorado Springs, Colorado 80908

Prepared for:
El Paso County, CO

Revise to have name match PCD File name. Applies throughout all documents.

On Behalf of:
Phillip S. and Jennifer Miles
PO Box 88461
Colorado Springs, CO 80908
719-352-8886

Prepared by:
Lodestar Engineering, LLC
PO Box 88461
Colorado Springs, CO 80908
Phillip Shay Miles, PE
719-352-8886

July 17, 2020

Add PCD File #: SP209

edit: "...established by the County for drainage reports..."

ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Delete "certification statement".

CERTIFICATION STATEMENT:

This report and plan for the final drainage design for the JeniShay Farms was prepared by me (or under my direct supervision) in accordance with the provisions of El Paso County drainage criteria manual volume one and two drainage designed and technical criteria for the owners there of. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others.

Signature: _____ Date: _____

Phillip Shay Miles, PE
Registered Professional Engineer State of Colorado No.40462

DEVELOPER'S STATEMENT:

Revise developer's statement to:
I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

Name of Developer: _____

Authorized Signature: _____

Printed Name: _____

Title: _____

Address: _____

Replace with typed name, title and address. The only item to remain is the signature line and date line

EL PASO COUNTY:

Replace El Paso County signature block with:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

_____ _____
Jennifer Irvine, P.E. Date
County Engineer / ECM Administrator

Conditions:

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Organize appendices to match table of contents.

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Revise all reference to this report from "Final Drainage Report" to "Preliminary Drainage Report"

1. Purpose

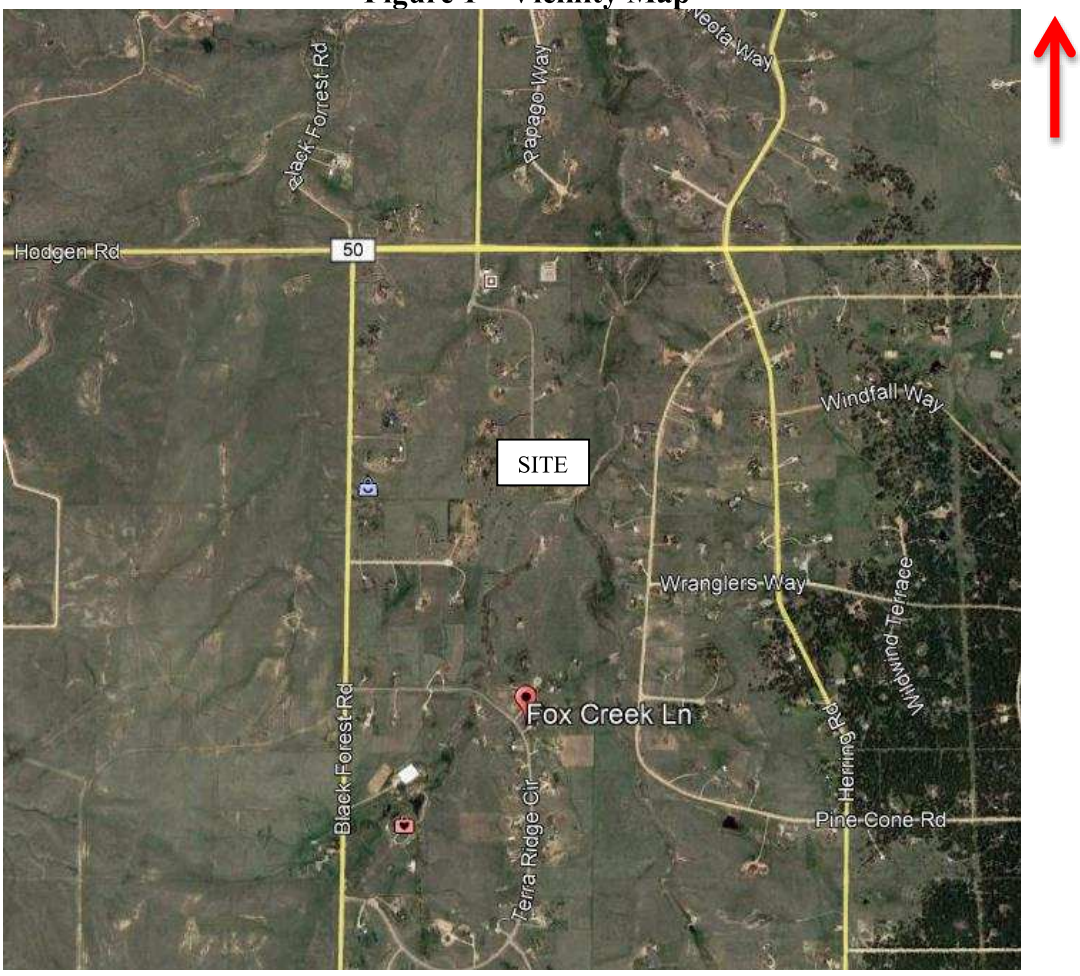
The purpose of this Final Drainage Report for JeniShay Farms is to quantify and evaluate the impacts of stormwater runoff generated by this Project and to provide adequate water quality/detention treatment.

2. General Description

The JeniShay Farms property (Project) is a 52.6-acre single-family development consisting 9 lots and a public street (Fox Creek Lane) located within Black Forest, Colorado in El Paso County. The project will consist of a public street, detention pond, and new home construction and associated site elements typical of single-family residential development (e.g. – driveways, patios, landscaping, etc.). The property is bounded by Ridgeview Acres to the north, Whispering Hills Estates to the west Wildwood Village to the east, and Terra Ridge Estates to the south. All lots surrounding the subject property are all zoned RR-5. The entire 39.72-acre parcel lies within unincorporated El Paso County and is currently zoned RR-5.

This project is located in the Town of Black Forest, El Paso County, Colorado. Access to the site is off Fox Creek Lane. It is located in Section 29, Township 11 south, Range 65 west of the 6th principal meridian. A vicinity map is provided below in Figure 1.

Figure 1 – Vicinity Map



The site is being re-platted from a portion of the Terra Ridge Filing No. 1 subdivision (lots 5 and 6) to be included in the newly formed JeniShay Farms subdivision. The site is bounded by large lot subdivision single-family development.

The existing site is covered with native grasses with a few randomly located ponderosa pines. The topography of the site is rolling hills with two drainage ways extending from south to north through the property. A 100 foot wide electric easement extends north to south along the eastern portion of the site.

3. Soils Conditions

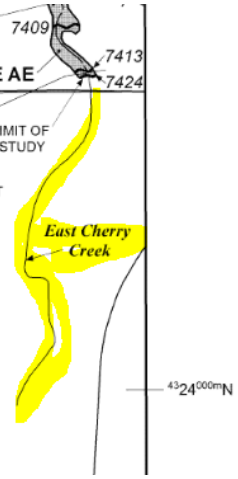
The proposed development is 52.6 acres. Ground cover primarily consists of existing vegetation primarily consisting of native grass and shrubs.

The general topography of the land slopes to the south at slopes in the range of 2% to 30%. According to the Natural Resources Conservation Service (NRCS), the soils in this area consist of Peyton-Pring Complex and Tomah-Crowfoot loamy sands, and can be classified as a Hydrologic Soil Group (HSG) Types B. A soil map and map unit (soils type) descriptions

revise to East Cherry Creek.

describing the HSG and other soils properties are provided in Appendix A. For the purposes of this report an HSG type B soil has been used to define rational method runoff coefficients.

Generally speaking, stormwater runoff from this project flows to the north and will initially enter an unnamed drainageway which ultimately discharges into Cherry Creek.



Drainage Criteria

hydrologic and hydraulic analysis performed in this report utilizes The City of Colorado ings Drainage Criteria Volumes 1 & 2 (2014) and the MHFD USDCM (Urban Storm inage Criteria Manual) Volumes 1 & 2. Stormwater runoff was determined using the ional Method and was calculated for existing and proposed conditions for the 5-yr (minor) 100-yr (major) recurrences. 1-hour rainfall depths were derived from NOAA Atlas 14, lume 8, Version 2 specific to the Project location.

Revise to City & County DCM (Vol 1, 1991) (Vol 2, 2002).
Only chapter 6 of the City DCM (2014) was adopted.

following MHFD hydrologic and hydraulic software were used in this report:

- UD-Culvert v3.05 – Culvert and Erosion Protection Calculations
- UD-Detention v3.07 – Water Quality and Detention Calculations
- UD-BMP v3.06 – LID Runoff Reduction Calculations

5. Existing and Proposed Drainage Conditions

5.1 Drainage Patterns and Hydraulic Routing

Existing

Stormwater runoff from this Project generally flows to the north and will initially enter an unnamed tributary ultimately discharging to Cherry Cr
was not conducted for this project. The imperviousnes
whereas the developed land is ~21.5%. Therefore, afte
runoff releasing below historic rates and only a 1.5% in
for the project remain essentially the same.

Provide an existing condition drainage map and provide narrative description of the design points and sub-basins.

Proposed

Proposed roadway construction and associated grading will create six (6) on-site basins and two (2) off-site basins. Refer to the drainage plan in Appendix C.

Design Point 1 flows are generated from basin B. Basin B consists of public roadway improvements to include pavement, and roadside ditches. Unconcentrated sheet flow across the pavement is collected in the adjacent ditch and is routed north to the proposed 18" storm culvert. At this location, runoff will be conveyed under the proposed roadway to the ditch on the east side ultimately discharging into the proposed water quality/detention pond facility.

Design Point 2 flows are generated from basins A and B. Basin A consists of public roadway improvements to include pavement, and roadside ditches. Unconcentrated sheet flow across the pavement is collected in the adjacent ditch and combines with basin B runoff and is routed north to design point 2. At this location, runoff will be conveyed in a riprap rundown channel

to the forebay of the proposed water quality/detention pond facility. Riprap will be provided with a d50 of 9" and a thickness of 18" to prevent erosion prior to entering the concrete forebay. The proposed forebay will be ~95cf in volume. Flows into a 2' wide concrete trickle channel will be conveyed to the outlet structure micropool. Refer to the forebay and detention pond calculations located in Appendix B. The emergency overflow route is over the proposed spillway which has been designed to pass the peak flow from the 100yr flow event.

Design Point 3 flows are generated from the Terra Ridge development and are conveyed to the project boundary via an unnamed drainageway. Due to the basin size contributing to this location (~300acres), a TR-20 model was used by the consultant to model and determine the flow value at this location. Performing a TR-20 model analysis was not chosen for use on this project. Instead, a rational method approach was used which is believed to have provided a conservative runoff rate. All data for the watershed was taken from the Terra Ridge Filing No. 1 drainage report.

Design Point 4 flows are generated from off-site basins OS1 and OS2 as well as on-site basins C and D. Basin OS1 and OS2 consist of large lot single family subdivision development improvements with homes, driveways, sheds, and various outbuildings. Basin C consists of half of a segment of driveway pavement and fill slope. Runoff flows down the side slope and directly into the adjacent drainageway. Basin D consists of a naturally vegetated field which will have some minor impervious area additions from the proposed home sites. Runoff from basin D is routed directly into the drainageway and then to the north to design point 4. To enable the flows at this location to pass under the proposed driveway, three 48" culverts are proposed. Energy dissipation will be provided at the outfall to minimize the potential for erosion/local scour.

Basin E flows are generated from a naturally vegetated field and a short segment of driveway pavement. This basin runoff is not being treated in the proposed water quality/detention pond because of the topographical constraints on site. Basin E flows are routed in the existing drainageway to the northeast combining with another drainageway to the east near the northeastern lot corner.

Basin F flows are generated from a naturally vegetated field which will have home site construction. Basin E flows are routed in an existing drainageway on the east side of the property which combines with the aforementioned drainageway within basin E near the northeastern lot corner.

5.2 Site Improvements

Utilities that exist within the project area are overhead electric lines running north to south

Clarify. I'm interpreting the paragraph that this report is reanalyzing the offsite flow at DP3 using Rational Method versus using the flows from the JR Engineering report. Rational Method is limited to drainage basin area <130 ac. See City DCM Chapter 6 Table 6-1 for allowable methods for estimating design flows. Hydrology will be reviewed on the resubmittal.

Contact the review engineer (gilbertlaforce@elpasoco.com 719-331-7134) to discuss the hydrology modeling prior to updating the report.

must include DP3

Criteria requires the entire applicable development site is treated for WQ unless it meets exclusion. In the case of Basin C, D, E & F these do not drain into the proposed pond.

Update the narrative to state these basins are excluded from permanent water quality per ECM Appendix I Section I.7.1.B.5 since these contain large lot single family sites (greater than 2.5 ac) and will have a total lot impervious area of less than 10 percent. (You can modify to max impervious of 20 percent provided you include analysis that the expected soil and vegetation conditions are suitable for infiltration of the WQCV for a typical site.)

The calculations for the 18" culvert which routes ditch flows from basin B to basin A under the proposed driveway were performed using 2019 Civil3D design software and are contained in Appendix B. The triple 48" storm culverts routing the drainageway under the proposed driveway are also contained in Appendix B.

State who will own and maintain the FSD pond.

Ditch Capacities

The hydraulic analysis for the Fox Creek Lane roadway ditches was performed using 2019 Civil3D design software and are contained in Appendix B.

5.4 On-site Detention Requirements

A full spectrum water quality/detention pond is proposed for this site to provide water quality for developed flows as a result of this development. In addition to water quality, detention is provided in the pond design. Refer to section 7 in this report for additional information regarding water quality capture volume (WQCV) and detention (peak flow attenuation) flow requirements for this project.

5.5 Compliance with Other Studies

The only studies related to this project are the Terra Ridge Filing No 1 and 2 reports (see references). The basins that are common to this project (Terra Ridge – basin 12 and 17) have only been modified slightly to account for the proposed roadway construction. Flows as determined in the Terra Ridge reports for the natural drainageway have been used and supplemented with the additional flows from the JeniShay Farms watershed to determine the on-site flow at the proposed driveway crossing.

5.6 Four Step Process

Step 1 – Runoff Reduction Practices

This development address Low Impact Development strategies primarily through the utilization of roadway ditches. Runoff from the pavement sheet flows across the grass lined ditch side slopes which provides some level of water quality treatment.

Step 2 – Implement BMPs that Provide a Water Quality Capture Volume with Slow Release

On-site flow is directed to the on-site private proposed full-spectrum detention/water quality facility. The extended detention basin provides Water Quality Capture Volume (WQCV) required for this site and attenuates the peak flows releasing them at approximate historic runoff rates over a longer period by releasing Excess Urban Runoff Volume (EURV).

Step 3 – Stabilize Drainageways

Portions of the existing conditions runoff currently enter the on-site natural drainageway via overland flow across the vacant lots and via the proposed full-spectrum detention pond. Due to the minor anticipated extent of land disturbance and improvements on these large lots coupled with on-site detention; the amount of runoff entering the drainageways remains basically the same. Predevelopment levels of release of the Excess Urban Runoff Volume (EURV) help the drainageway maintain its current morphology by mimicking the natural historic runoff rates over a longer period by peak flow attenuation.

Step 4 – Source Control BMPs

See ECM Section I.7.2.A for the description of Step 4 and update the narrative accordingly.

Construction BMP's that will be implemented include silt fence, a vehicle tracking pad, a stabilized staging area, concrete washout, inlet protection, and erosion control blanket. The implementation of these BMP's is outlined in the Grading, Erosion and Stormwater Quality Control Plan and Stormwater Management Plan for the site. The Stormwater Management Plan also addresses materials storage and spill containment handling during construction to protect downstream receiving waters.

