

DRAINAGE LETTER
for
WILLOW SPRINGS RANCH AT FOREST LAKES DRIVE

Forest Lakes Drive
Monument, Colorado

September 9, 2021

Prepared for:

Polo Brown Company
514 Pike Avenue
Canon City, CO 81212
Contact: Daniel Brown
(303) 999-5533

Prepared by:

Drexel, Barrell & Co.
3 South Seventh Street
Colorado Springs, CO 80905
Contact: Tim McConnell, P.E.
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for
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1.0 CERTIFICATION STATEMENTS

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 by the County for drainage reports and said report is in conformity with the applicable 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.

SIGNATURE (Affix Seal):


For and on behalf of Drexel, Barrett & Co. Date
Tim D. McConnell, P.E. #33797



Developer's Statement

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.


Authorized Signature Date
Daniel Brown 9/9/21
Polo Brown Company
514 Pike Avenue, Canon City, CO 81212

El Paso County

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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for
WILLOW SPRINGS RANCH AT FOREST LAKES DRIVE

2.0 PURPOSE

The purpose of this letter is to supplement the Preliminary Drainage Report for Willow Springs Ranch (December 12, 2019) with regards to the subdivision connection to Forest Lakes Drive, an El Paso County owned right-of-way. Runoff patterns, drainage facilities and the ability to safely pass developed runoff to historic downstream facilities shall be presented.

3.0 GENERAL SITE DESCRIPTION

Location

Willow Springs Ranch is located in the Town of Monument, El Paso County, Colorado, within portions of the Southeast Quarter of Section 22, the West Half of Section 26 and the East Half of Section 27, Township 11 South, Range 67 West of the 6th P.M., northeast of Baptist Road and Forest Lakes Drive

Proposed Development

Willow Springs Ranch is approximately 219 acres in size that straddles portions of both sides of Monument and Teachout Creeks. The development is currently under construction and is proposed to consist of approximately 400 single-family residential units, numerous open space tracts, roads, parks, detention facilities and other improvements.

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the following soils are found on the project site:

Tomah-Crowfoot loamy sands (B), Pring coarse sandy loam (B), Jarre-Tecolote complex (B), Alamosa loam (D), Ustic Torrifluvents (B), and Tomah-Crowfoot complex (B).

Runoff coefficients corresponding to groups A and B were used for the purposes of the site drainage analysis. See appendix for Soils map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panels 08041CO278G and 08041CO286G (December 7, 2018), portions of the site lie within the designated 100-year floodplain along Monument Creek and Teachout Creek. No residential development is proposed within the existing 100-year floodplain.

4.0 DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for existing and developed conditions using the Rational Method as required for basins containing less than 100 acres.

5.0 EXISTING CONDITION

For the purposes of this analysis, the study area was limited to the northern portion of the Forest Lakes Drive public right-of-way, generally outside of the defined roadway, along the length of the Willow Springs Ranch property. Drainage basins were established to determine flows that are directly tributary to the public right-of-way, versus those that drain offsite to the northeast to be captured by the proposed Willow Springs Ranch drainage system. Reference the existing conditions map in the appendix.

The study area primarily consists of natively vegetated open space, with a 10' gravel trail running along the length of Forest Lakes Drive. The gravel trail transitions to concrete at either end of the Willow Springs Ranch property.

See below for a basin summary and table:

Rational Method Runoff Summary

BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
OS-1		0.40	0%	0.5	1.2
OS-2		0.16	0%	0.2	0.5
OS-3		1.73	0%	1.1	2.7
E-1		0.15	0%	0.2	0.4
E-2		0.13	48%	0.4	0.7
	DP1	0.68	9%	0.9	2.1
E-3		1.64	32%	3.3	6.8
E-4		0.14	79%	0.5	1.0
	DP2	3.66	17%	3.2	7.0
E-5		0.35	0%	0.4	0.9
E-6		0.70	0%	0.8	1.9

Basins OS-1 & E-1 drain into the public right-of-way and travel via swale to the northwest from a high point approximately 400-lf from the intersection with Cattail Drive.

Basin E-2 drains directly into Forest Lakes Drive and flows are captured by the existing curb and gutter, traveling to the northwest.

Design Point 1 is comprised of basins OS-1, E-1 and E-2 and represents the flows heading northwest from the high point on Forest Lakes Drive.

Basin OS-3 drains towards the public right-of-way from the Willow Springs Ranch property. Flows from this basin are captured by an existing Type D area inlet, and directed to the southeast via existing 18" storm sewer.

Basins OS-2 and E-3 drain directly into Forest Lakes Drive. Flows are captured by the existing curb and gutter, traveling to the southeast towards the existing storm sewer system just northwest of the Willow Ranch access road. Flows are captured by dual 15' at-grade curb inlets and directed to the southeast via 18" and 24" storm sewer.

Basin E-4 drains directly into Forest Lakes Drive. Flows are captured by the existing curb and gutter, traveling towards a low point and existing storm system just west of the intersection with Hay Creek Road.

Design Point 2 is comprised of basins OS-2, OS-3, E-3 and E-4 and represents the flows heading to the southeast via either curb and gutter or storm sewer towards the existing detention facility located at the southwest corner of Hay Creek Road and Forest Lakes Drive.

Basins E-5 and E-6 generally drain to the northeast onto the Willow Springs Ranch property.

6.0 DEVELOPED CONDITION

Development of the Willow Springs Ranch subdivision has resulted in three proposed roadway connections to Forest Lakes Drive. Amber Wheat Drive, Mountain Brome Drive and Willow Ranch Road, from northwest to southeast respectively. As with the existing condition, the study area has been generally limited to the public right-of-way on the north side of Forest Lakes Drive.

Grading for the Willow Springs Ranch subdivision has remained outside of the public right-of-way with exception of the roadway connections. Outside of these connections, and to the north of the right-of-way, the proposed grading is such that any existing flows from the Willow Springs Ranch property remain onsite and no longer enter the right-of-way.

See below for a basin summary and table:

BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
A1	DP1	0.29	24%	0.5	1.0
B1		0.37	21%	0.6	1.4
B2	DP2	1.69	44%	4.0	8.2
B3		0.44	0%	0.5	1.3
B4		0.60	0%	0.7	1.8
B5		0.10	0%	0.1	0.3

Basin A1/Design Point 1 is located northwest of the high point on Forest Lakes Drive and captures flows directly tributary to the Forest Lakes Drive public right-of-way. Comparing these flows ($Q_5=0.5$ cfs and $Q_{100}=1.0$ cfs) to Existing DP1 ($Q_5=0.9$ cfs and $Q_{100}=2.1$ cfs) indicates that flows within the ROW have been reduced. These flows travel to a low point approximately 125-ft west of the intersection with Cattail Drive where they are captured by an existing 24" storm sewer system that runs to an existing detention facility in the Forest Lakes Filing 2B subdivision to the south.

Basin B1 covers a portion of right-of-way just northwest of the proposed Amber Wheat Drive intersection. Flows generated by this basin are directed onto the Willow Springs Ranch property and will ultimately be captured by the onsite storm sewer system.

Basin B2/Design Point 2 covers the area that drains directly into Forest Lakes Drive, including the intersections of the three proposed subdivision roadway connections. These flows travel to the southeast where they are captured by the existing storm sewer system just northwest of the proposed Willow Ranch Road intersection, with flowby continuing to along Forest Lakes Drive to a low point and storm sewer system just west of Hay Creek Drive. Comparing these flows at DP2 ($Q_5=4.0$ cfs and $Q_{100}=8.2$ cfs) to Existing DP2 ($Q_5=3.2$ cfs and $Q_{100}=7.0$ cfs) indicates that flows within the ROW have slightly increased.

Water quality is provided for DP2 flows by the detention facility (Southeast corner of the Hay Creek Road/Forest Lakes Drive intersection) installed as part of the Baptist Road West project. Initially, at the time of design (FHU Final Drainage Report for Baptist Road West), this detention facility accounted for DP 18 flows of $Q_5=10.6$ cfs and $Q_{100}=33.5$ cfs. This flow was then corroborated by the Classic Consulting Preliminary and Final Drainage Report for Forest Lakes Filings 2A and 2B, as DP 29-EX $Q_5=11.8$ cfs and $Q_{100}=34.7$ cfs in the existing condition. Development of Forest Lakes Filing 2A included installation of a detention facility Pond B just east of the intersection with Pelican Bay Drive, per the aforementioned Classic drainage report this resulted in developed flows at DP 29 of $Q_5=9.8$ cfs and $Q_{100}=31.8$ cfs. This developed flow along with the difference resulting from the Willow Springs Ranch work in the Forest Lakes ROW results in flows equivalent to the original pond design, therefore the pond is assumed to have adequate capacity to absorb the minor 1.2-cfs increase in 100-year flows. See appendix for previous report excerpts.