6. Water Quality

Stormwater that is generated from this Project is either discharged offsite in the form of unconcentrated sheet flow or is collected in roadside ditches and routed thru the proposed water quality/detention facility outfalling via an 18" storm sewer pipe.

The proposed on-site imperviousness of the area contributing to the pond is 30.3%. Basin C is the only area of improvements that has not been included in the sites imperviousness calculations because runoff cannot be physically treated in the proposed pond and yield extremely minor runoff values (Q5=0.5cfs, Q100=1.5cfs).

The proposed full spectrum extended detention basin (EDB) has been analyzed in this study based on the proposed site conditions as shown on the Drainage Plan. The pond facility provides 0.058acre-ft of water quality capture volume, 0.151acre-ft of excess urban runoff volume and 0.400 acre-ft of detention storage where 0.336 acre-ft is required. The proposed EDB will release a peak flow 3.3cfs during the 100 ws from the proposed EDB are released via a proposed 18" storm sew ate located within the outlet structure box. The outlet structure will h d to drain the EURV over a period of 72 hours. The orifice plate will ter holes. The EDB will have a rip rap emergency overflow spillway th k flows (10.4cfs) in the event the outlet structure becomes entirely clogged or the pond is already full. The spillway will be constructed of rip rap with a d50 = 9", 18" thick, a crest length of 25' with 4:1 side slopes. Flow depth over the crest of the spillway during the 100yr event storm will be 0.26' with 1.0' of freeboard. A 10ft maintenance road has been provided. Refer to the design calculations in Appendix B for additional information.

See comments on the drainage map and update your narrative accordingly.

7. Erosion Control Plan

A Grading, Erosion and Stormwater Quality Control Plan has been submitted separately as a stand-alone construction drawing. Refer to plans titled JeniShay Farms – Grading, Erosion and Stormwater Quality Control Plans, prepared by Lodestar Engineering, dated September 1, 2019.

Update to state "Pre-development grading is requested with the preliminary plan application and a pre-development GEC and SWMP has been...."

8. Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) numbers 08041C0305G and08041C0315G dated December 7, 2018 this project is not located within a FEMA designated 100yr floodplain. Therefore no map revisions will be necessary as a result of this project. A copy of the FIRM maps is provided in Appendix A.

9. Drainage and Bridge Fees

The project is not located within a fee (drainage) basin and bridge fees are not required. Therefore, no drainage or bridge fees are required for this development.

Add a statement identify that the project is located within the East Cherry Creek Drainage Basin.

10. Construction Cost Opinion

Item	Unit	Quantity	Unit Price	Extended Cost
18" Storm Pipe	LF	80	$125	$1,000
48" Storm Pipe	LF	150	$275	$41,250
Outlet Structure	EA	1	$15,000	$15,000
Forebay	EA	1	$25,000	$25,000
Trickle Channel	LS	1	$7,500	$7,500
			Sub-total	$89,750
			Contingency 20%	$17,950
			TOTAL	$107,700

All storm system elements for this project are private and therefore there will be no reimbursement from El Paso County.

11. Summary

The Final Drainage Report for JeniShay Farms was prepared using the El Paso County Engineering Criteria Manual, City of Colorado Springs Drainage Criteria Manuals, and Mile High Flood Control District Manuals. Stormwater quality and detention is provided by a proposed facility located on-site. No adverse downstream impacts are anticipated as a result of the proposed site improvements.

update reference 2

12. References

1. Engineering Criteria Manual, El Paso County, December 2016
2. Drainage Criteria Manual, Volumes I and II, City of Colorado Springs, May 2014
3. Urban Storm Drainage Criteria Manual (USDCM), Volumes I-III, Mile High Flood Control District (MHFD).
4. Final Drainage Report for Terra Ridge Filing No. 1, JR Engineering, April 1997.
5. Final Drainage Report for Terra Ridge Filing No. 2, JR Engineering, June 1999.
6. FEMA Flood Insurance Rate Map Numbers 08041C0305G and 08041C0305G, El Paso County, Colorado, December 7, 2018
7. Natural Resources Conservation Service, Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
8. United States Geological Survey (USGS) Topographic Quadrangle Map
9. NOAA Atlas 14, Volume 8, Version 2 Point Precipitation Frequency Data Server, https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

Appendix B
Calculations

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for El Paso County Area, Colorado

fox creek subdivision

October 13, 2019

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:5,510 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
14	Brussett loam, 1 to 3 percent slopes	1.2	1.0%
68	Peyton-Pring complex, 3 to 8 percent slopes	123.2	94.7%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	5.7	4.4%
Totals for Area of Interest		**130.1**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

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

El Paso County Area, Colorado

14—Brussett loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367j
Elevation: 7,200 to 7,500 feet
Frost-free period: 115 to 125 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brussett and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brussett

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Typical profile

A - 0 to 8 inches: loam
BA - 8 to 12 inches: loam
Bt - 12 to 26 inches: clay loam
Bk - 26 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: Loamy Park (R048AY222CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

68—Peyton-Pring complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369f
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Divide (R049BY216CO)
Hydric soil rating: No

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Loamy Park (R048AY222CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b9
Elevation: 7,300 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Tomah and similar soils: 50 percent
Crowfoot and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tomah

Setting

Landform: Hills, alluvial fans
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from arkose and/or residuum weathered from arkose

Typical profile

A - 0 to 10 inches: loamy sand
E - 10 to 22 inches: coarse sand
C - 48 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Sandy Divide (R049BY216CO)
Hydric soil rating: No

Description of Crowfoot

Setting

Landform: Alluvial fans, hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 12 inches: loamy sand
E - 12 to 23 inches: sand
Bt - 23 to 36 inches: sandy clay loam
C - 36 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Sandy Divide (R049BY216CO)
Hydric soil rating: No

Minor Components

Other soils

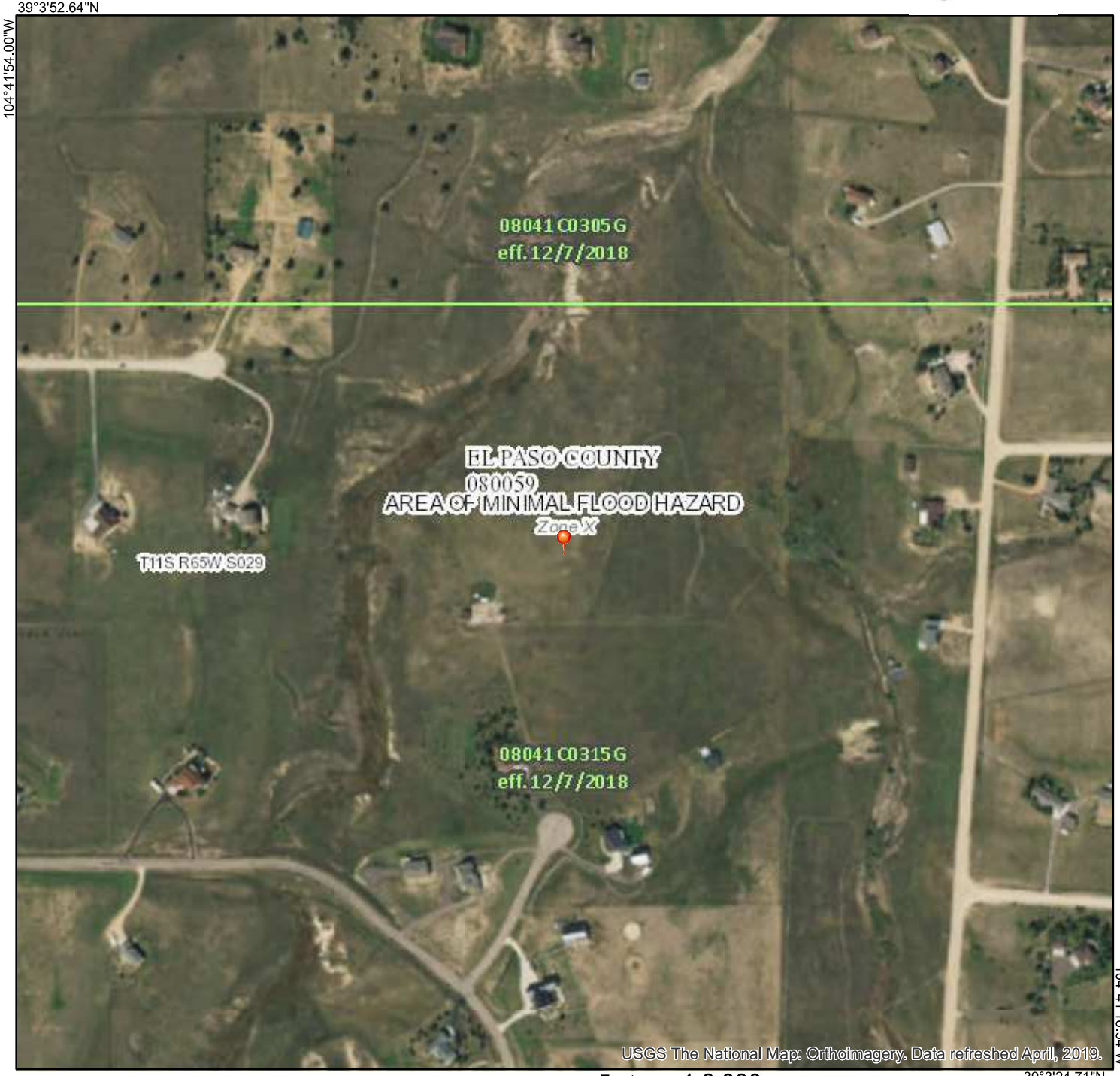
Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Effective LOMRs
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	Coastal Transect
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/28/2019 at 7:40:48 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

FINAL DRAINAGE REPORT

JeniShay Farms

(Composite Runoff Coefficient - 5 Year)

ON-SITE						
Basin	***Area (acres)***					***C5***
	Paved/Drive/Walk	***Res >1acre***	***Gravel***	***Lawn/Meadow***	***TOTAL***	
A	0.42	2.57	0.12	1.06	4.17	0.25
B	0.40	0.00	0.12	0.44	0.95	0.48
C	0.09	0.00	0.00	0.25	0.34	0.30
D	0.00	15.02	0.00	0.00	15.02	0.20
E	0.03	5.35	0.00	0.00	5.38	0.20
F	0.00	14.13	0.00	0.00	14.13	0.20

OFF-SITE						
Basin	***Area (acres)***					***C5***
	Paved/Drive/Walks	***Res >1acre***	***Gravel***	***Lawn/Meadow***	***TOTAL***	
OS1	0.00	30.00	0.00	0.00	30.00	0.20
OS2	0.00	6.36	0.00	0.00	6.36	0.20

Per DCM Table 6-6

Surface	**Runoff Coefficent**
Paved/Drive/Walk	0.90
Res >1acre	0.20
Gravel	0.59
Lawn/Meadow	0.08

FINAL DRAINAGE REPORT

JeniShay Farms

(Composite Runoff Coefficient - 100 Year)

ON-SITE						
Basin	**Area (acres)**					**C100**
	Paved/Drive/Walk	**Res >1acre**	**Gravel**	**Lawn/Meadow**	**TOTAL**	
A	0.42	2.57	0.12	1.06	4.17	0.48
B	0.40	0.00	0.12	0.44	0.95	0.65
C	0.09	0.00	0.00	0.25	0.34	0.51
D	0.00	15.02	0.00	0.00	15.02	0.44
E	0.03	5.35	0.00	0.00	5.38	0.44
F	0.00	14.13	0.00	0.00	14.13	0.44

OFF-SITE						
Basin	**Area (acres)**					**C100**
	Paved/Drive/Walks	**Res >1acre**	**Gravel**	**Lawn/Meadow**	**TOTAL**	
OS1	0.00	30.00	0.00	0.00	30.00	0.44
OS2	0.00	6.36	0.00	0.00	6.36	0.44

Per DCM Table 6-6

Surface	**Runoff Coefficent**
Paved/Drive/Walk	0.96
Res >1acre	0.44
Gravel	0.70
Lawn/Meadow	0.35

FINAL DRAINAGE REPORT

JeniShay Farms

(Percentage of Imperviousness)

ON-SITE: PROPOSED						
Basin	***Area (acres)***					***% Imp***
	Paved/Drive/Walk	***Res >1acre***	***Gravel***	***Lawn/Meadow***	***TOTAL***	
A	0.42	2.57	0.12	1.06	4.17	25.26
B	0.40	0.00	0.12	0.44	0.95	52.36
C	0.09	0.00	0.00	0.25	0.34	27.95
D	0.00	15.02	0.00	0.00	15.02	20.00
E	0.03	5.35	0.00	0.00	5.38	20.43
F	0.00	14.13	0.00	0.00	14.13	20.00
Totals	**0.94**	**37.08**	**0.23**	**1.75**	**40.00**	**21.44**

OFF-SITE: PROPOSED						
Basin	***Area (acres)***					***% Imp***
	Paved/Drive/Walks	***Res >1acre***	***Gravel***	***Lawn/Meadow***	***TOTAL***	
OS1	0.00	30.00	0.00	0.00	30.00	20.00
OS2	0.00	6.36	0.00	0.00	6.36	20.00
Totals	**0.00**	**36.36**	**0.00**	**0.00**	**36.36**	**20.00**

TO POND: PROPOSED						
A,B	**0.82**	**2.57**	**0.23**	**1.50**	**5.13**	**30.29**

Per DCM Table 6-6

Surface	**% Impervious**
Paved/Drive/Walk	100
Res >1acre	20
Gravel	80
Lawn/Meadow	2