Basin B3 and B4 cover areas of right-of-way that drain onto the Willow Springs Ranch property to the northeast and will ultimately be captured by the onsite storm sewer system.

Basin B5 covers a portion of right-of-way that drains directly offsite to the northeast. Grading within the right-of-way is proposed in this area in order to accommodate the proposed right turn lane for the proposed Willow Ranch Road.

7.0 DRAINAGE & BRIDGE FEES

Drainage and bridge fees are not required as the site has been previously platted.

8.0 SUMMARY

Development of the Willow Springs Ranch and associated connections to the Forest Lakes Drive public right-of-way will not adversely affect surrounding or downstream developments.

The proposed grading for the subdivision will allow for portions of tributary watershed that would previously have drained into the right-of-way to now be captured and treated within the Willow Spring Ranch development.

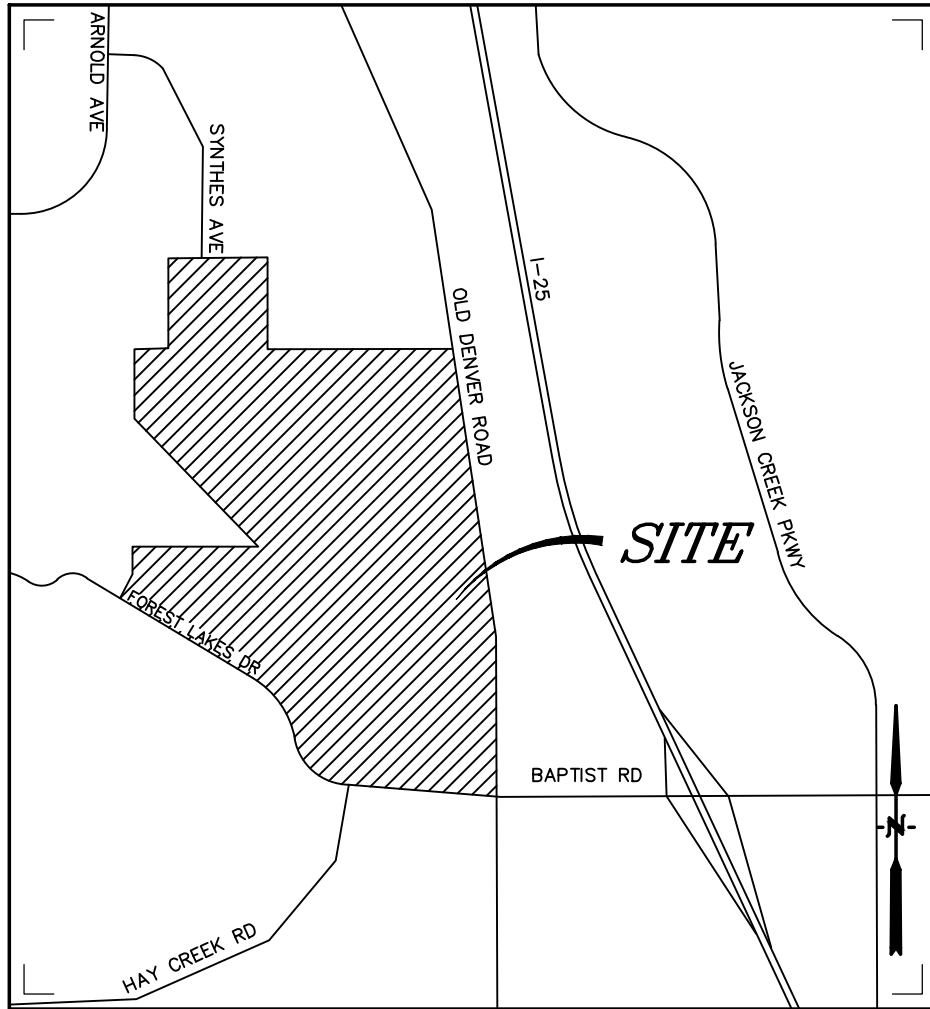
The increase in impervious area tributary to the right-of-way is minor (0.11 impervious acres) and is primarily a result of the partial conversion of the public trail from gravel to concrete. The increase in flows tributary to the downstream detention facility at Haycreek Road is negligible and will not adversely affect the facility or its ability to function as designed.

9.0 REFERENCES

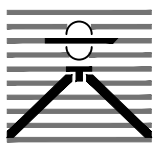
The sources of information used in the development of this study are listed below:

1. El Paso County Drainage Criteria Manual, October 31, 2018.
2. Final Drainage Report For Baptist Road West, El Paso County, Colorado (Felsburg, Holt & Ullevig), March 19, 2015.
3. Preliminary Drainage Report for Willow Springs Ranch (Drexel, Barrell & Co.), December 9, 2019.
4. Preliminary & Final Drainage Report for Forest Lakes Filings 2A & 2B (Classic Consulting Engineers & Surveyors) December 2015.

Appendix



Vicinity Map
Not to scale



WILLOW SPRINGS RANCH
MONUMENT, CO
VICINITY MAP

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:

DWG. NO.

JOB NO:

20876-05CSCV

VMAP

SHEET 1 OF 1

Custom Soil Resource Report Soil Map



Map Scale: 1:9,490 if printed on A portrait (8.5" x 11") sheet.

0 100 200 400 600 Meters

0 450 900 1800 2700 Feet

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: Jul 4, 2010—Oct 16, 2017

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
1	Alamosa loam, 1 to 3 percent slopes	1.9	1.9%
38	Jarre-Tecolote complex, 8 to 65 percent slopes	7.1	6.8%
71	Pring coarse sandy loam, 3 to 8 percent slopes	32.2	31.1%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	58.8	56.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	1.5	1.5%
101	Ustic Torrfluvents, loamy	1.9	1.8%
Totals for Area of Interest		103.4	100.0%

Map Unit Descriptions

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

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

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

Custom Soil Resource Report

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.

National Flood Hazard Layer FIRMette



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
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



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 **10/15/2019 at 10:03:08 AM** 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.



39°3'46.02"N

104°52'6.46"W

0 250 500 1,000 1,500 2,000 Feet 1:6,000

39°3'18.08"N

104°51'29.00"W

USGS The National Map Orthoimagery. Data refreshed April, 2019.

R 18-08-0914P
1/18/2019

08041 C0286 G DWAY
CA eff. 12/7/2018 13 FEET
LOMR 19-08-0089P
eff. 12/10/2018

National Flood Hazard Layer FIRMette



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 Cross Sections with 1% Annual Chance Water Surface Elevation |
| | | 17.5 |
| | | Coastal Transect |
| | | 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 |



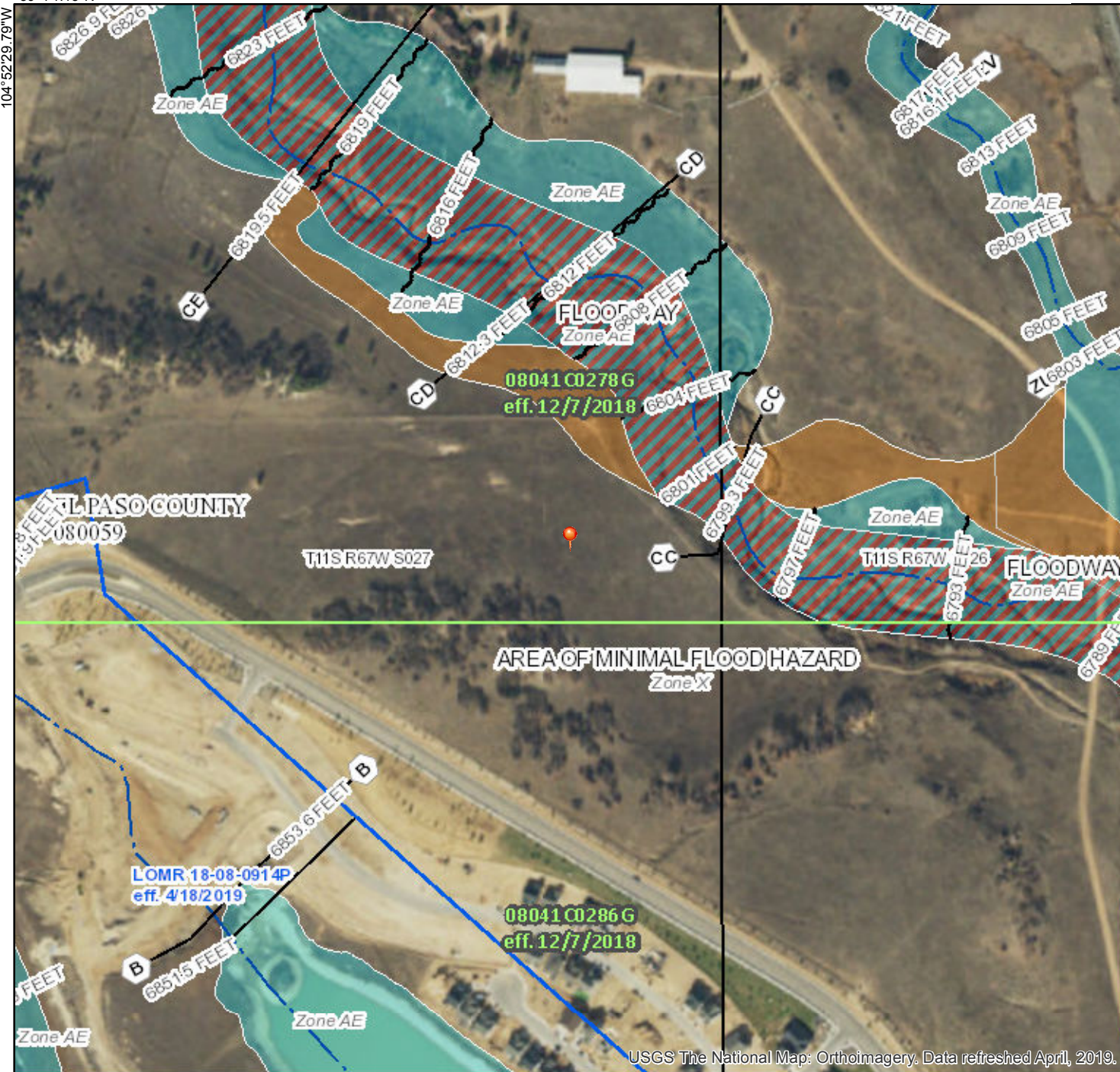
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This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped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

104°52'29.79"W
39°4'1.13"N



USGS The National Map: Orthoimagery. Data refreshed April, 2019.

PROJECT INFORMATION								
PROJECT:	Willow Springs Ranch at Forest Lakes							
PROJECT NO:	20876-05							
DESIGN BY:	KGV		 Drexel, Barrell & Co.					
REV. BY:	TDM							
AGENCY:	El Paso County							
REPORT TYPE:	Final							
DATE:	8/11/2021							
Soil Type: B								
			C2*	C5*	C10*	C100*	% IMPERV	
Pasture/Meadow				0.25		0.35	0	
Gravel				0.80		0.85	80	
Asphalt/Sidewalk				0.90		0.96	100	
*C-Values and Basin Imperviousness based on Table 5-1, El Paso County Drainage Criteria Manual								
EXISTING								
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
			ACRE	C2	C5	C10		C100
OS-1	Pasture/Meadow	0.40		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL OS-1		0.40						
OS-2	Pasture/Meadow	0.16		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL OS-2		0.16						
OS-3	Pasture/Meadow	1.73		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL OS-3		1.73						
E-1	Pasture/Meadow	0.15		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL E-1		0.15						
E-2	Pasture/Meadow	0.05		0.25		0.35	0	
	Gravel	0.08		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.58		0.65	48%	
TOTAL E-2		0.13						
E-3	Pasture/Meadow	1.00		0.25		0.35	0	
	Gravel	0.54		0.80		0.85	80	
	Asphalt/Sidewalk	0.10		0.90		0.96	100	
	WEIGHTED AVERAGE			0.47		0.55	32%	
TOTAL E-3		1.64						
E-4	Pasture/Meadow	0.03		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.11		0.90		0.96	100	
	WEIGHTED AVERAGE			0.76		0.83	79%	
TOTAL E-4		0.14						
E-5	Pasture/Meadow	0.35		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL E-5		0.35						
E-6	Pasture/Meadow	0.70		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL E-6		0.70						
TOTAL SITE		3.52		0.52		0.66	20.0%	
TRIBUTARY TO ROW		4.35		0.36		0.45	16.2%	
							Impervious Acreage (ac.)	0.70

PROJECT INFORMATION

PROJECT: Willow Springs Ranch at Forest Lakes
 PROJECT NO: 20876-05
 DESIGN BY: KGV
 REV. BY: TDM
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/9/2021



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF
EXISTING TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t _i)				TRAVEL TIME (t _t)					TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT.	C ₅	C ₁₀₀	AREA	LENGTH	HT	SLOPE	t _i	LENGTH	HT	SLOPE	VEL.	t _t	COMP. t _c	MINIMUM t _c	Min
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min			Min
OS-1		0.25	0.35	0.40	75	12	16.0	5.5						5.5	5	5.5
OS-2		0.25	0.35	0.16	50	8	16.0	4.5						4.5	5	5.0
OS-3		0.25	0.35	1.73	300	3	1.0	27.5	500	5	1.0	5.2	1.6	29.1	5	29.1
E-1		0.25	0.35	0.15	50	1	2.0	8.9	250	2.5	1.0	5.2	0.8	9.7	5	9.7
E-2		0.58	0.65	0.13	50	0.5	1.0	6.9						6.9	5	6.9
OS1+E1+E2	DP1	0.31	0.41	0.68				9.7						9.7		9.7
E-3		0.47	0.55	1.64	100	2	2.0	9.3						9.3	5	9.3
E-4		0.76	0.83	0.14	50	1	2.0	3.6						3.6	5	5.0
OS2+OS3+E3+E4	DP2	0.37	0.46	3.66				29.1	1000	18	1.8	6.4	2.6	31.7	5	31.7
E-5		0.25	0.35	0.35	50	1	2.0	8.9						8.9	5	8.9
E-6		0.25	0.35	0.70	50	1	2.0	8.9						8.9	5	8.9

PROJECT INFORMATION

PROJECT: Willow Springs Ranch at Forest Lakes
PROJECT NO: 20876-05
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Final
DATE: 9/9/2021



Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING **RUNOFF** **5 YR STORM** **P1=** **1.50**

BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF		C * A	I (IN/HR)	Q (CFS)
			RUNOFF COEFF	t _c (MIN)			
OS-1		0.40	0.25	5.5	0.10	4.99	0.5
OS-2		0.16	0.25	5.0	0.04	5.10	0.2
OS-3		1.73	0.25	29.1	0.43	2.46	1.1
E-1		0.15	0.25	9.7	0.04	4.15	0.2
E-2		0.13	0.58	6.9	0.08	4.66	0.4
	DP1	0.68	0.31	9.7	0.21	4.15	0.9
E-3		1.64	0.47	9.3	0.77	4.21	3.3
E-4		0.14	0.76	5.0	0.11	5.10	0.5
	DP2	3.66	0.37	31.7	1.35	2.35	3.2
E-5		0.35	0.25	8.9	0.09	4.28	0.4
E-6		0.70	0.25	8.9	0.18	4.28	0.8

PROJECT INFORMATION

PROJECT: Willow Springs Ranch at Forest Lakes
PROJECT NO: 20876-05
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Final
DATE: 9/9/2021



Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF		100 YR STORM			P1=	2.67
BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF		C * A	I (IN/HR)	Q (CFS)
			RUNOFF COEFF	t _c (MIN)			
OS-1		0.40	0.35	5.5	0.14	8.88	1.2
OS-2		0.16	0.35	5.0	0.06	9.09	0.5
OS-3		1.73	0.35	29.1	0.61	4.38	2.7
E-1		0.15	0.35	9.7	0.05	7.38	0.4
E-2		0.13	0.65	6.9	0.08	8.29	0.7
	DP1	0.68	0.41	9.7	0.28	7.38	2.1
E-3		1.64	0.55	9.3	0.91	7.49	6.8
E-4		0.14	0.83	5.0	0.11	9.09	1.0
	DP2	3.66	0.46	31.7	1.68	4.17	7.0
E-5		0.35	0.35	8.9	0.12	7.62	0.9
E-6		0.70	0.35	8.9	0.25	7.62	1.9

PROJECT INFORMATION								
PROJECT:	Willow Springs Ranch at Forest Lakes							
PROJECT NO:	20876-05							
DESIGN BY:	KGV							
REV. BY:	TDM							
AGENCY:	El Paso County							
REPORT TYPE:	Final							
DATE:	8/12/2021							
Soil Type: B								
				C2*	C5*	C10*	C100*	% IMPERV
Pasture/Meadow					0.25		0.35	0
Gravel					0.80		0.85	80
Asphalt/Sidewalk					0.90		0.96	100
*C-Values and Basin Imperviousness based on Table 5-1, El Paso County Drainage Criteria Manual								
PROPOSED								
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
			ACRE	C2	C5	C10		C100
A1	Pasture/Meadow	0.21		0.25		0.35	0	
	Gravel	0.04		0.80		0.85	80	
	Asphalt/Sidewalk	0.04		0.90		0.96	100	
	WEIGHTED AVERAGE			0.41		0.50	24%	
TOTAL A1		0.29						
B1	Pasture/Meadow	0.28		0.25		0.35	0	
	Gravel	0.03		0.80		0.85	80	
	Asphalt/Sidewalk	0.06		0.90		0.96	100	
	WEIGHTED AVERAGE			0.39		0.48	21%	
TOTAL B1		0.37						
B2	Pasture/Meadow	0.89		0.25		0.35	0	
	Gravel	0.28		0.80		0.85	80	
	Asphalt/Sidewalk	0.53		0.90		0.96	100	
	WEIGHTED AVERAGE			0.54		0.62	44%	
TOTAL B2		1.69						
B3	Pasture/Meadow	0.44		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL B3		0.44						
B4	Pasture/Meadow	0.60		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL B4		0.60						
B5	Pasture/Meadow	0.10		0.25		0.35	0	
	Gravel	0.00		0.80		0.85	80	
	Asphalt/Sidewalk	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.25		0.35	0%	
TOTAL B5		0.10						
TOTAL SITE		3.48		0.42		0.51	25.6%	
TRIBUTARY TO ROW		1.98		0.52		0.60	41.1%	
				Impervious Acreage (ac.)			0.81	