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.0612°, Longitude: -104.6936°
Elevation: 7469.19 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.237 (0.193-0.293)	0.288 (0.234-0.356)	0.375 (0.304-0.466)	0.453 (0.365-0.564)	0.567 (0.444-0.737)	0.661 (0.504-0.868)	0.760 (0.558-1.02)	0.865 (0.608-1.19)	1.01 (0.683-1.43)	1.13 (0.739-1.61)
10-min	0.347 (0.283-0.429)	0.421 (0.343-0.521)	0.550 (0.446-0.682)	0.663 (0.535-0.826)	0.831 (0.650-1.08)	0.968 (0.738-1.27)	1.11 (0.817-1.50)	1.27 (0.891-1.75)	1.48 (1.00-2.10)	1.65 (1.08-2.36)
15-min	0.423 (0.345-0.523)	0.514 (0.418-0.635)	0.670 (0.544-0.831)	0.809 (0.652-1.01)	1.01 (0.793-1.32)	1.18 (0.900-1.55)	1.36 (0.997-1.82)	1.54 (1.09-2.13)	1.81 (1.22-2.56)	2.02 (1.32-2.88)
30-min	0.604 (0.492-0.746)	0.732 (0.596-0.905)	0.955 (0.774-1.18)	1.15 (0.928-1.43)	1.44 (1.13-1.87)	1.68 (1.28-2.20)	1.93 (1.42-2.59)	2.19 (1.54-3.03)	2.57 (1.73-3.63)	2.86 (1.87-4.09)
60-min	0.769 (0.626-0.950)	0.921 (0.749-1.14)	1.19 (0.968-1.48)	1.44 (1.16-1.80)	1.82 (1.43-2.37)	2.13 (1.63-2.81)	2.47 (1.82-3.33)	2.84 (2.00-3.93)	3.36 (2.27-4.77)	3.78 (2.48-5.40)
2-hr	0.933 (0.765-1.15)	1.11 (0.908-1.36)	1.43 (1.17-1.76)	1.73 (1.41-2.14)	2.19 (1.74-2.86)	2.59 (1.99-3.40)	3.01 (2.24-4.05)	3.48 (2.47-4.80)	4.15 (2.83-5.86)	4.70 (3.10-6.67)
3-hr	1.02 (0.840-1.25)	1.20 (0.987-1.47)	1.54 (1.26-1.89)	1.87 (1.52-2.30)	2.38 (1.90-3.10)	2.82 (2.19-3.70)	3.31 (2.47-4.44)	3.85 (2.75-5.30)	4.63 (3.18-6.53)	5.28 (3.50-7.47)
6-hr	1.19 (0.986-1.44)	1.38 (1.14-1.68)	1.75 (1.45-2.13)	2.12 (1.74-2.59)	2.71 (2.19-3.53)	3.24 (2.53-4.23)	3.82 (2.88-5.11)	4.47 (3.23-6.13)	5.43 (3.76-7.62)	6.22 (4.16-8.75)
12-hr	1.40 (1.16-1.68)	1.61 (1.34-1.94)	2.03 (1.69-2.46)	2.45 (2.02-2.97)	3.12 (2.53-4.02)	3.71 (2.92-4.81)	4.36 (3.31-5.79)	5.10 (3.70-6.93)	6.17 (4.30-8.60)	7.06 (4.75-9.86)
24-hr	1.63 (1.37-1.95)	1.90 (1.59-2.27)	2.41 (2.01-2.88)	2.88 (2.39-3.47)	3.63 (2.95-4.61)	4.27 (3.37-5.47)	4.97 (3.79-6.52)	5.74 (4.19-7.73)	6.86 (4.81-9.47)	7.78 (5.27-10.8)
2-day	1.90 (1.60-2.25)	2.25 (1.89-2.66)	2.86 (2.40-3.40)	3.42 (2.85-4.08)	4.24 (3.45-5.31)	4.93 (3.91-6.24)	5.67 (4.33-7.34)	6.45 (4.73-8.59)	7.57 (5.33-10.3)	8.46 (5.78-11.7)
3-day	2.09 (1.77-2.46)	2.46 (2.08-2.91)	3.13 (2.63-3.70)	3.72 (3.11-4.42)	4.59 (3.74-5.71)	5.31 (4.22-6.68)	6.08 (4.66-7.83)	6.90 (5.07-9.13)	8.05 (5.69-10.9)	8.97 (6.15-12.3)
4-day	2.25 (1.91-2.64)	2.64 (2.23-3.10)	3.32 (2.80-3.92)	3.93 (3.30-4.66)	4.83 (3.95-5.99)	5.58 (4.45-6.99)	6.37 (4.90-8.18)	7.22 (5.33-9.52)	8.41 (5.96-11.4)	9.36 (6.44-12.8)
7-day	2.65 (2.26-3.09)	3.06 (2.60-3.58)	3.78 (3.21-4.43)	4.43 (3.74-5.21)	5.38 (4.43-6.62)	6.18 (4.95-7.69)	7.02 (5.43-8.96)	7.92 (5.88-10.4)	9.19 (6.56-12.4)	10.2 (7.07-13.9)
10-day	3.00 (2.56-3.49)	3.44 (2.94-4.01)	4.21 (3.59-4.92)	4.90 (4.15-5.75)	5.91 (4.87-7.23)	6.75 (5.42-8.36)	7.63 (5.92-9.69)	8.57 (6.38-11.2)	9.88 (7.08-13.3)	10.9 (7.61-14.8)
20-day	3.99 (3.43-4.60)	4.57 (3.93-5.28)	5.55 (4.76-6.43)	6.39 (5.45-7.44)	7.60 (6.28-9.17)	8.56 (6.91-10.5)	9.56 (7.46-12.0)	10.6 (7.93-13.7)	12.0 (8.65-16.0)	13.1 (9.20-17.7)
30-day	4.80 (4.15-5.52)	5.51 (4.75-6.34)	6.68 (5.74-7.70)	7.65 (6.55-8.87)	9.01 (7.46-10.8)	10.1 (8.15-12.2)	11.1 (8.72-13.9)	12.2 (9.19-15.7)	13.7 (9.90-18.1)	14.8 (10.4-19.9)
45-day	5.81 (5.04-6.65)	6.68 (5.78-7.65)	8.07 (6.97-9.27)	9.21 (7.91-10.6)	10.7 (8.90-12.7)	11.9 (9.65-14.3)	13.0 (10.2-16.1)	14.2 (10.7-18.1)	15.7 (11.3-20.5)	16.8 (11.9-22.4)
60-day	6.67 (5.80-7.60)	7.66 (6.65-8.74)	9.23 (7.99-10.6)	10.5 (9.03-12.1)	12.2 (10.1-14.3)	13.4 (10.9-16.1)	14.6 (11.5-17.9)	15.7 (11.9-19.9)	17.2 (12.5-22.4)	18.2 (13.0-24.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Final Drainage Report

JeniShay Farms

(Basin Summary)

From Area Runoff Coefficient Summary				*OVERLAND FLOW TIME*				*TRAVEL TIME*					TOTAL	*INTENSITY **		*TOTAL FLOWS*	
BASIN	AREA TOTAL *(Acres)*	C_5 *From DCM Table 6-6*	C_{100} *From DCM Table 6-6*	C_5	Length *(ft)*	Height *(ft)*	T_C *(min)*	Conveyance Coeff.	Slope *(%)*	Length *(ft)*	Velocity *(fps)*	T_t *(min)*	*(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
A	4.17	0.25	0.48	0.30	150	10	9.8	15	4.0%	320	3.0	1.8	11.6	3.9	6.6	***4.1***	***13.1***
B	0.95	0.48	0.65	0.30	10	3.3	1.5	15	5.6%	1285	3.5	6.0	7.5	4.6	7.6	***2.1***	***4.7***
C	0.34	0.30	0.51	0.30	40	14	2.9	0	0.0%	0	0.0	0.0	5.0	5.2	8.7	***0.5***	***1.5***
D	15.02	0.20	0.44	0.30	300 .	24	13.0	10	5.0%	240	2.2	1.8	14.8	3.5	5.9	***10.6***	***39.2***
E	5.38	0.20	0.44	0.30	300	20	13.9	15	4.9%	70	3.3	0.4	14.2	3.6	6.0	***3.9***	***14.3***
F	14.13	0.20	0.44	0.30	300	28	12.4	15	3.2%	1180	2.7	7.3	19.7	3.1	5.2	***8.8***	***32.5***
OS1	30.00	0.20	0.44	0.30	300	12	16.4	15	3.0%	815	2.6	5.2	21.6	3.0	5.0	***17.8***	***65.9***
OS2	6.36	0.20	0.44	0.30	300	10	17.4	15	3.0%	580	2.6	3.7	21.1	3.0	5.0	***3.8***	***14.1***

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: PSM

Date: 10/28/2019

Checked by: PSM

JeniShay Farms
(Surface Routing Summary)

					Intensity		*Flow*		
Design Point(s)	***Contributing Basins/Design Points***	***Equivalent CA_5***	***Equivalent CA_{100}***	***Maximum T_C***	***I_5***	***I_{100}***	***Q_5***	***Q_{100}***	***Comments***
1	B	0.46	0.62	7.5	4.6	7.6	***2.1***	***4.7***	***To proposed 18" culvert***
2	DP1, A	1.50	2.62	11.6	3.9	6.6	***5.8***	***17.3***	***To proposed pond (inflow)***
3	JR ENG DP-005	47.97	118.08	45.9	1.8	3.1	***86.3***	***366.0***	***Creek flow at entrance to property***
4	DP3, OS1, OS2, D	58.25	140.69	53.5	1.7	2.9	***99.0***	***408.0***	***To proposed Triple 48" culverts***

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Oct 28 2019

Basin A Ditch 100yr

Triangular

Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 5.00
N-Value	= 0.030

Calculations

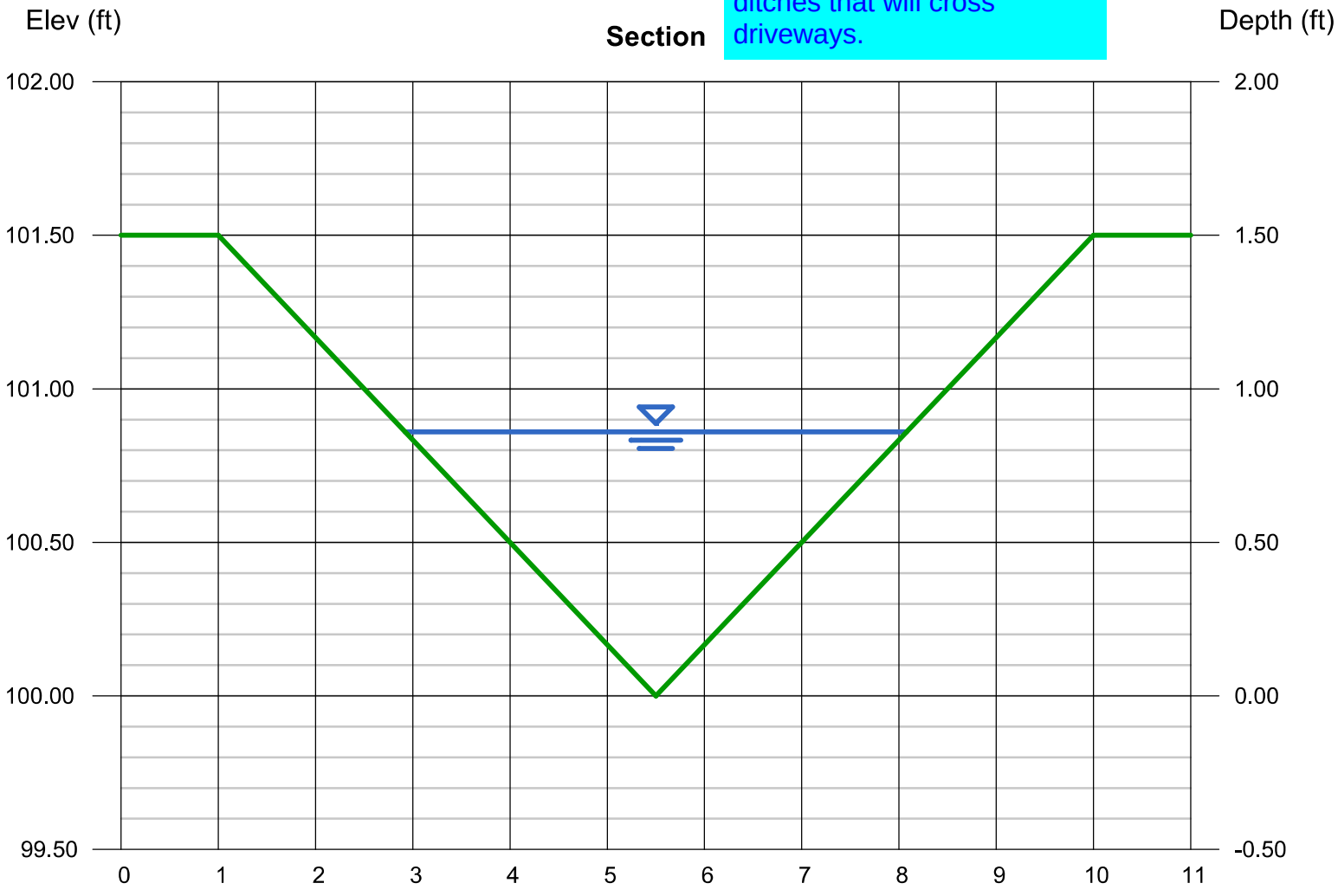
Compute by:	Known Q
Known Q (cfs)	= 13.10

Highlighted

Depth (ft)	= 0.86
Q (cfs)	= 13.10
Area (sqft)	= 2.22
Velocity (ft/s)	= 5.90
Wetted Perim (ft)	= 5.44
Crit Depth, Yc (ft)	= 1.04
Top Width (ft)	= 5.16
EGL (ft)	= 1.40

Per ECM 2.5.8.C, roadside ditches shall have a minimum depth of 24 inches to accommodate driveway culverts. This applies to all ditches that will cross driveways.

Section



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Oct 28 2019

Basin B Ditch 100yr

Triangular

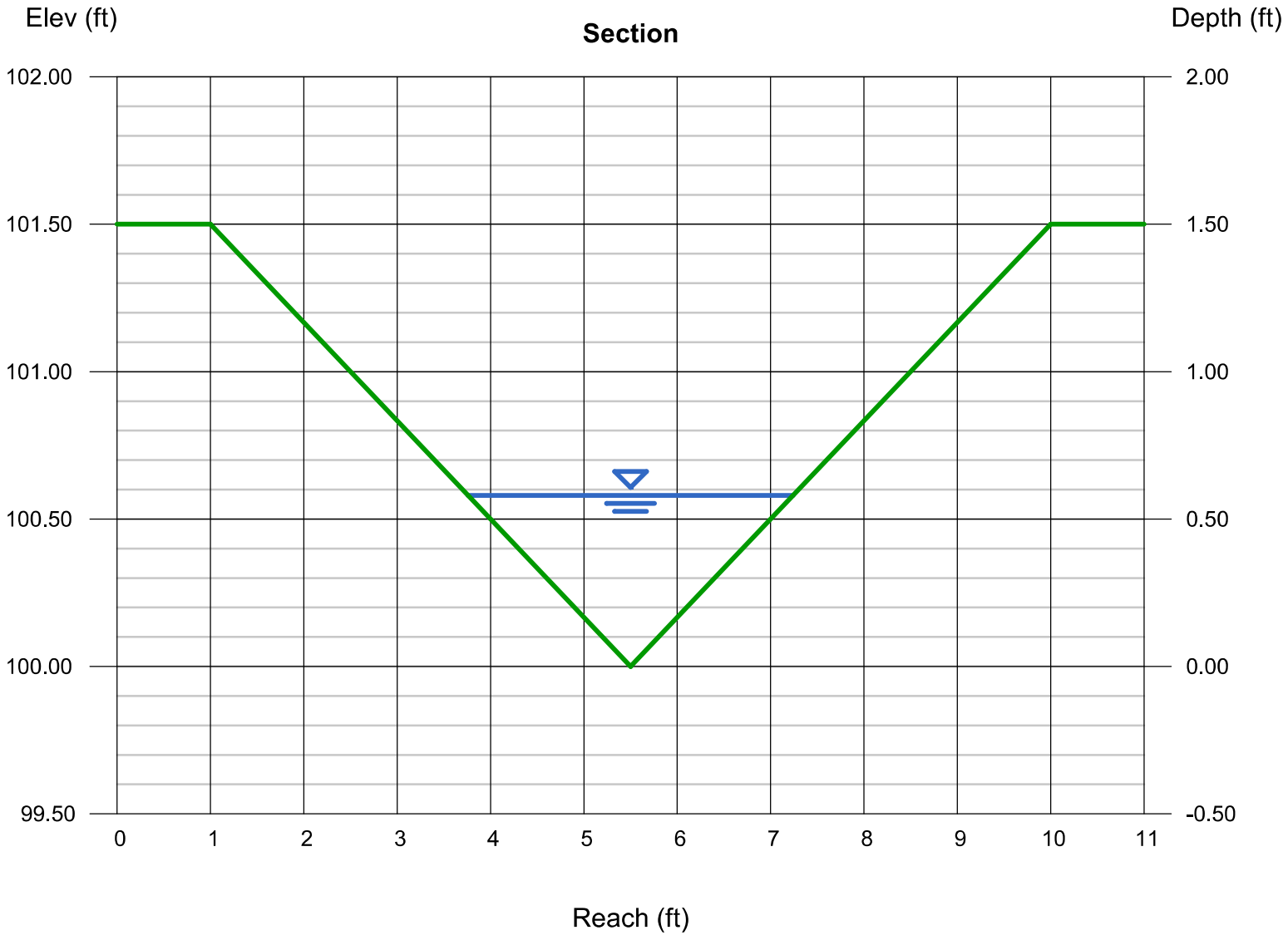
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 5.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.70