PROJECT INFORMATION

PROJECT: Willow Springs Ranch at Forest Lakes
 PROJECT NO: 20876-05
 DESIGN BY: KGV
 REV. BY: TDM
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 9/9/2021



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t _i)				TRAVEL TIME (t _t)					TIME OF CONC. t _c		FINAL t _c
BASIN	DESIGN PT:	C ₅	C ₁₀₀	AREA	LENGTH	HT	SLOPE	t _i	LENGTH	HT	SLOPE	VEL.	t _t	COMP.	MINIMUM	
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	t _c	t _c	Min
A1	DP1	0.41	0.50	0.29	100	2	2.0	10.3	250	2.5	1.0	5.2	0.8	11.1	5	11.1
B1		0.39	0.48	0.37	50	1	2.0	7.4	250	2.5	1.0	5.2	0.8	8.2	5	8.2
B2	DP2	0.54	0.62	1.69	100	2	2.0	8.3						8.3	5	8.3
B3		0.25	0.35	0.44	50	3	6.0	6.2						6.2	5	6.2
B4		0.25	0.35	0.60	50	2.5	5.0	6.6						6.6	5	6.6
B5		0.25	0.35	0.10	50	5	10.0	5.2						5.2	5	5.2

PROJECT INFORMATION

PROJECT: Willow Springs Ranch at Forest Lakes
PROJECT NO: 20876-05
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Final
DATE: 9/9/2021



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED	RUNOFF		5 YR STORM		P1=	1.50	
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
A1	DP1	0.29	0.41	11.1	0.12	3.94	0.5
B1		0.37	0.39	8.2	0.14	4.40	0.6
B2	DP2	1.69	0.54	8.3	0.92	4.39	4.0
B3		0.44	0.25	6.2	0.11	4.82	0.5
B4		0.60	0.25	6.6	0.15	4.73	0.7
B5		0.10	0.25	5.2	0.03	5.05	0.1

PROJECT INFORMATION

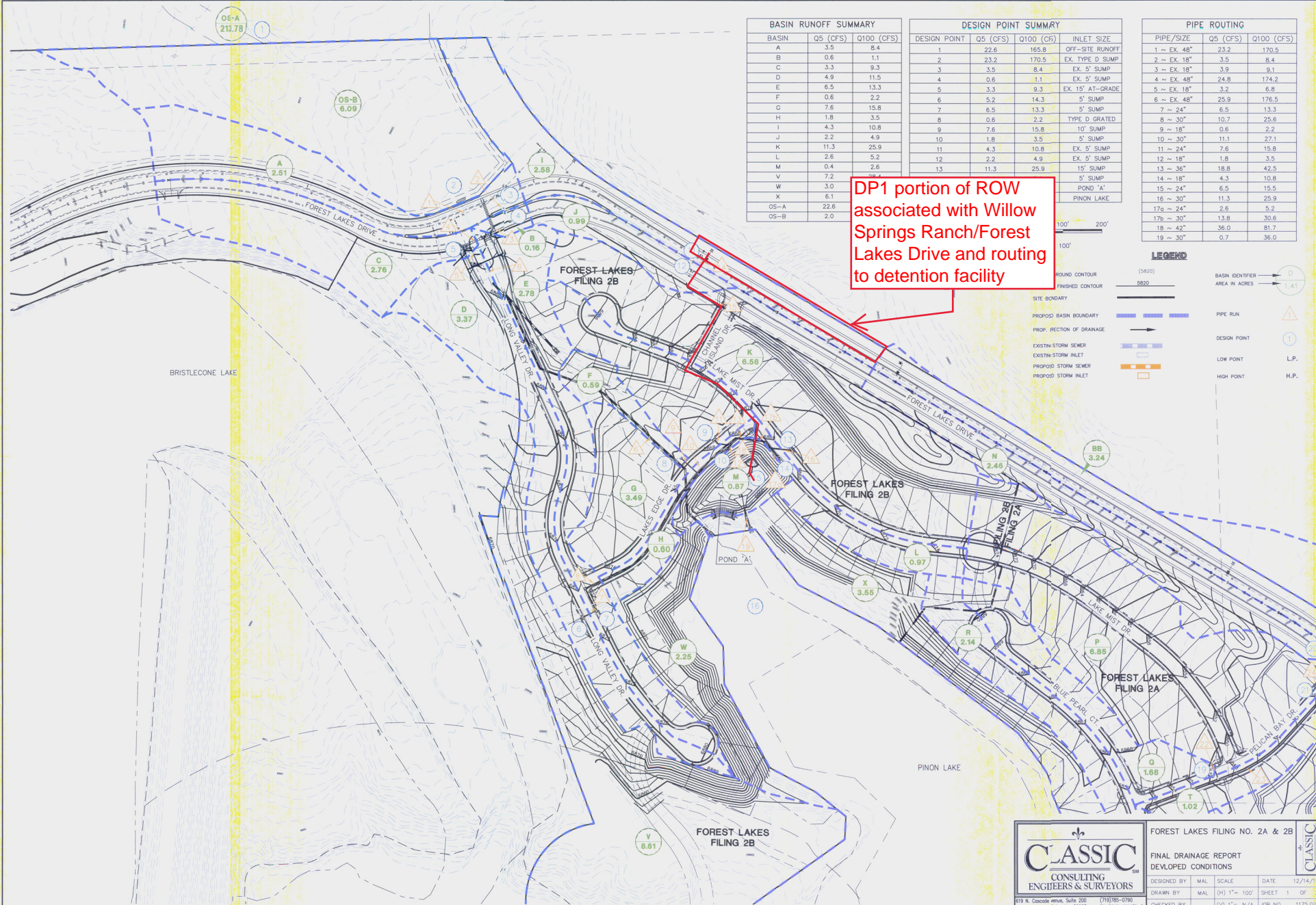
PROJECT: Willow Springs Ranch at Forest Lakes
PROJECT NO: 20876-05
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Final
DATE: 9/9/2021



Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED	RUNOFF	100 YR STORM			P1=	2.67	
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
A1	DP1	0.29	0.50	11.1	0.14	7.01	1.0
B1		0.37	0.48	8.2	0.18	7.83	1.4
B2	DP2	1.69	0.62	8.3	1.05	7.82	8.2
B3		0.44	0.35	6.2	0.15	8.58	1.3
B4		0.60	0.35	6.6	0.21	8.42	1.8
B5		0.10	0.35	5.2	0.04	8.99	0.3



BASIN RUNOFF SUMMARY		
BASIN	Q5 (CFS)	Q100 (CFS)
A	3.5	8.4
B	0.6	1.1
C	3.3	9.3
D	4.9	11.5
E	8.5	13.3
F	0.6	2.2
G	7.6	15.8
H	1.8	3.5
I	4.3	10.8
J	2.2	4.9
K	11.3	25.9
L	2.6	5.2
M	0.4	2.6
V	7.2	
W	3.0	
X	6.1	
OS-A	22.6	
OS-B	2.0	

DESIGN POINT SUMMARY			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	INLET SIZE
1	22.6	165.8	OFF-SITE RUNOFF
2	23.2	170.5	EX. TYPE D SUMP
3	3.5	8.4	EX. 5' SUMP
4	0.6	1.1	EX. 5' SUMP
5	3.3	9.3	EX. 15' AT-GRADE
6	5.2	14.3	5' SUMP
7	6.5	13.3	5' SUMP
8	0.6	2.2	TYPE D GRATED
9	7.6	15.8	10' SUMP
10	1.8	3.5	5' SUMP
11	4.3	10.8	EX. 5' SUMP
12	2.2	4.9	EX. 5' SUMP
13	11.3	25.9	5' SUMP
POND 'A'			
PINON LAKE			

PIPE ROUTING		
PIPE/SIZE	Q5 (CFS)	Q100 (CFS)
1 ~ EX. 48"	23.2	170.5
2 ~ EX. 18"	3.5	8.4
3 ~ EX. 18"	3.9	9.1
4 ~ EX. 48"	24.8	174.2
5 ~ EX. 18"	3.2	6.8
6 ~ EX. 48"	25.9	176.5
7 ~ 24"	6.5	13.3
8 ~ 30"	10.7	25.6
9 ~ 18"	0.6	2.2
10 ~ 30"	11.1	27.1
11 ~ 24"	7.6	15.8
12 ~ 18"	1.8	3.5
13 ~ 36"	18.8	42.5
14 ~ 18"	4.3	10.8
15 ~ 24"	6.5	15.5
16 ~ 30"	11.3	25.9
17 ~ 24"	2.6	5.2
17 ~ 30"	13.8	30.6
18 ~ 42"	36.0	81.7
19 ~ 30"	0.7	36.0

DP1 portion of ROW associated with Willow Springs Ranch/Forest Lakes Drive and routing to detention facility

LEGEND

ROUND CONTOUR (5820)
FINISHED CONTOUR (5820)

SITE BOUNDARY
PROPOSED BASIN BOUNDARY
PROP. DIRECTION OF DRAINAGE
EXISTING STORM SEWER
EXISTING STORM INLET
PROPOSED STORM SEWER
PROPOSED STORM INLET

BASIN IDENTIFIER (D)
AREA IN ACRES (1.41)

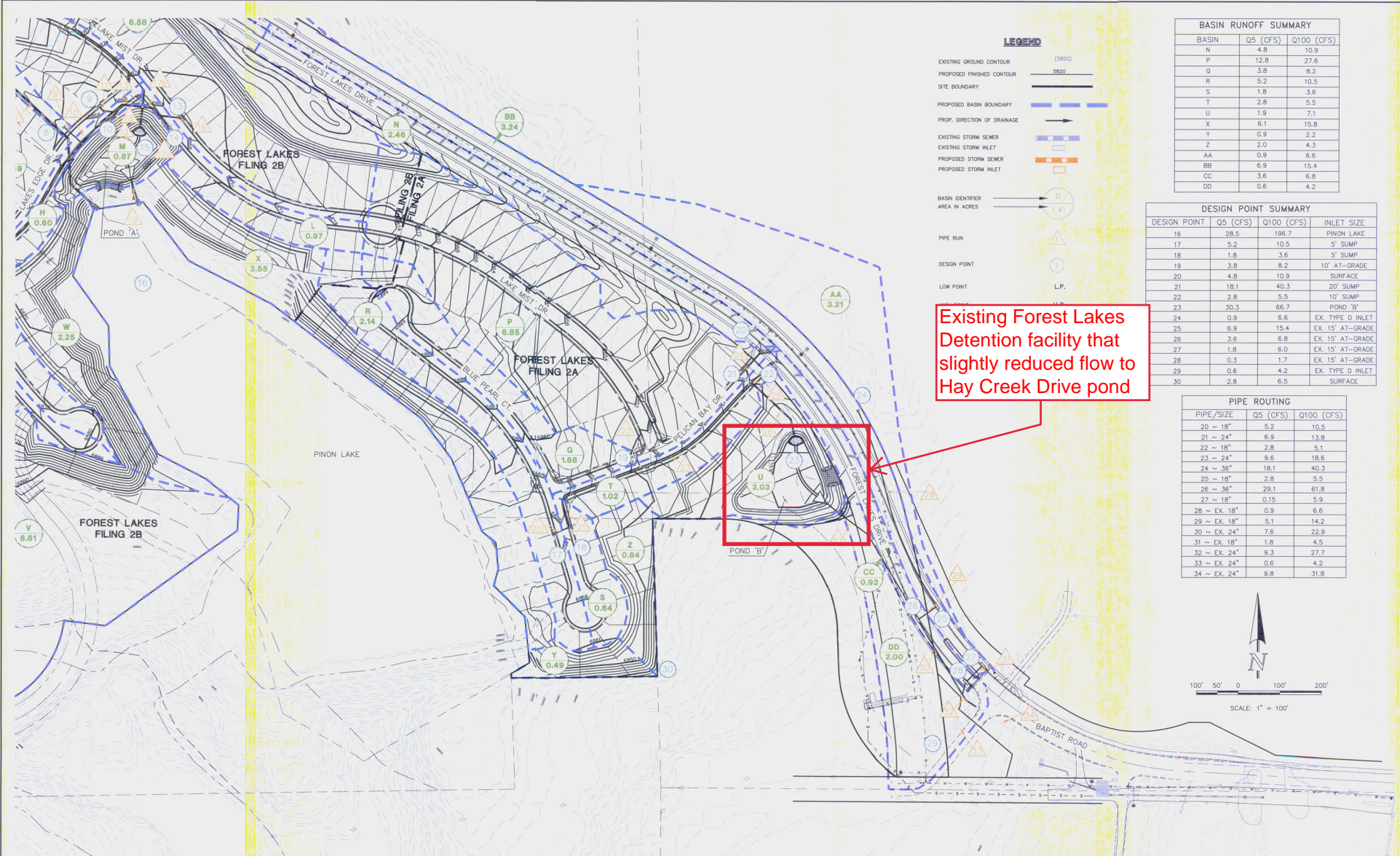
PIPE RUN
DESIGN POINT
LOW POINT (L.P.)
HIGH POINT (H.P.)

CLASSIC
CONSULTING ENGINEERS & SURVEYORS

FOREST LAKES FILING NO. 2A & 2B
FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS

DESIGNED BY: MAL SCALE: DATE: 12/14/15
DRAWN BY: MAL (H) 1"=100' SHEET 1 OF 2
CHECKED BY: (V) 1"=N/A JOB NO. 1175.02

619 N. Cascade Avenue, Suite 200 (719) 785-0780
Colorado Springs, Colorado 80903 (719) 785-0785 (fax)



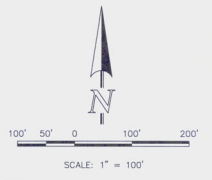
LEGEND

- EXISTING GROUND CONTOUR (5820)
- PROPOSED FINISHED CONTOUR 5820
- SITE BOUNDARY
- PROPOSED BASIN BOUNDARY
- PROP. DIRECTION OF DRAINAGE
- EXISTING STORM SEWER
- EXISTING STORM INLET
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- BASIN IDENTIFIER
- AREA IN ACRES
- PIPE RUN
- DESIGN POINT
- LOW POINT L.P.

BASIN RUNOFF SUMMARY		
BASIN	Q5 (CFS)	Q100 (CFS)
N	4.8	10.9
P	12.8	27.6
Q	3.8	8.2
R	5.2	10.5
S	1.8	3.6
T	2.8	5.5
U	1.9	7.1
X	6.1	15.8
Y	0.9	2.2
Z	2.0	4.3
AA	0.9	6.6
BB	6.9	15.4
CC	3.6	6.8
DD	0.6	4.2

DESIGN POINT SUMMARY			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	INLET SIZE
16	28.5	196.7	PINON LAKE
17	5.2	10.5	5' SUMP
18	1.8	3.6	5' SUMP
19	3.8	8.2	10' AT-GRADE
20	4.8	10.9	SURFACE
21	18.1	40.3	20' SUMP
22	2.8	5.5	10' SUMP
23	30.3	66.7	POND 'B'
24	0.9	6.6	EX. TYPE D INLET
25	6.9	15.4	EX. 15' AT-GRADE
26	3.6	6.8	EX. 15' AT-GRADE
27	1.8	6.0	EX. 15' AT-GRADE
28	0.3	1.7	EX. 15' AT-GRADE
29	0.6	4.2	EX. TYPE D INLET
30	2.8	6.5	SURFACE

PIPE ROUTING		
PIPE SIZE	Q5 (CFS)	Q100 (CFS)
20 ~ 18"	5.2	10.5
21 ~ 24"	6.9	13.8
22 ~ 18"	2.8	5.1
23 ~ 24"	9.6	18.6
24 ~ 36"	18.1	40.3
25 ~ 18"	2.8	5.5
26 ~ 36"	29.1	61.8
27 ~ 18"	0.15	5.9
28 ~ EX. 18"	0.9	6.6
29 ~ EX. 18"	5.1	14.2
30 ~ EX. 24"	7.6	22.9
31 ~ EX. 18"	1.8	4.5
32 ~ EX. 24"	9.3	27.7
33 ~ EX. 24"	0.6	4.2
34 ~ EX. 24"	9.8	31.8