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 4.700
Area (sqft)	= 1.01
Velocity (ft/s)	= 4.66
Wetted Perim (ft)	= 3.67
Crit Depth, Yc (ft)	= 0.69
Top Width (ft)	= 3.48
EGL (ft)	= 0.92



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Oct 28 2019

Basin A Ditch Rundown 100yr

Triangular

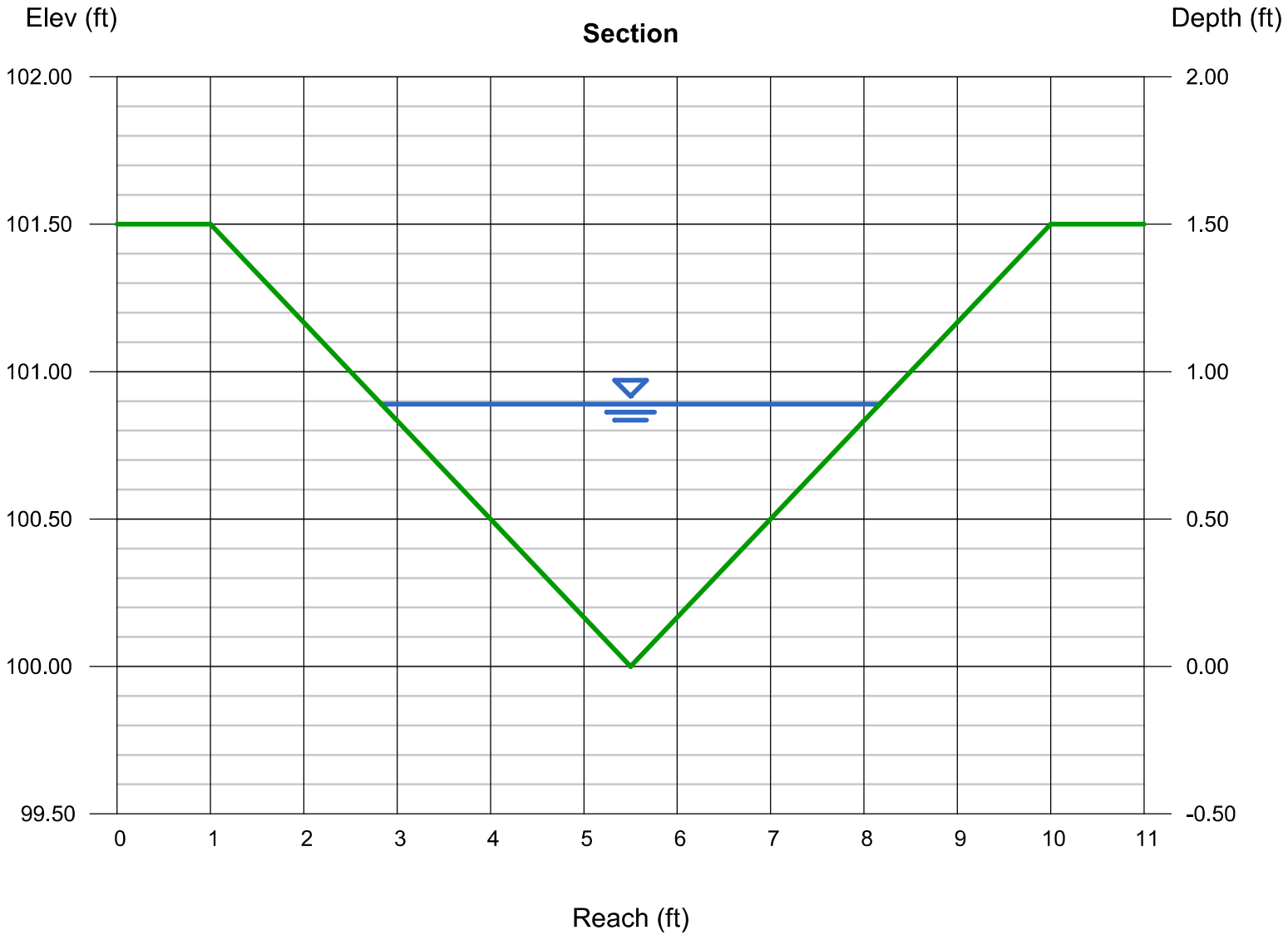
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 15.80
N-Value	= 0.060

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.10

Highlighted

Depth (ft)	= 0.89
Q (cfs)	= 13.10
Area (sqft)	= 2.38
Velocity (ft/s)	= 5.51
Wetted Perim (ft)	= 5.63
Crit Depth, Yc (ft)	= 1.04
Top Width (ft)	= 5.34
EGL (ft)	= 1.36



Culvert Report

18inch Culvert

Invert Elev Dn (ft)	=	100.00
Pipe Length (ft)	=	40.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	100.40
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Rough tapered inlet throat
Coeff. K,M,c,Y,k	=	0.519, 0.64, 0.021, 0.9, 0.5

Embankment

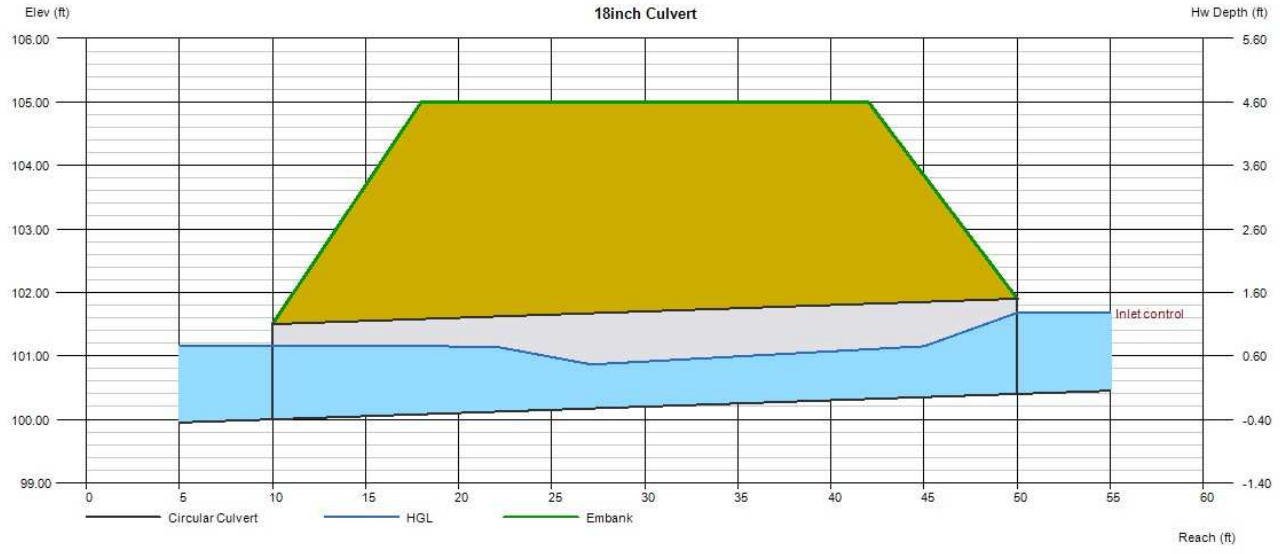
Top Elevation (ft)	=	105.00
Top Width (ft)	=	24.00
Crest Width (ft)	=	150.00

Calculations

Qmin (cfs)	=	4.70
Qmax (cfs)	=	4.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	4.70
Qpipe (cfs)	=	4.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.19
Veloc Up (ft/s)	=	4.67
HGL Dn (ft)	=	101.17
HGL Up (ft)	=	101.23
Hw Elev (ft)	=	101.68
Hw/D (ft)	=	0.85
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Oct 28 2019

Triple 48inch Culverts

Invert Elev Dn (ft)	=	100.00
Pipe Length (ft)	=	50.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	100.50
Rise (in)	=	48.0
Shape	=	Circular
Span (in)	=	48.0
No. Barrels	=	3
n-Value	=	0.012
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Rough tapered inlet throat
Coeff. K,M,c,Y,k	=	0.519, 0.64, 0.021, 0.9, 0.5

Embankment

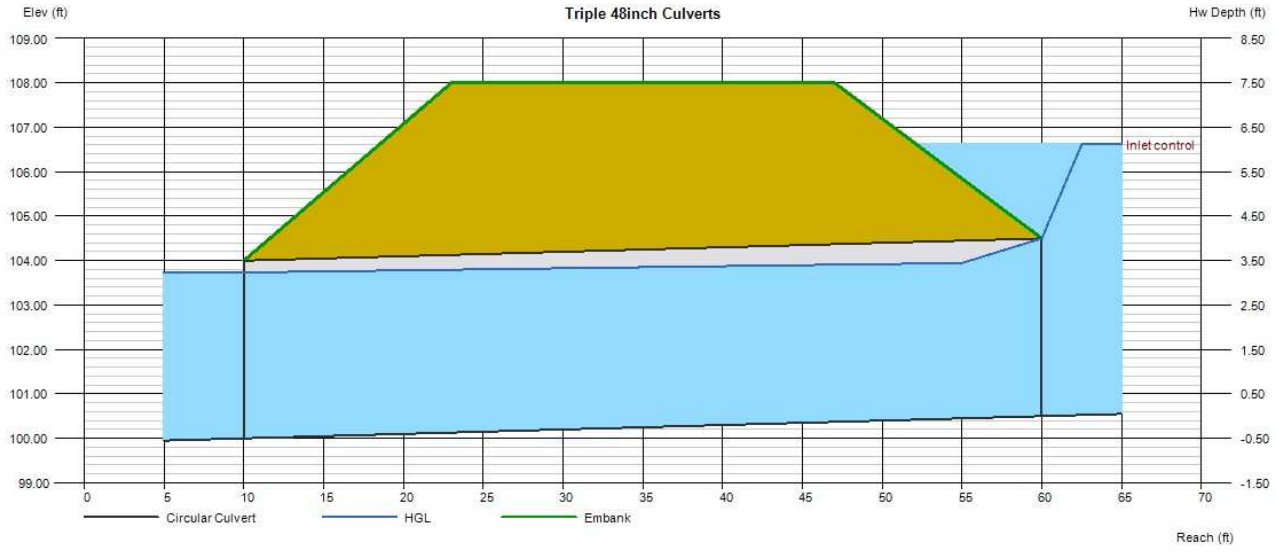
Top Elevation (ft)	=	108.00
Top Width (ft)	=	24.00
Crest Width (ft)	=	150.00

Calculations

Qmin (cfs)	=	408.00
Qmax (cfs)	=	408.00
Tailwater Elev (ft)	=	(dc+D)/2

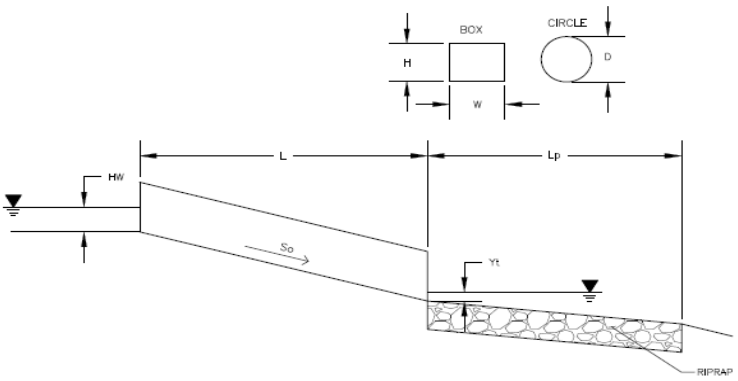
Highlighted

Qtotal (cfs)	=	408.00
Qpipe (cfs)	=	408.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	11.14
Veloc Up (ft/s)	=	11.75
HGL Dn (ft)	=	103.74
HGL Up (ft)	=	103.97
Hw Elev (ft)	=	106.62
Hw/D (ft)	=	1.53
Flow Regime	=	Inlet Control



Determination of Culvert Headwater and Outlet Protection

Project: JeniShay Farms
Basin ID: Triple 48" Culvert Outfall



Soil Type:
Choose One:
(•) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

	Design Discharge	Q =	408	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	48	inches
	Inlet Edge Type (Choose from pull-down list)	Grooved End Projection		
Box Culvert:		OR		
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	3	
	Inlet Elevation	Elev IN =	100.5	ft
	Outlet Elevation **OR** Slope	Elev OUT =	100	ft
	Culvert Length	L =	50	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =	103.75	ft
	Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	3.75	ft
Flow Area at Max Channel Velocity	A_t =	27.20	ft^2
Culvert Cross Sectional Area Available	A =	12.57	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.21	
Sum of All Losses Coefficients	k_s =	1.41	ft
Culvert Normal Depth	Y_n =	2.89	ft
Culvert Critical Depth	Y_c =	3.47	ft
Tailwater Depth for Design	d =	3.74	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	3.44	ft
Expansion Factor	1/(2*tan(Θ)) =	6.31	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	4.25	$ft^{0.5}/s$
Froude Number	Fr =	1.50	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	1.09	
Inlet Control Headwater	HW_I =	6.44	ft
Outlet Control Headwater	HW_O =	5.80	
Design Headwater Elevation	**HW =**	**106.94**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.61**	**HW/D > 1.5!**
Minimum Theoretical Riprap Size	d_{50} =	5	in
Nominal Riprap Size	d_{50} =	6	in
UDFCD Riprap Type	**Type =**	**VL**	
Length of Protection	**L_p =**	**21**	**ft**
Width of Protection	**T =**	**8**	**ft**

JeniShay Farms
(Forebay Calculations)

WQCV Equation

WQCV = a(0.91*(I)^3 - 1.19*I^2 + 0.78*I)

(per UDFCD eq 3-1)	Solve	WQCV = water quality capture volume (watershed inches)	
	1	a = 40-hr drain time coefficient (per UDFCD Vol 3 Table 3-2)	
	0.3029	I = imperviousness (%/100) (per imperviousness calculations)	
	Solution =	**0.15**	

Water Quality Capture Volume Required

V = (WQCV/12)*A	Solve	V = required storage volume (acre-ft)	
(per UDFCD eq 3-3)	0.15	WQCV = water quality capture volume (watershed inches)	
	5.13	A = tributary watershed area (acre)	
	Solution =	**0.065**	acre-ft
	Solution =	**2837**	ft^3

Water Quality Capture Volume Required (per UDFCD: Basins 5 to 20 acres = 3%)

V = (WQCV*.03)	Solve	V = required storage volume (ft^3), minimum	
	2837	WQCV Required (ft^3)	
	Solution =	**85.1**	ft^3 - *Minimum*
	Solution =	**95.0**	ft^3 - *Per geometric design*

Peak Release Rate

Q = V/T	Solve	Q = peak release rate (ft^3/s)	
	95.0	V = required storage volume (ft^3)	
	300	T = 5 minute drain time (s)	
	Solution =	**0.317**	ft^3/s

Area of Orifice

Ao = Q/(Cd*2*g*h)	Solve	Ao = area of orifice (ft^2)	
(orifice equation)	0.317	Q = peak release rate (ft^3/s)	
	0.6	Cd = coefficient of discharge	
	32.17	g = gravitational constant (ft/s)^2	
	1.5	h = head (ft) - *per forebay design depth*	
	Solution =	**0.00547**	(ft^2)
	Solution =	**0.7875**	(in^2)

Release Pipe Size

D = (4*A)/pi)^2	Solve	D = diameter of pipe (in)	
	0.7875	Ao = area of orifice (in^2)	
	3.1416	pi	
	Solution =	**1.01**	(in)

Release Pipe Size (8" Minimum)

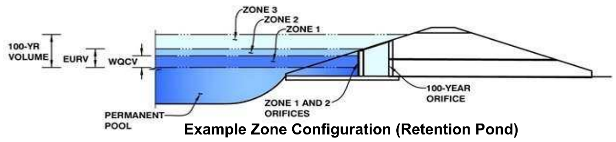
	Solution =	**8.00**	(in)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: **JeniShay Farms**

Basin ID: **EDB w/NOAA Atlas 14 One-hr Precip**



Example Zone Configuration (Retention Pond)

Required Volume Calculation

			Optional User Override 1-hr Precipitation	
Selected BMP Type =	**EDB**			
Watershed Area =	5.13	acres		
Watershed Length =	950	ft		
Watershed Slope =	0.047	ft/ft		
Watershed Imperviousness =	30.29%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	100.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	0.065	acre-feet		
Excess Urban Runoff Volume (EURV) =	0.160	acre-feet		
2-yr Runoff Volume (P1 = 0.92 in.) =	0.095	acre-feet	0.92	inches
5-yr Runoff Volume (P1 = 1.19 in.) =	0.138	acre-feet	1.19	inches
10-yr Runoff Volume (P1 = 1.44 in.) =	0.218	acre-feet	1.44	inches
25-yr Runoff Volume (P1 = 1.82 in.) =	0.402	acre-feet	1.82	inches
50-yr Runoff Volume (P1 = 2.13 in.) =	0.528	acre-feet	2.13	inches
100-yr Runoff Volume (P1 = 2.47 in.) =	0.696	acre-feet	2.47	inches
500-yr Runoff Volume (P1 = 3.36 in.) =	1.084	acre-feet	3.36	inches
Approximate 2-yr Detention Volume =	0.088	acre-feet		
Approximate 5-yr Detention Volume =	0.130	acre-feet		
Approximate 10-yr Detention Volume =	0.196	acre-feet		
Approximate 25-yr Detention Volume =	0.251	acre-feet		
Approximate 50-yr Detention Volume =	0.275	acre-feet		
Approximate 100-yr Detention Volume =	0.336	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.065	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.094	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.176	acre-feet
Total Detention Basin Volume =	0.336	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 0.5 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	485	0.011		
	--	0.50	--	--	--	748	0.017	301	0.007
7443	--	1.00	--	--	--	1,050	0.024	747	0.017
	--	1.50	--	--	--	1,426	0.033	1,363	0.031
7444	--	2.00	--	--	--	1,945	0.045	2,200	0.051
	--	2.50	--	--	--	2,598	0.060	3,355	0.077
7445	--	3.00	--	--	--	2,976	0.068	4,749	0.109
	--	3.50	--	--	--	3,524	0.081	6,374	0.146
7446	--	4.00	--	--	--	4,258	0.098	8,319	0.191
	--	4.50	--	--	--	4,930	0.113	10,616	0.244
7447	--	5.00	--	--	--	5,787	0.133	13,295	0.305
	--	5.50	--	--	--	6,340	0.146	16,327	0.375
7448	--	6.00	--	--	--	7,480	0.172	19,782	0.454
7448.9	--	6.90	--	--	--	8,711	0.200	27,068	0.621
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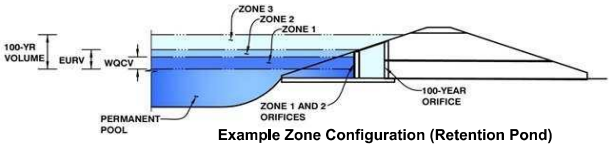
Notice: Hydraulic design and calculations for the pond and culverts will be reviewed in detail with the final plat application.

Project: JeniShay Fa

Basin ID:



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.29	0.065	Orifice Plate
Zone 2 (EURV)	3.66	0.094	Orifice Plate
Zone 3 (100-year)	5.23	0.176	Weir&Pipe (Restrict)
		0.336	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.66	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.75	1.50					
Orifice Area (sq. inches)	0.35	0.35	0.35					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.66	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.00	N/A	feet
Overflow Grate Open Area % =	65%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.66	N/A	feet
Over Flow Weir Slope Length =	2.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.89	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	2.60	N/A	ft^2
Overflow Grate Open Area w/ Debris =	1.30	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	4.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.29	N/A	ft^2
Outlet Orifice Centroid =	0.20	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.98	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.70	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	25.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.26	feet
Stage at Top of Freeboard =	6.96	feet
Basin Area at Top of Freeboard =	0.20	acres

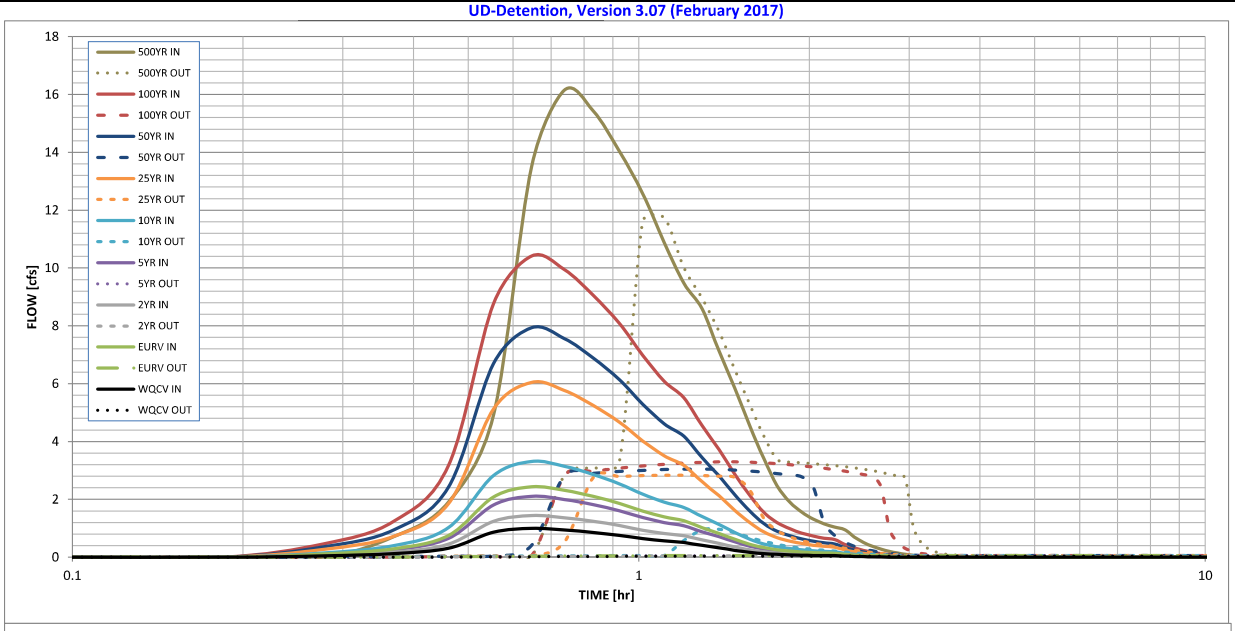
Adjust to be equal to or less than historic

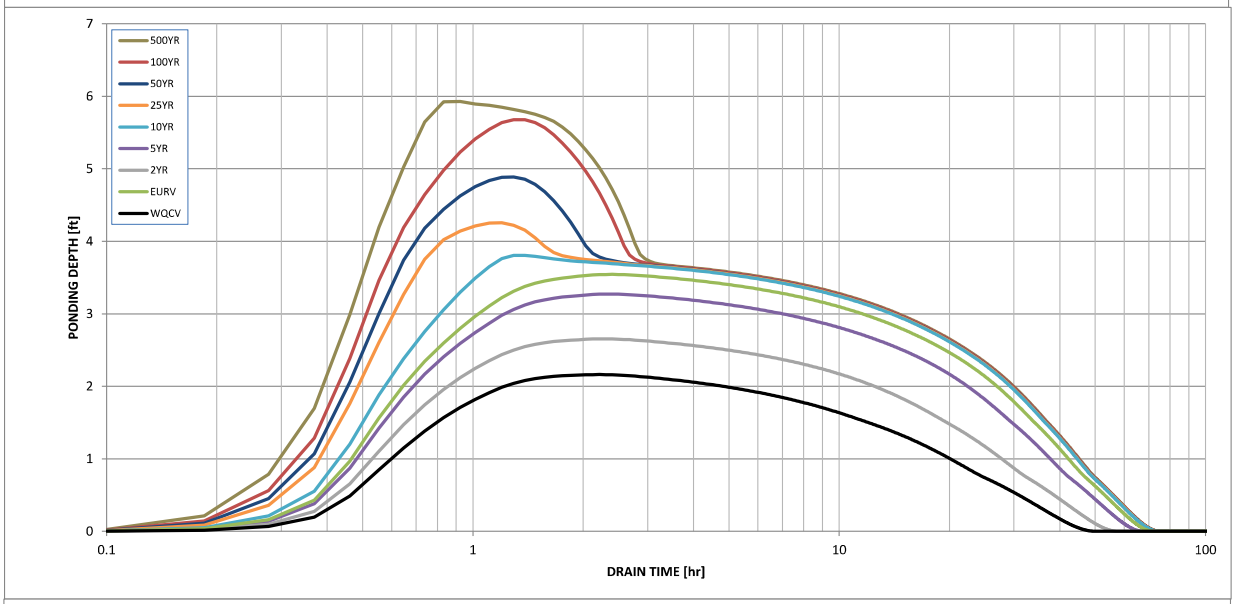
Routed Hydrograph Results

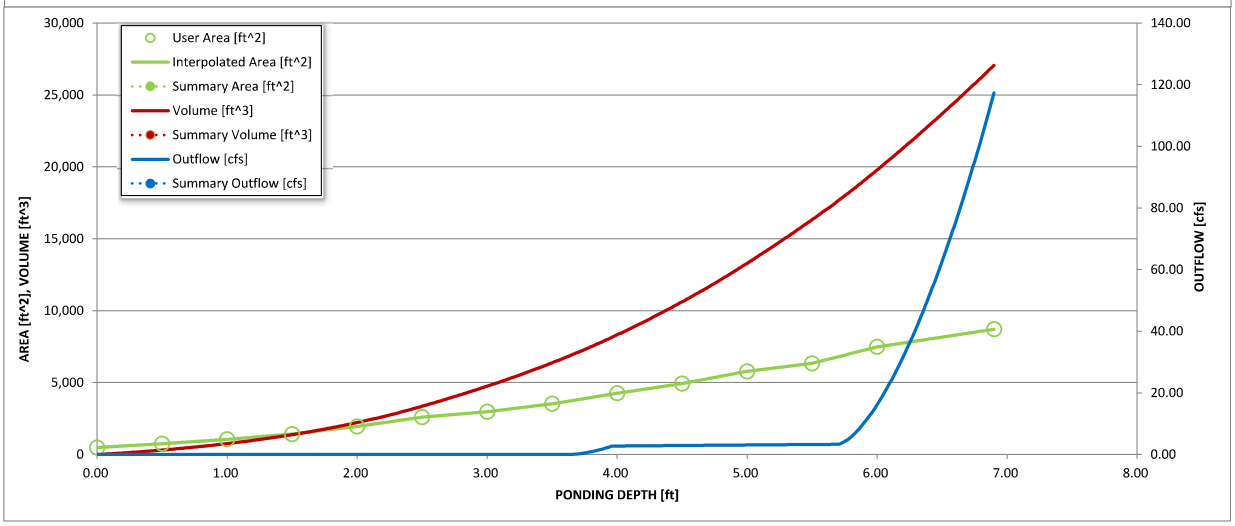
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.92	1.19	1.44	1.82	2.13	2.47	3.36
Calculated Runoff Volume (acre-ft) =	0.065	0.160	0.095	0.138	0.218	0.402	0.528	0.696	1.084
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.065	0.160	0.094	0.138	0.218	0.401	0.528	0.696	1.084
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.01	0.14	0.53	0.76	1.06	1.72
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.7	2.7	3.9	5.4	8.8
Peak Inflow Q (cfs) =	1.0	2.4	1.4	2.1	3.3	6.0	7.9	10.4	16.1
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.1	1.0	2.8	3.0	3.3	11.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	1.4	1.1	0.8	0.6	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.4	1.1	1.1	1.2	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	57	46	53	56	49	46	43	37
Time to Drain 99% of Inflow Volume (hours) =	**45**	64	51	60	64	61	58	56	51
Maximum Ponding Depth (ft) =	2.16	3.54	2.66	3.27	3.81	4.26	4.89	5.68	5.93
Area at Maximum Ponding Depth (acres) =	0.05	0.08	0.06	0.08	0.09	0.11	0.13	0.15	0.17
Maximum Volume Stored (acre-ft) =	0.058	0.150	0.086	0.128	0.172	0.216	0.290	0.400	0.441

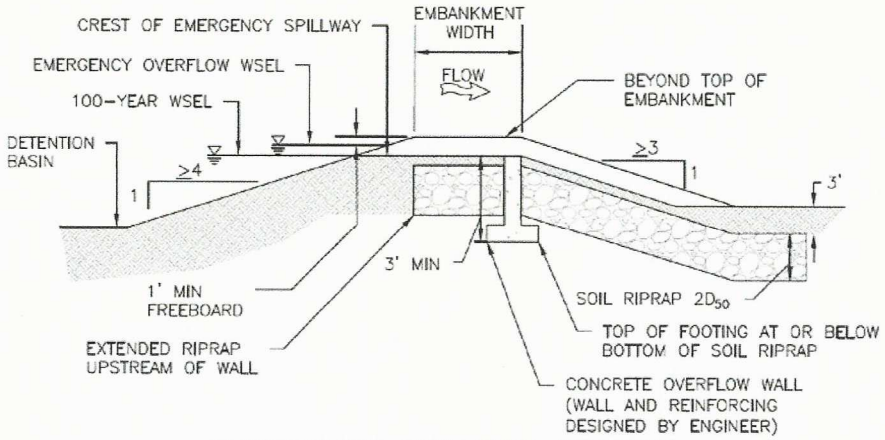
Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