NO.	REVISION	DATE	REVIEW

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

RYLE R. CAMPBELL, COLORADO P.E. #29794 DATE

619 N. Cascade Arroyo, Suite 200
Colorado Springs, Colorado 80903
(719) 785-0790
(719) 785-0799 fax

FOREST LAKES FILING NO. 2A & 2B

FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS

DESIGNED BY	MAL	SCALE	DATE
DRAWN BY	MAL	(H) 1" = 100'	12/14/13
CHECKED BY	(V) N/A	SHEET NO.	2 OF 2
		JOB NO.	1175.02

JOB NUMBER: 1175.02
 DATE: 03/11/16
 CALCULATED BY: MAL

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
 REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
26	PIPE 23 + PIPE 24 + PIPE 25	7.70	9.75	12.6	3.78	6.34	29.1	61.8	36" @ 0.9%
27	POND 'B' RELEASE	0.08	0.88	12.9	3.74	6.28	0.3	5.5	18" RCP
28	DP-24	0.26	1.12	15.4	3.49	5.85	0.9	6.6	EX. 18" RCP
29	PIPE 28 + DP-25 (Intercepted)	1.45	2.43	15.4	3.49	5.85	5.1	14.2	EX. 18" RCP
30	PIPE 27 + PIPE 29 + DP-26 (Intercepted)	2.19	3.91	15.4	3.49	5.85	7.6	22.9	EX. 24" RCP
31	DP-27 (Intercepted)	0.42	0.62	9.0	4.29	7.20	1.8	4.5	EX. 18" RCP
32	PIPE 30 + PIPE 31 + DP-28 (Intercepted)	2.67	4.74	15.4	3.49	5.85	9.3	27.7	EX. 24" RCP
33	DP-29-DEV	0.16	0.70	14.9	3.53	5.93	0.6	4.2	EX. 24" RCP (RTA)
34	PIPE 32 + PIPE 33	2.83	5.44	15.4	3.49	5.85	9.8	31.8	EX. 24" RCP (RTA)

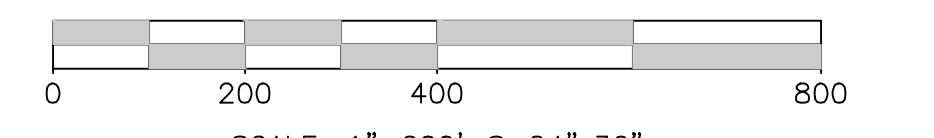
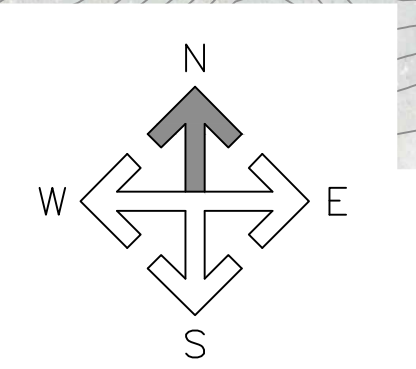
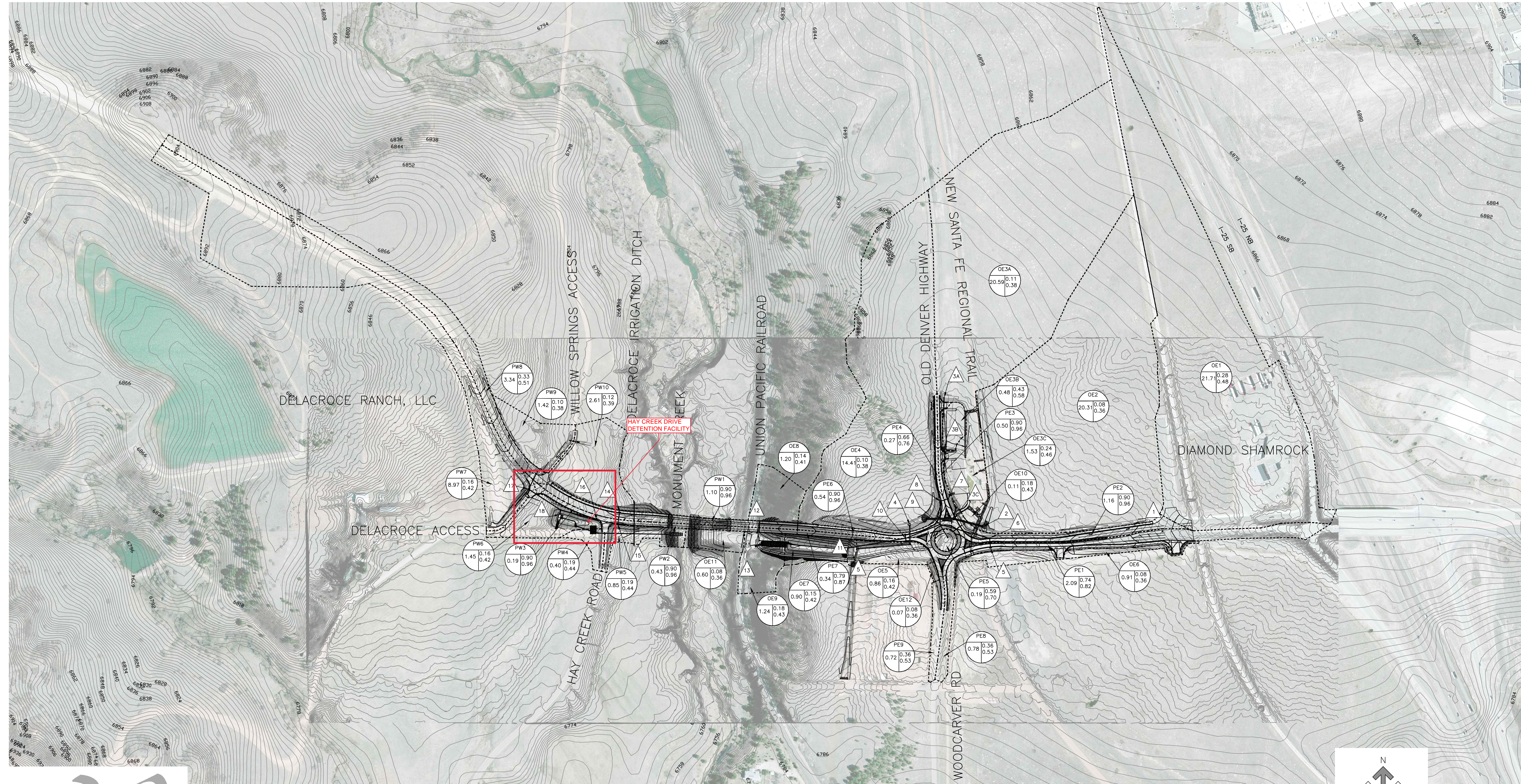
JOB NAME: FOREST LAKES FILING NO. 2
 JOB NUMBER: 1175.02
 DATE: 03/11/16
 CALCULATED BY: MAL

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
 REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY (EXISTING CONDITIONS)

Pipe Run	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
12	DP-29-EX	0.49	2.35	24.5	2.78	4.67	1.4	11.0	EX. 24" RCP (RTA)
13	PIPE 11 + PIPE 12	4.25	7.44	24.5	2.78	4.67	11.8	34.7	EX. 24" RCP (RTA)
14	DP-11	1.03	1.51	9.3	4.23	7.11	4.3	10.8	EX. 18" RCP
15	PIPE 14 + DP-12	1.88	2.58	9.3	4.23	7.11	7.9	18.3	EX. 24" RCP

BAPTIST ROAD WEST PROPOSED DRAINAGE PLAN



SCALE: 1"=200' @ 24"x36"

MARCH 16, 2015

**STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)
100-YEAR STORM- PROPOSED EAST BASINS**

Project: West Baptist Road
Project #: 11150-01
Date: 16-Mar-15
File: West Baptist Road Hydro.xls

Q=C*I*A

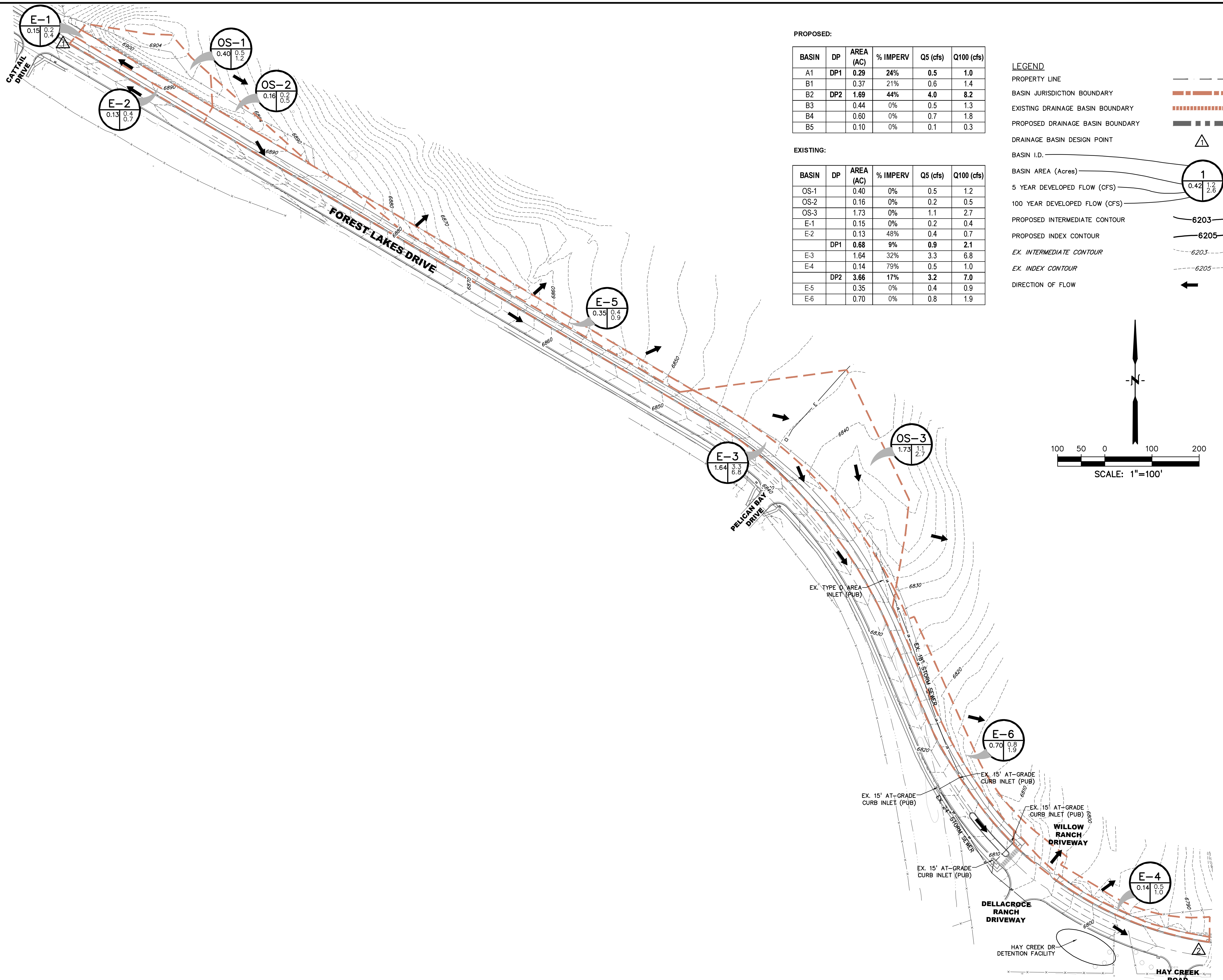
1-Hour Intensity
100-Year
2.67
 $P_1 = I = (26.65 P_1) / (10 + TC)^{0.76}$

ROUTED BASINS AT DES. PT. (1)	DES. PT. (2)	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS (22)
		AREA DESIG. (3)	AREA (AC.) (4)	COEF. (5)	tc (MIN) (6)	C*A (AC) (7)	I (IN/HR) (8)	Q (CFS) (9)	tc (MIN) (10)	C*A (AC) (11)	I (IN/HR) (12)	Q (CFS) (13)	SLOPE (%) (14)	Q (15)	DESIGN (CFS) (16)	SLOPE (%) (17)	PIPE SIZE (18)	LENGTH (FT.) (19)	VEL. (FPS) (20)	tt (MIN) (21)	
OE1	1	OE1	21.71	0.48	36.7	10.52	3.83	40.3													
OE1,2	2	OE2	20.31	0.36	41.3	7.40	3.57	26.4	44.8	17.92	3.39	60.8						966	2.0	8.1	Tc=36.7+8.1=44.8
OE3A	3A	OE3A	20.59	0.38	45.7	7.90	3.35	26.5													
OE3A, OE3B	3B	OE3B	0.48	0.58	6.4	0.28	8.50	2.4	47.8	8.18	3.26	26.7						242	1.96	2.1	Tc=45.7+2.1=47.8
OE1,2,3A,3B,3C,10	3C	OE3C	1.53	0.46	14.6	0.71	6.24	4.4	50.1	26.85	3.16	85.0						338	2.42	2.3	Tc=47.8+2.3=50.1
OE1,2,3A,3B,3C,4,10	4	OE4	14.41	0.38	33.0	5.41	4.08	22.1	50.8	32.26	3.14	101.2						213	5	0.7	Tc=50.1+0.7=50.8
OE1,2,3A,3B,3C,4,5,10	5	OE5	0.86	0.42	15.0	0.36	6.16	2.2	51.6	32.62	3.11	101.3						407	8	0.8	Tc=50.8+0.8=51.6
	OFFSITE	OE6	0.91	0.36	10.2	0.33	7.23	2.4													
	TO POND	OE7	0.90	0.42	10.0	0.37	7.30	2.7													
OE8	12	OE8	1.20	0.41	10.0	0.49	7.30	3.6													
PE 1,2,3,4,5,6,7+OE7,9	13	OE9	1.24	0.43	10.0	0.53	7.30	3.9	14.8	5.35	6.20	33.2						289	2.8	1.7	Tc=13.1+1.7=14.8, Potential max. overflow to RR
	TO K5	OE10	0.11	0.43	14.3	0.05	6.30	0.3													
PE1	5	PE1	2.09	0.82	11.4	1.71	6.93	11.9													
PE1+PE2	6	PE2	1.16	0.96	8.7	1.11	7.68	8.5	11.5	2.82	6.91	19.5						43	5.0	0.1	Tc=11.4+0.1=11.5
PE3	7	PE3	0.50	0.96	5.0	0.48	9.09	4.3													
PE3+PE4	8	PE4	0.27	0.76	5.0	0.20	9.09	1.9	5.1	0.68	9.04	6.2						33	7.6	0.1	Tc=5.0+0.1=5.1
PE1,2,3,4,5	9	PE5	0.19	0.70	5.0	0.13	9.09	1.2	12.1	3.63	6.77	24.6						234	6.8	0.6	Tc=11.5+0.6=12.1
PE1,2,3,4,5,6,7	10	PE6	0.54	0.96	5.0	0.52	9.09	4.7	12.4	4.44	6.70	29.8						170	11.2	0.3	Tc=12.1+0.3=12.4
PE1,2,3,4,5,6,7, OE7	11	PE7	0.34	0.87	5.0	0.29	9.09	2.7	13.1	4.82	6.54	31.5						269	6.5	0.7	Tc=12.4+0.7=13.1, Total flow to East Pond
	OFFSITE	PE8	0.78	0.53	5.7	0.41	8.76	3.6													Flows to south undetained
	OFFSITE	PE9	0.72	0.53	5.8	0.38	8.71	3.3													Flows to south undetained



WQ treatment location for DP1

WQ treatment location for DP2



PROPOSED:

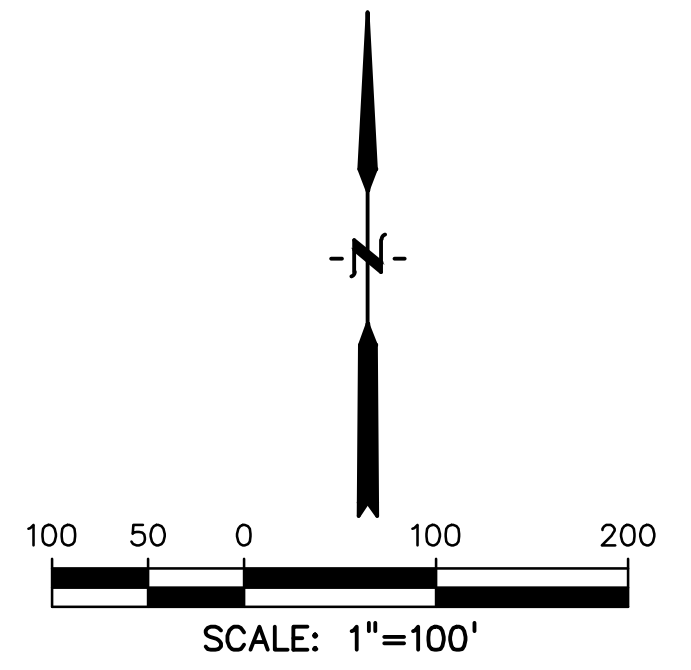
BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
A1	DP1	0.29	24%	0.5	1.0
B1		0.37	21%	0.6	1.4
B2	DP2	1.69	44%	4.0	8.2
B3		0.44	0%	0.5	1.3
B4		0.60	0%	0.7	1.8
B5		0.10	0%	0.1	0.3

EXISTING:

BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
OS-1		0.40	0%	0.5	1.2
OS-2		0.16	0%	0.2	0.5
OS-3		1.73	0%	1.1	2.7
E-1		0.15	0%	0.2	0.4
E-2		0.13	48%	0.4	0.7
	DP1	0.68	9%	0.9	2.1
E-3		1.64	32%	3.3	6.8
E-4		0.14	79%	0.5	1.0
	DP2	3.66	17%	3.2	7.0
E-5		0.35	0%	0.4	0.9
E-6		0.70	0%	0.8	1.9