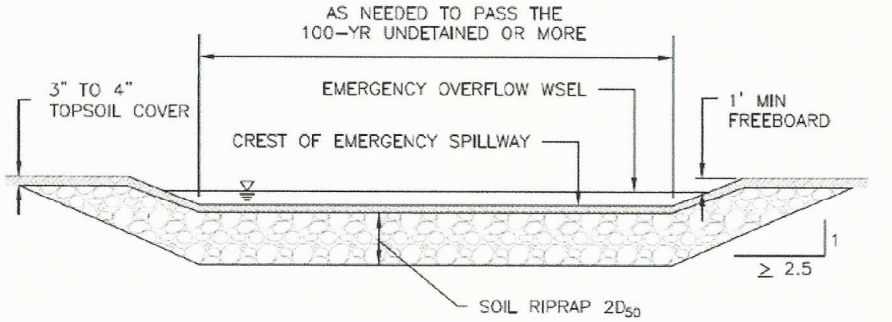




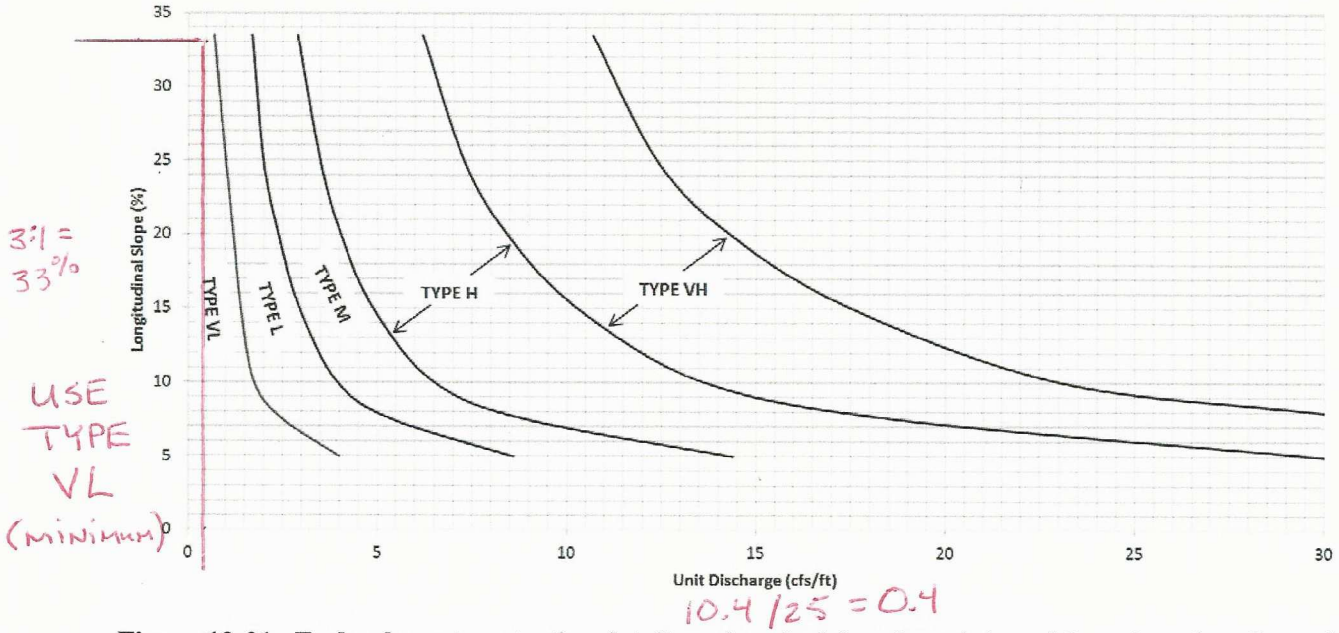




EMERGENCY SPILLWAY PROFILE



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL



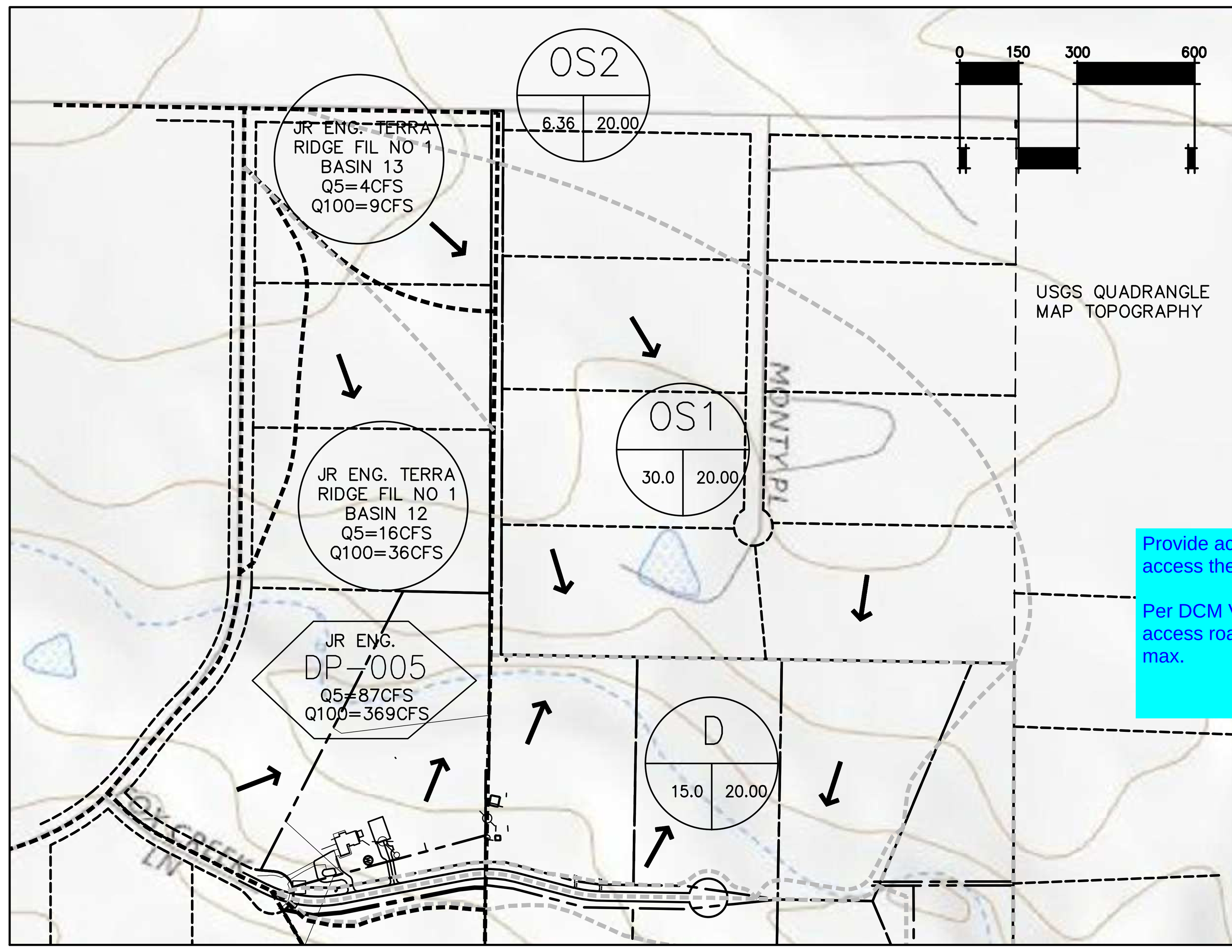
3:1 = 33%

USE TYPE VL (MINIMUM)

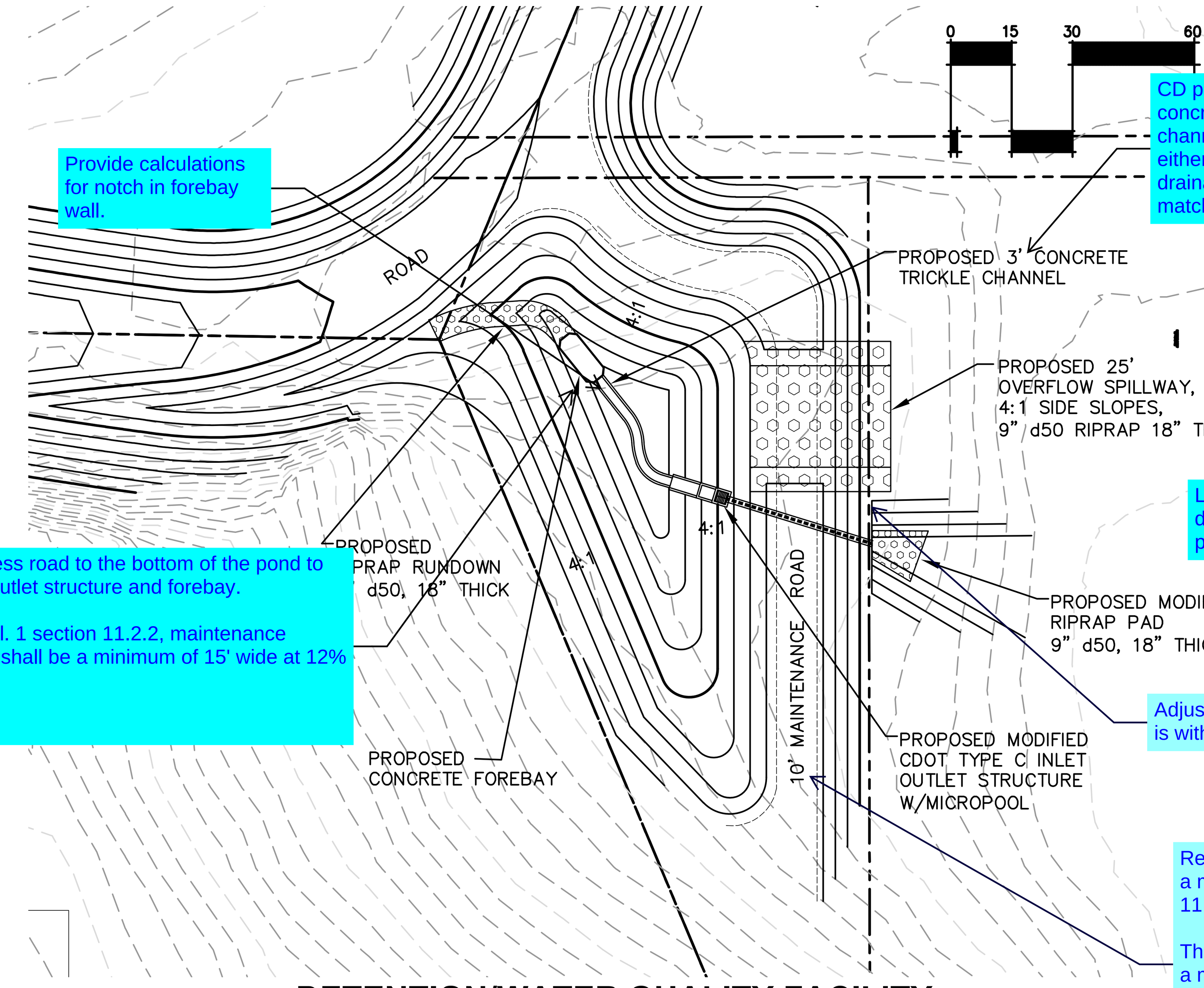
10.4/25 = 0.4

Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Appendix A
Maps



OFF-SITE BASINS
1"=300'



DETENTION/WATER QUALITY FACILITY
1"=30'

Provide calculations for notch in forebay wall.

Provide access road to the bottom of the pond to access the outlet structure and forebay.

Per DCM Vol. 1 section 11.2.2, maintenance access road shall be a minimum of 15' wide at 12% max.

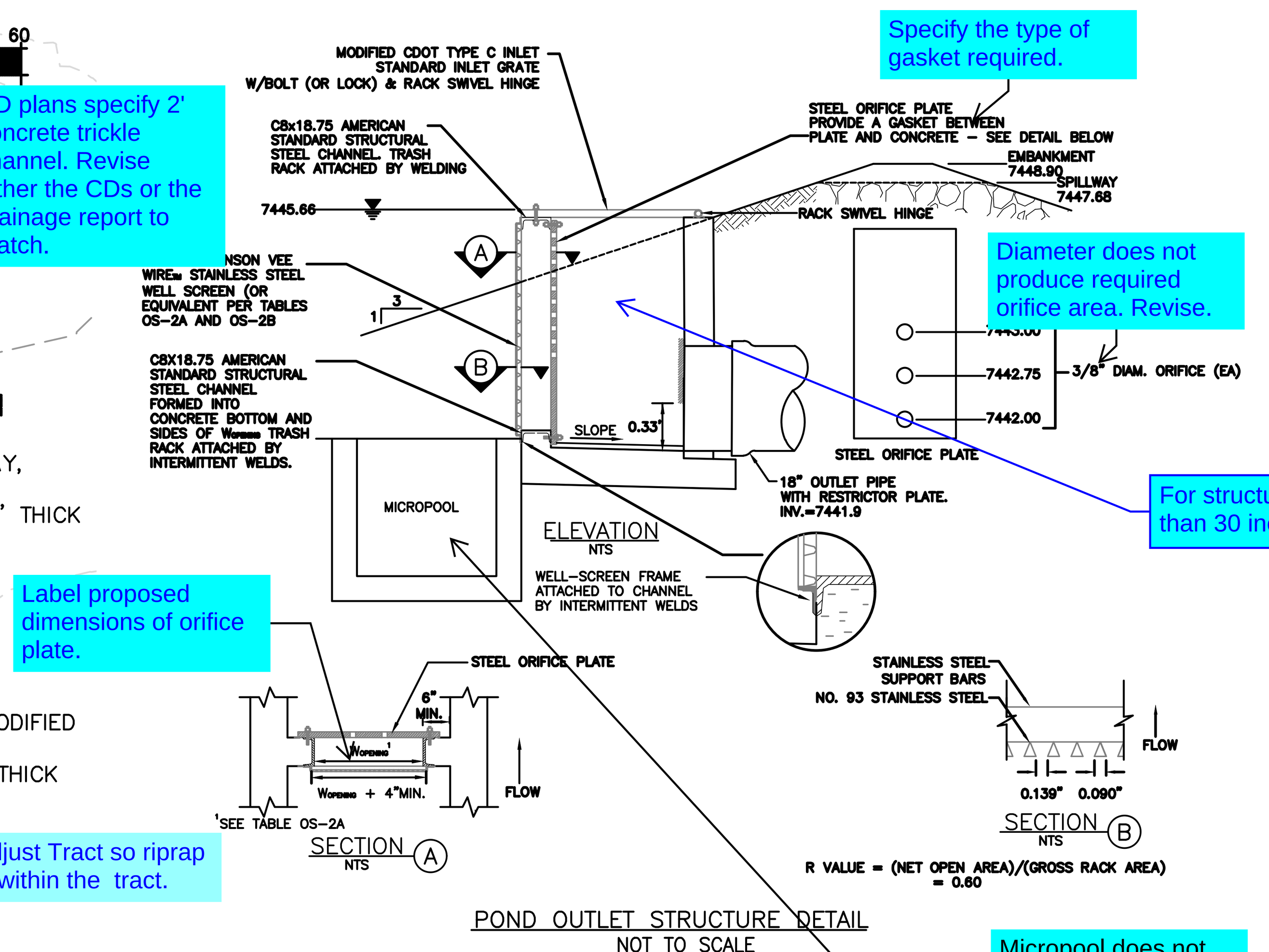
CD plans specify 2' concrete trickle channel. Revise either the CDs or the drainage report to match.