LEGEND

- PROPERTY LINE
- BASIN JURISDICTION BOUNDARY
- EXISTING DRAINAGE BASIN BOUNDARY
- PROPOSED DRAINAGE BASIN BOUNDARY
- DRAINAGE BASIN DESIGN POINT
- BASIN I.D.
- BASIN AREA (Acres)
- 5 YEAR DEVELOPED FLOW (CFS)
- 100 YEAR DEVELOPED FLOW (CFS)
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- EX. INTERMEDIATE CONTOUR
- EX. INDEX CONTOUR
- DIRECTION OF FLOW



PREPARED BY:



CLIENT:



DRAINAGE PLANS FOR:
WILLOW SPRINGS RANCH
BAPTIST ROAD & FOREST LAKES DRIVE
MONUMENT, COLORADO

ISSUE	DATE
INITIAL ISSUE	8-10-21
RESUBMITTAL	9-9-21

DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	20876-05-FLDR

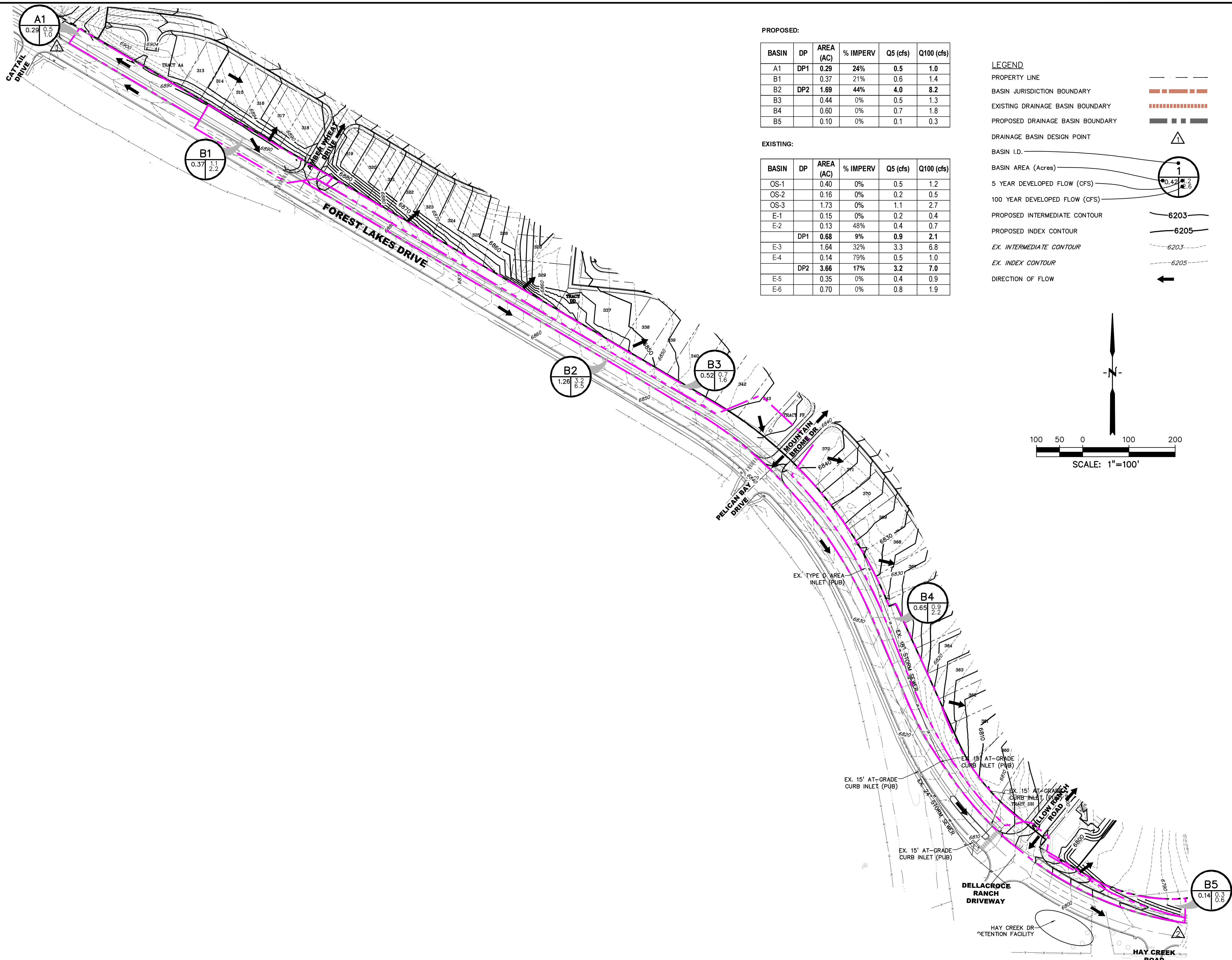
DRAWING SCALE:
HORIZONTAL: 1" = 100"
VERTICAL: N/A

EXISTING
DRAINAGE PLAN

PROJECT NO. 20876-05CSCV
DRAWING NO.

DRN1

SHEET: 1 OF 2



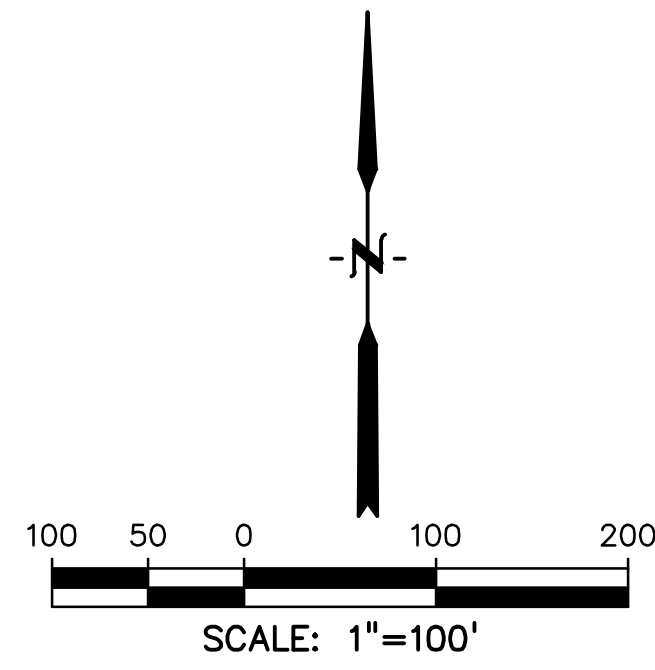
PROPOSED:

BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
A1	DP1	0.29	24%	0.5	1.0
B1		0.37	21%	0.6	1.4
B2	DP2	1.69	44%	4.0	8.2
B3		0.44	0%	0.5	1.3
B4		0.60	0%	0.7	1.8
B5		0.10	0%	0.1	0.3

EXISTING:

BASIN	DP	AREA (AC)	% IMPERV	Q5 (cfs)	Q100 (cfs)
OS-1		0.40	0%	0.5	1.2
OS-2		0.16	0%	0.2	0.5
OS-3		1.73	0%	1.1	2.7
E-1		0.15	0%	0.2	0.4
E-2		0.13	48%	0.4	0.7
	DP1	0.68	9%	0.9	2.1
E-3		1.64	32%	3.3	6.8
E-4		0.14	79%	0.5	1.0
	DP2	3.66	17%	3.2	7.0
E-5		0.35	0%	0.4	0.9
E-6		0.70	0%	0.8	1.9

- LEGEND**
- PROPERTY LINE
 - BASIN JURISDICTION BOUNDARY
 - EXISTING DRAINAGE BASIN BOUNDARY
 - PROPOSED DRAINAGE BASIN BOUNDARY
 - DRAINAGE BASIN DESIGN POINT
 - BASIN I.D.
 - BASIN AREA (Acres)
 - 5 YEAR DEVELOPED FLOW (CFS)
 - 100 YEAR DEVELOPED FLOW (CFS)
 - PROPOSED INTERMEDIATE CONTOUR
 - PROPOSED INDEX CONTOUR
 - EX. INTERMEDIATE CONTOUR
 - EX. INDEX CONTOUR
 - DIRECTION OF FLOW



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DRAINAGE PLANS FOR:
WILLOW SPRINGS RANCH
 BAPTIST ROAD & FOREST LAKES DRIVE
 MONUMENT, COLORADO

ISSUE	DATE
INITIAL ISSUE	8-10-21
RESUBMITTAL	9-9-21

DESIGNED BY: TDM
 DRAWN BY: KGV
 CHECKED BY: TDM
 FILE NAME: 20876-05-FLDR

DRAWING SCALE:
 HORIZONTAL: 1" = 100"
 VERTICAL: N/A

PROPOSED DRAINAGE PLAN

PROJECT NO. 20876-05CSCV
 DRAWING NO.

DRN2

SHEET: 2 OF 2