Label proposed dimensions of orifice plate.

Adjust Tract so riprap is within the tract.

Revise top of embankment structure to a min. 12' wide per DCM Vol 1 Section 11.3.3

The top of embankment is labeled as a maintenance road however the riprap spillway prevents access to this side. Show how the maintenance road on the west east side is accessed from the public road.



POND OUTLET STRUCTURE DETAIL
NOT TO SCALE

Specify the type of gasket required.

Diameter does not produce required orifice area. Revise.

For structures that have a height greater than 30 inches, steps are required.

Micropool does not meet requirements per USDCM Vol. 3. T-12. Well screen shall be submerged to the bottom of the micropool, per USDCM Vol. 3 T-5, 7. This detail also does not match construction plans.

NOTICE:

comments to the outlet structure detail are preliminary in nature. Detailed review will be provided in the future final plat application.

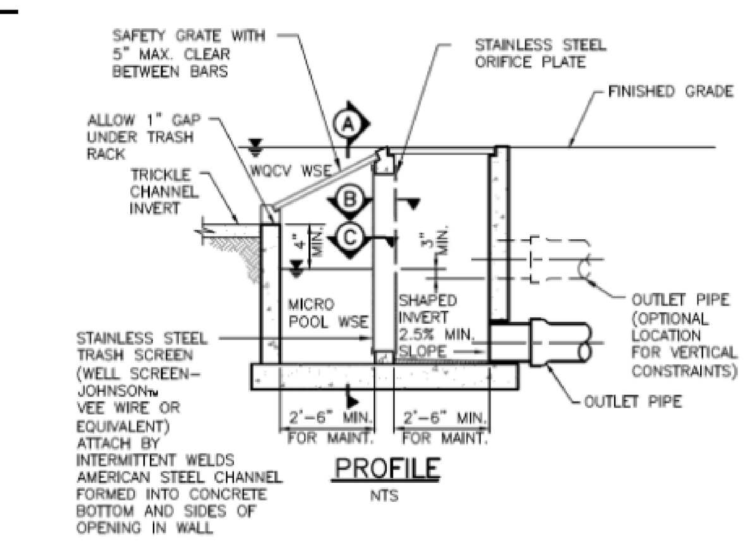
Hydraulic design will be reviewed in detail in the subsequent final drainage report for the final plat application.

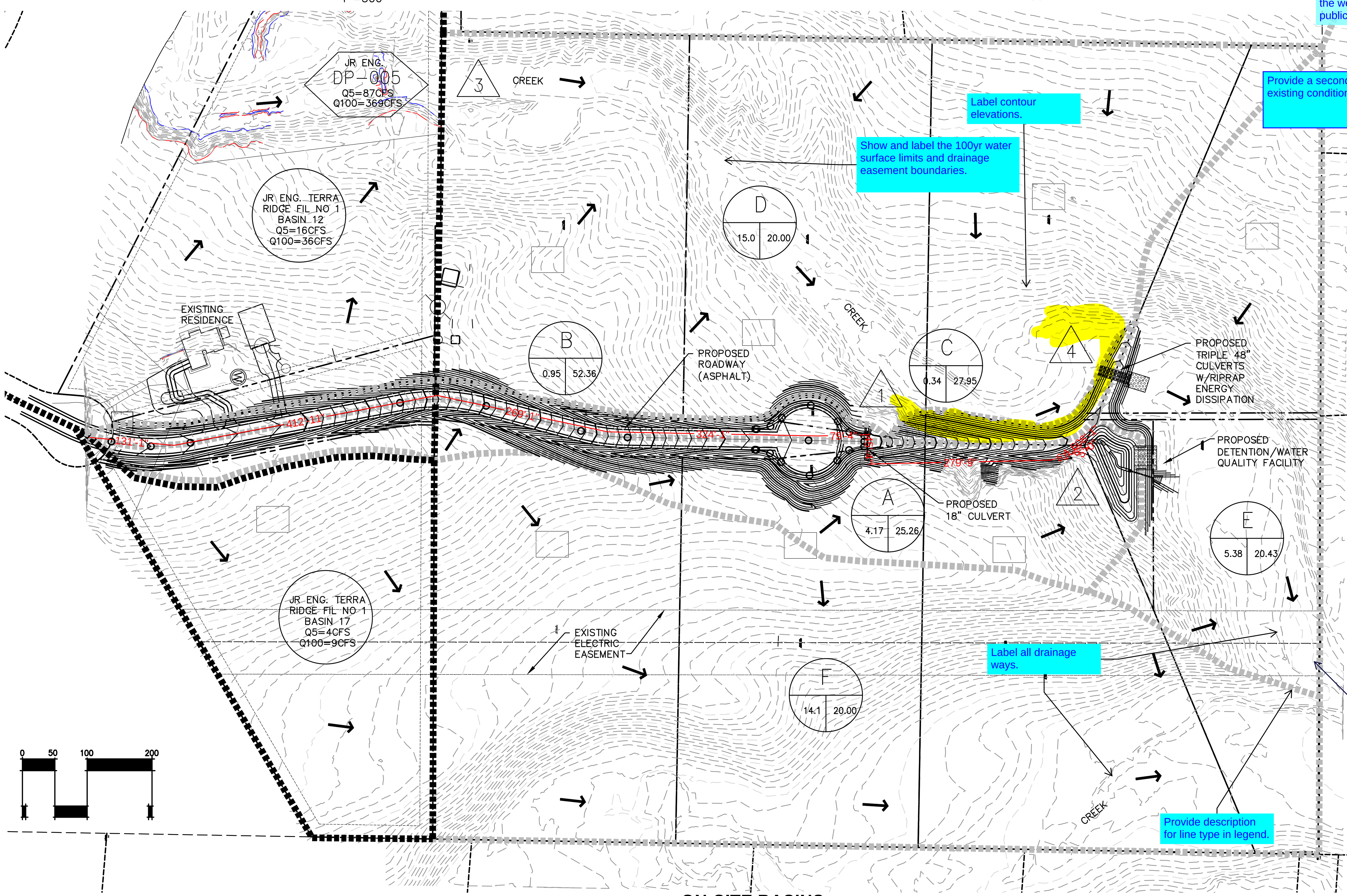
LODESTAR ENGINEERING

NORTH

LEGEND

Symbol	Description
A (1.25 / 1.25)	BASIN ID; % IMPERVIOUS; AREA (ACRES)
1 (triangle)	DESIGN POINT
heavy dashed line	DRAINAGE BASIN BOUNDARY
dashed line	EXISTING CONTOUR
solid line	PROPOSED CONTOUR
arrow	SURFACE FLOW DIRECTION





ON-SITE BASINS
1"=100'

Label contour elevations.

Show and label the 100yr water surface limits and drainage easement boundaries.

Provide a second drainage map that shows existing conditions.

Provide a narrative discussion regarding the creek. Provide analysis of the creek stability and whether or not improvements are required. State that open channel hydraulic analysis of the creek will be conducted with the final drainage report. Example is the bank stability and superelevated WSE at the bend (highlighted in yellow), whether or not armoring is required.

Label all drainage ways.

Add an ultimate DP on both the existing and proposed drainage map. Developed condition flow at this point must be equal to or less than historic.

Provide description for line type in legend.

RUNOFF COEFFICIENT SUMMARY

BASIN	AREA (ACRES)	C5	C100
A	4.17	0.25	0.48
B	0.95	0.48	0.65
C	0.34	0.30	0.51
D	15.02	0.20	0.44
E	5.38	0.20	0.44
F	14.13	0.20	0.44
OS1	30.00	0.20	0.44
OS2	6.36	0.20	0.44

RUNOFF SUMMARY

DESIGN POINT	Q5	Q100
1	2.1	4.7
2	5.8	17.3
3	86.3	366.0
4	99.0	408.0

WATER QUALITY/DETENTION SUMMARY

FACILITY TYPE	EXTENDED DET. BASIN
WQCV	0.058 ACRE-FT
EURV	0.151 ACRE-FT
100-YR STORAGE REQUIRED	0.336 ACRE-FT
100-YR STORAGE PROVIDED	0.400 ACRE-FT
100-YR PEAK OUTFLOW Q	3.3 CFS

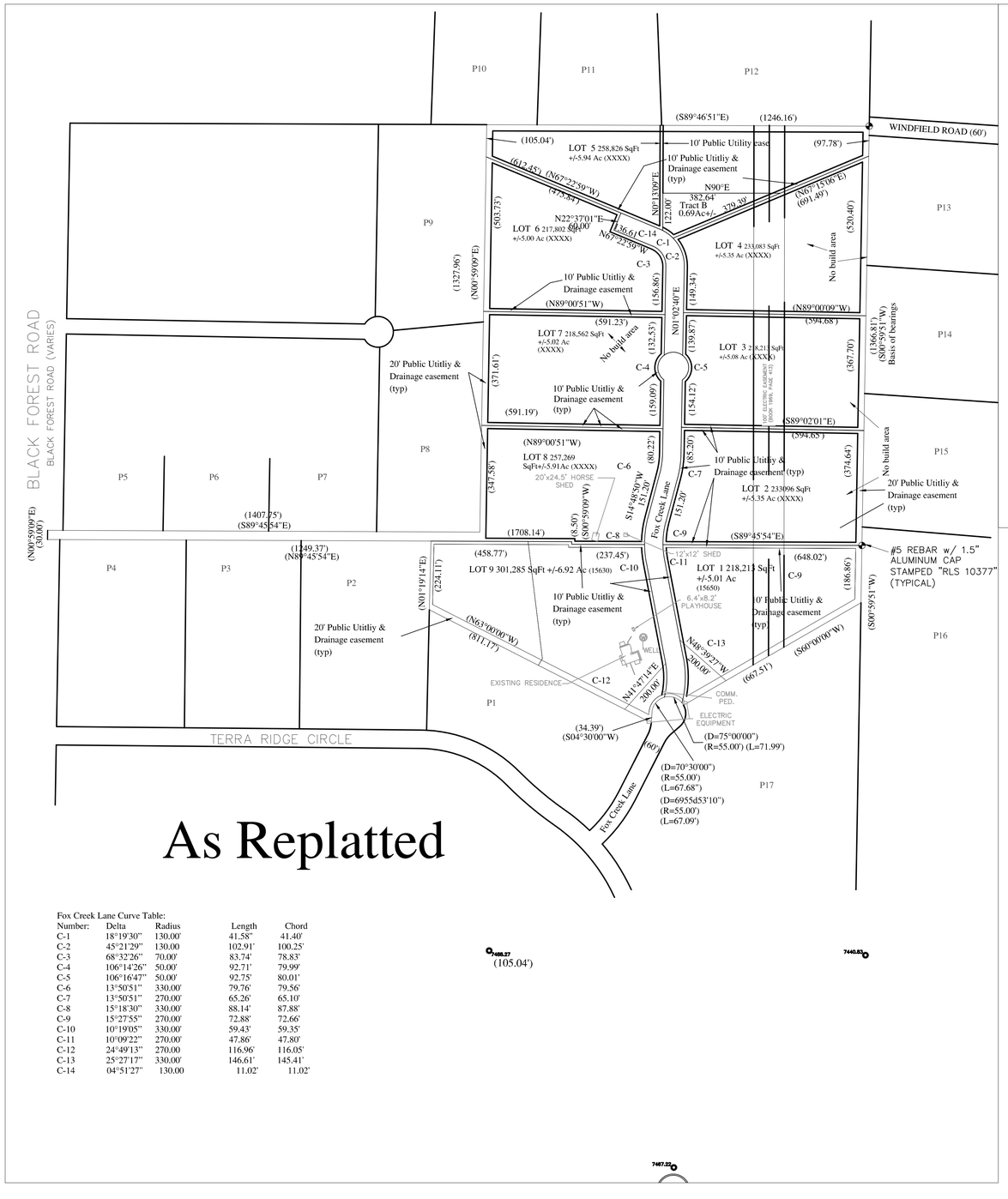
JENISHAY FARMS
TOWN OF BLACK FOREST
EL PASO COUNTY, COLORADO

DRAINAGE PLAN

D1
SHEET NO.

Preliminary Plat
JENISHAY FARMS

Title Vacation & Replat of Lots 5 and 6, Terra Ridge Filing No. 1, Together with 7 Lots in JeniShay Farms
A Portion of Section 29, Township 11 South, Range 65 West of the 6th P.M., El Paso County, Colorado



As Replatted

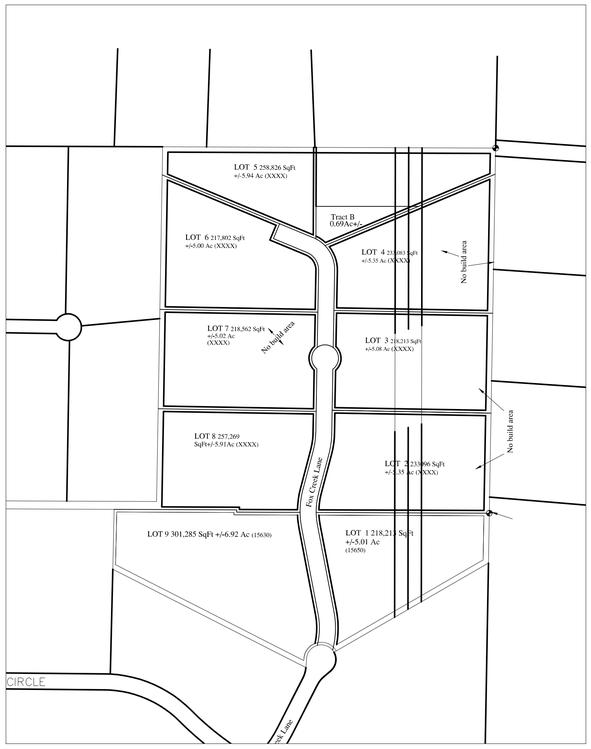
Fox Creek Lane Curve Table:

Number:	Delta	Radius	Length	Chord
C-1	18°19'30"	130.00'	41.58"	41.40'
C-2	45°21'29"	130.00	102.91'	100.25'
C-3	68°32'26"	70.00'	83.74'	78.83'
C-4	106°14'26"	50.00'	92.71'	79.99'
C-5	106°16'47"	50.00'	92.75'	80.01'
C-6	13°50'51"	330.00'	79.76'	79.56'
C-7	13°50'51"	270.00'	65.26'	65.10'
C-8	15°18'30"	330.00'	88.14'	87.88'
C-9	15°27'55"	270.00'	72.88'	72.66'
C-10	10°19'05"	330.00'	59.43'	59.35'
C-11	10°09'22"	270.00'	47.86'	47.80'
C-12	24°49'13"	270.00	116.96'	116.05'
C-13	25°27'17"	330.00'	146.61'	145.41'
C-14	04°51'27"	130.00	11.02'	11.02'

ADJACENT PROPERTY DESCRIPTION

P1	Not a part of this subdivision Robb Peters 51293--02-004 Lot 4, Terra Ridge Fil. No 1 Zoned RR-5
P2	Not a part of this subdivision Mark Davis 51293--02-003 Lot 3, Terra Ridge Fil. No 1 Zoned RR-5
P3	Not a part of this subdivision Justin Sumpter 51293--02-002 Lot 2, Terra Ridge Fil. No 1 Zoned RR-5
P4	Not a part of this subdivision Eric Mikuska 51293--02-001 Lot 1, Terra Ridge Fil. No 1 Zoned RR-5
P5	Not a part of this subdivision Diana Gard 51293--01-008 Lot 8, Whispering Hills Estates Zoned RR-5
P6	Not a part of this subdivision Rhonda Barr 51293--01-007 Lot 7, Whispering Hills Estates Zoned RR-5
P7	Not a part of this subdivision Christopher Humlicek 51293--01-006 Lot 6, Whispering Hills Estates Zoned RR-5
P8	Not a part of this subdivision David Khaliqi 51293--01-005 Lot 5, Whispering Hills Ests Zoned RR-5
P9	Not a part of this subdivision Todd Andrews 51293--01-004 Lot 4, Whispering Hills Ests Zoned RR-5
P10	Not a part of this subdivision Richard Martinez 51290--04-013 Lot 8, Ridgeview Acres Zoned RR-5
P11	Not a part of this subdivision Temmer Family Trust 51290--04-012 Lot 7, Ridgeview Acres Zoned RR-5
P12	Not a part of this subdivision Kimberly Tebrugge 51290--04-011 Lot 6, Ridgeview Acres Zoned RR-5
P13	Not a part of this subdivision Roy & Julie Heare 51290--05-002 Lot 148, Wildwood Village Unit 3 Zoned RR-5
P14	Not a part of this subdivision David Porter 51290--05-001 Lot 149, Wildwood Village Unit 3 Zoned RR-5
P15	Not a part of this subdivision Paul Gavin 51290--05-001 Lot 149, Wildwood Village Unit 3 Zoned RR-5
P16	Not a part of this subdivision Edwin Bedford 51290--05-004 Lot 151, Wildwood Village Unit 4 Zoned RR-5
P17	Not a part of this subdivision Hugo Oregel 51293--02-007 Lot 1, Terra Ridge Fil No. 2 Zoned RR-5

Remove this sheet from the drainage report



NO BUILD ZONE DESCRIPTION

NUMBER	DELTA	LENGTH	NUMBER	DELTA	LENGTH
NB1	S53°30'41"E	50.73'	NB12	N78°30'05"E	181.02'
NB2	N0°37'39"E	311.68'	NB13	S89°46'51"E	424.68'
NB3	N45°51'51"E	565.58'	NB14	S00°59'51"W	1295.67'
NB4	N0°10'10"E	291.71'	NB15	N42°49'03"W	112.36'
NB5	S67°43'09"E	117.25'	NB16	N03°50'27"E	377.45'
NB6	D=65°15'58" / R=62.70'	L=71.42'	NB17	N15°49'03"W	615.27'
NB7	S3°30'17"W	174.77'	NB18	N2°44'58"E	147.16'
NB8	S47°19'57"W	650.53'	NB19	S74°33'27"W	454.28'
NB9	S0°57'34"W	294.68'	NB20	S5°34'49"W	107.03'
NB10	N32°04'24"E	203.41'	NB21	N67°22'59"W	130.53'
NB11	N53°50'23"E	115.16'			

Drainage Report - Preliminary_v1.pdf Markup Summary

Callout (33)

Subject: Callout
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Author: dsdlaforce
Date: 1/4/2021 2:36:36 PM
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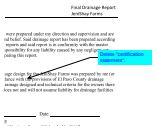
Revise title to Preliminary Drainage Report.



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Author: dsdlaforce
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Delete "certification statement".

Subject: Callout
Page Label: 2
Author: dsdlaforce
Date: 1/4/2021 2:40:43 PM
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Revise developer's statement to:
I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

Subject: Callout
Page Label: 2
Author: dsdlaforce
Date: 1/4/2021 2:42:15 PM
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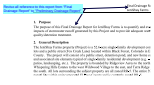
edit: "...established by the County for drainage reports..."



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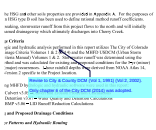
Revise all reference to this report from "Final Drainage Report" to "Preliminary Drainage Report"



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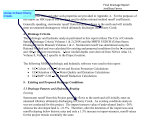
Revise to City & County DCM (Vol 1, 1991) (Vol 2, 2002).

Only chapter 6 of the City DCM (2014) was adopted.



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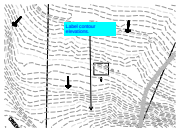
revise to East Cherry Creek.



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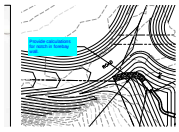
Label contour elevations.



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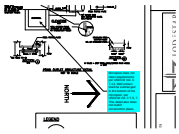
Provide calculations for notch in forebay wall.



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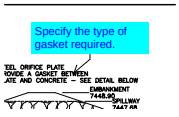
Micropool does not meet requirements per USDCM Vol. 3. T-12. Well screen shall be submerged to the bottom of the micropool, per USDCM Vol. 3 T-5, 7. This detail also does not match construction plans.



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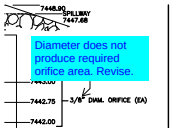
Specify the type of gasket required.



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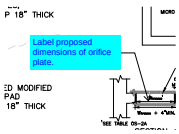
Diameter does not produce required orifice area. Revise.



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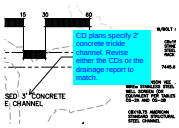
Label proposed dimensions of orifice plate.



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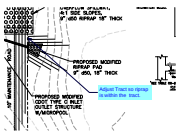
CD plans specify 2' concrete trickle channel. Revise either the CDs or the drainage report to match.



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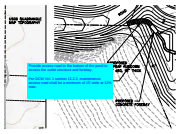
Adjust Tract so riprap is within the tract.



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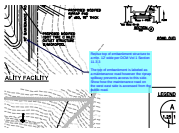
Layer:
Space:

Provide access road to the bottom of the pond to access the outlet structure and forebay.

Per DCM Vol. 1 section 11.2.2, maintenance access road shall be a minimum of 15' wide at 12% max.



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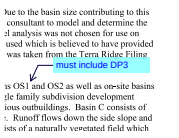
Layer:
Space:

Revise top of embankment structure to a min. 12' wide per DCM Vol 1 Section 11.3.3

The top of embankment is labeled as a maintenance road however the riprap spillway prevents access to this side. Show how the maintenance road on the west east side is accessed from the public road.



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Author: dsdlaforce
Date: 1/4/2021 4:54:10 PM
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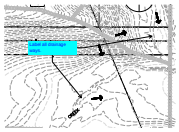
Space:

must include DP3



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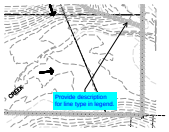
Label all drainage ways.



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Author: dsdlaforce
Date: 1/4/2021 4:59:50 PM
Status:
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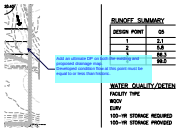
Provide description for line type in legend.



Subject: Callout
Page Label: 46
Author: dsdlaforce
Date: 1/4/2021 4:59:59 PM
Status:
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Add an ultimate DP on both the existing and proposed drainage map.
Developed condition flow at this point must be equal to or less than historic.

Subject: Callout
Page Label: 10
Author: dsdlaforce
Date: 1/4/2021 5:05:20 PM
Status:
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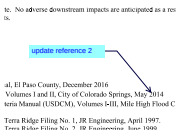
Add a statement identify that the project is located within the East Cherry Creek Drainage Basin.



Subject: Callout
Page Label: 11
Author: dsdlaforce
Date: 1/4/2021 5:05:59 PM
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update reference 2

Subject: Callout
Page Label: 8
Author: dsdlaforce
Date: 1/4/2021 5:27:14 PM
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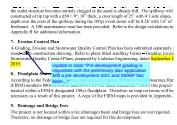
Space:

Criteria requires the entire applicable development site is treated for WQ unless it meets exclusion. In the case of Basin C, D, E & F these do not drain into the proposed pond.

Update the narrative to state these basins are excluded from permanent water quality per ECM Appendix I Section I.7.1.B.5 since these contain large lot single family sites (greater than 2.5 ac) and will have a total lot impervious area of less than 10 percent. (You can modify to max impervious of 20 percent provided you include analysis that the expected soil and vegetation conditions are suitable for infiltration of the WQCV for a typical site.)



Subject: Callout
Page Label: 10
Author: dsdlaforce
Date: 1/4/2021 5:31:58 PM
Status:
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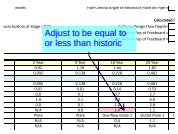
Update to state "Pre-development grading is requested with the preliminary plan application and a pre-development GEC and SWMP has been...."



Subject: Callout
Page Label: 42
Author: dsdlaforce
Date: 1/4/2021 5:38:02 PM
Status:
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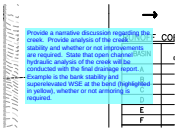
Space:

Adjust to be equal to or less than historic



Subject: Callout
Page Label: 46
Author: dsdlaforce
Date: 1/5/2021 4:44:18 PM
Status:
Color:
Layer:
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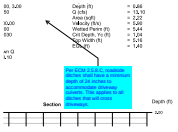
Provide a narrative discussion regarding the creek. Provide analysis of the creek stability and whether or not improvements are required. State that open channel hydraulic analysis of the creek will be conducted with the final drainage report. Example is the bank stability and superelevated WSE at the bend (highlighted in yellow), whether or not armoring is required.



Subject: Callout
Page Label: 34
Author: dsdlaforce
Date: 1/5/2021 7:47:53 AM
Status:
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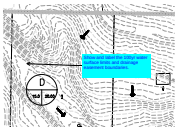
Per ECM 2.5.8.C, roadside ditches shall have a minimum depth of 24 inches to accommodate driveway culverts. This applies to all ditches that will cross driveways.



Subject: Callout
Page Label: 46
Author: dsdlaforce
Date: 1/5/2021 8:02:29 AM
Status:
Color:
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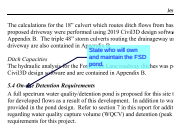
Space:

Show and label the 100yr water surface limits and drainage easement boundaries.



Subject: Callout
Page Label: 9
Author: dsdlaforce
Date: 1/5/2021 8:07:52 AM
Status:
Color:
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Space:

State who will own and maintain the FSD pond.

Subject: Callout
Page Label: 9
Author: dsdlaforce
Date: 1/5/2021 8:16:32 AM
Status:
Color:
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Space:

See ECM Section I.7.2.A for the description of Step 4 and update the narrative accordingly.

Subject: Callout
Page Label: 1
Author: dsdlaforce
Date: 1/5/2021 8:36:29 AM
Status:
Color:
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Space:

Revise to have name match PCD File name. Applies throughout all documents.

Subject: Callout
Page Label: 8
Author: dsdlaforce
Date: 1/5/2021 8:46:47 AM
Status:
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Clarify. I'm interpreting the paragraph that this report is reanalyzing the offsite flow at DP3 using Rational Method versus using the flows from the JR Engineering report. Rational Method is limited to drainage basin area <130 ac. See City DCM Chapter 6 Table 6-1 for allowable methods for estimating design flows. Hydrology will be reviewed on the resubmittal.

Contact the review engineer (gilbertlaforce@elpasoco.com 719-331-7134) to discuss the hydrology modeling prior to updating the report.

Cloud (2)

Subject: Cloud
Page Label: 2
Author: dsdlaforce
Date: 1/4/2021 2:37:09 PM
Status:
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Subject: Cloud
Page Label: 2
Author: dsdlaforce
Date: 1/4/2021 2:39:56 PM
Status:
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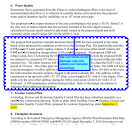
Cloud+ (1)



Subject: Cloud+
Page Label: 10
Author: dsdlaforce
Date: 1/4/2021 5:06:26 PM
Status:
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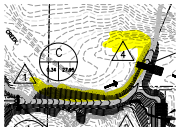
See comments on the drainage map and update your narrative accordingly.

Highlight (1)



Subject: Highlight
Page Label: 46
Author: dsdlaforce
Date: 1/5/2021 8:02:56 AM
Status:
Color:
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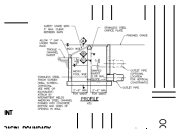
Image (2)



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Author: dsdlaforce
Date: 1/4/2021 4:19:05 PM
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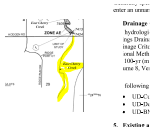

Subject: Image
Page Label: 7
Author: dsdlaforce
Date: 1/4/2021 4:39:59 PM
Status:
Color:
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Line (1)

Subject: Line
Page Label: 1
Author: dsdlaforce
Date: 1/4/2021 2:36:36 PM
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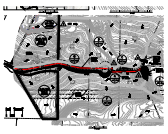
Space:

Polylength Measurement (1)



Subject: Polylength Measurement
Page Label: 46
Author: dsdlaforce
Date: 1/4/2021 4:19:05 PM
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1,608'-1"

Text Box (10)

Add PCD File #: SP209

Subject: Text Box
Page Label: 1
Author: dsdlaforce
Date: 1/4/2021 2:36:36 PM
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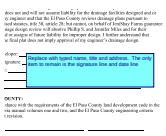
Add PCD File #: SP209



Subject: Text Box
Page Label: 2
Author: dsdlaforce
Date: 1/4/2021 2:44:08 PM
Status:
Color:
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Replace with typed name, title and address. The only item to remain is the signature line and date line

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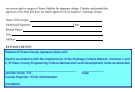

Subject: Text Box
Page Label: 2
Author: dsdlaforce
Date: 1/4/2021 2:45:26 PM
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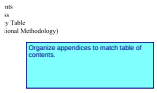
Replace El Paso County signature block with:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

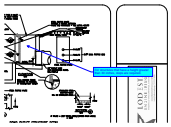
_____
_ _____
Jennifer Irvine, P.E.
Date
County Engineer / ECM Administrator

Conditions:



Subject: Text Box
Page Label: 3
Author: dsdlaforce
Date: 1/4/2021 2:48:08 PM
Status:
Color:
Layer:
Space:

Organize appendices to match table of contents.



Subject: Text Box
Page Label: 46
Author: dsdlaforce
Date: 1/4/2021 4:27:52 PM
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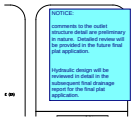
For structures that have a height greater than 30 inches, steps are required.



Subject: Text Box
Page Label: 46
Author: dsdlaforce
Date: 1/4/2021 4:37:52 PM
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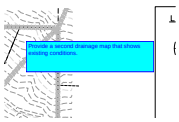
NOTICE:

comments to the outlet structure detail are preliminary in nature. Detailed review will be provided in the future final plat application.

Hydraulic design will be reviewed in detail in the subsequent final drainage report for the final plat application.



Subject: Text Box
Page Label: 46
Author: dsdlaforce
Date: 1/4/2021 4:38:44 PM
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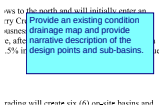
Provide a second drainage map that shows existing conditions.



Subject: Text Box
Page Label: 7
Author: dsdlaforce
Date: 1/4/2021 4:41:23 PM
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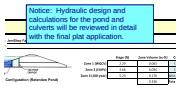
Provide an existing condition drainage map and provide narrative description of the design points and sub-basins.



Subject: Text Box
Page Label: 42
Author: dsdlaforce
Date: 1/5/2021 7:44:55 AM
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Notice: Hydraulic design and calculations for the pond and culverts will be reviewed in detail with the final plat application.

Subject: Text Box
Page Label: 47
Author: dsdlaforce
Date: 1/5/2021 7:49:08 AM
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Remove this sheet from the drainage report