DRAINAGE LETTER
FOR
19580 FOUR WINDS WAY

FEBRUARY 2022

Prepared for:

THE MAYNARD COMPANY
1364 OLD CEDAR GROVE
MONUMENT, CO 80132

Prepared By:

CATAMOUNT ENGINEERING
321 W. Henrietta Ave, Suite A
Woodland Park, CO 80863
719-426-2124

PCD FILE NO's:
CDR225

DRAINAGE LETTER FOR 19580 FOUR WINDS WAY

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 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.

Certification Statement:
This report and plan for the preliminary and final drainage design for the 19584 FOUR WINDS WAY was prepared by me (or under my direct supervision) in accordance with the provisions of City of Colorado Springs/El Paso County Drainage Criteria Manual Volumes 1 and 2 Drainage Design and Technical Criteria for the owners thereof. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others.

COLORADO LICENSED
DAVID L. MIJARES
40510
PROFESSIONAL ENGINEER

David L. Mijares, Colorado PE #40510
For and on behalf of Catamount Engineering

4.28.22
Date

Developer's Statement:
I, the developer have read and will comply with all of the requirements specified in this drainage report and plan.

THE MAYNARD COMPANY hereby certifies that the drainage facilities for 19580 FOUR WINDS WAY shall be constructed according to the design presented in this report. I understand that El Paso County does not and will not assume liability for the drainage facilities designed and or certified by my engineer and that the El Paso County reviews drainage plans pursuant to Colorado Revised Statues, Title 30, Article 28; but cannot, on behalf of 19580 FOUR WINDS WAY, guarantee that final drainage design review will absolve THE MAYNARD GROUP and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

THE MAYNARD GROUP
Business Name

By: _____

Title: PRESIDENT

Address: 1364 OLD CEDAR GROVE.

MONUMENT, CO 80132

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

Jennifer Irvine, PE
County Engineer/ECM Administrator

Date

Conditions:

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DRAINAGE LETTER FOR 19580 FOUR WINDS WAY

PURPOSE

The purpose of this drainage report is to identify existing drainage patterns, quantify developed storm water runoff, and establish outfall scenarios from the proposed development of the single-family platted lot. Development of the lot required earthwork in excess of 500 CY and a drainage letter is required to accompany the grading plan.

GENERAL LOCATION AND DESCRIPTION

The subject 31,722 square feet consists of a platted residential lot zoned R-4 identified as Lot 168 Top O the Moor II subdivision. The lot is located within Section 1, Township 11 South, Range 67 West of the 6th principal meridian in El Paso County. The parcel is bounded on all sides by platted residential lots within the Top O the Moor II subdivision. Access to the parcel is from existing 20' access easement bordering this parcel and the easterly Lot 167 to Four Winds Way (Public ROW). The parcel has been previously graded to allow for homesite development.

The parcel is located within the Dirty Woman Creek drainage. The parcel sheet flows south onto adjacent residential lots at slopes between 7% and 33%.

Existing soils on the site consist of Kettle gravelly loam, hydrologic soil group B (100.0%) as determined by the Natural Resources Conservation Service Web Soil Survey. The site is sparsely vegetated with native grasses. Moderate shrub and tree cover are evident. A soils and foundation investigation and Geologic Hazards Evaluation was performed by CTL Thompson, project number CS19360-120 and is dated March 16, 2021.

No portion of the site lies within an F.E.M.A. designated floodplain per FIRM 08041C0277 G, effective December 07, 2018. A firmette exhibiting the parcel has been included in the appendix of this report.

EXISTING DRAINAGE CONDITIONS

An original subdivision drainage report 'Top O' The Moor – Woodmoor Corporation' (PCD File# SP67005) was previously completed by R. Keith, Hook & Associates and dated April 27, 1967. The parcel was developed as a flag lot with stem access to Four Winds Way; it sits higher than existing residences to the South. Runoff from development upstream and north of the parcel drain to towards Four Winds Way and will cross the proposed driveway flag in a proposed culvert. A natural saddle and the subsequent drainage are located on the gravel access road, near to Four Winds Way ROW (with drainage running south and parallel to Four Winds Way).

It is understood that grading operations have taken place prior to the preliminary topography capture and engineering. Required existing offsite drainage analysis was completed utilizing

county LIDAR and USGS quad map. The exhibit depicts that the primary drainage paths across the project site were unchanged by grading operations and no significant offsite runoff enters the parcel. The preliminary grading operations do not appear to have significantly affected the stormwater drainage pathways.

Basin OS-1 (0.15 Acres, Q_5=0.1 cfs, Q_{100}=0.4 cfs) consists of portions of the northern adjacent common area lot (parcel #7101302073) that sheet flow southwest into Basin E1 and is conveyed in natural drainage offsite to the site at DP E1. Basin OS-1 is combined with onsite basin EX1 (0.18 Acres, Q_5=0.1 cfs, Q_{100}=0.5 cfs) at DP E1(Q_5=0.1 cfs, Q_{100}=0.9 cfs) and is conveyed offsite in sheet flows, to the south into adjacent residential parcels.

Basin OS-2 (0.25 Acres, Q_5=0.2 cfs, Q_{100}=0.8 cfs) consists of a portion of the northern adjacent common area lot (parcel #7101302073), another portion of the access easement and the western limits of the neighboring lot 167. Basin OS-2 has been previously graded and contains a small portion of gravel driveway access.

Basin OS-3 (0.10 Acres, Q_5=0.2 cfs, Q_{100}=0.5 cfs) consists of flag pole lot access north of parcel 167 that sheet flow east and south along the Four Winds Way drainage. Basin OS-3 contains a gravel roadway access to the adjacent common space north of the subject parcel.

Basin OS-4 (0.02 Acres, Q_5=0.0 cfs, Q_{100}=0.1 cfs) consists of a small portion of the northern adjacent common area lot (parcel #7101302073) that sheet flows south and slightly east into basin EX-2 and subsequently to Design Point 2. Basin OS-4 is combined with onsite basin EX2 (0.53 Acres, Q_5=0.2 cfs, Q_{100}=1.5 cfs) at DP E2(Q_5=0.4 cfs, Q_{100}=2.4 cfs) and is conveyed offsite in sheet flows, to the south into adjacent residential parcels.

Basin OS-5 (0.42 Acres, Q_5=0.2 cfs, Q_{100}=1.3 cfs) consists of portions of the northern adjacent common area lot (parcel #7101302073) and Lot 158 which sheet flow east in an existing swale and south to Design Point E3 and then into the well-defined channel along the Four Winds Way ROW.

Basin OS-6 (2.89 Acres, Q_5=1.9 cfs, Q_{100}=7.7 cfs) consists of portions of the northern adjacent common area lot (parcel #7101302073) and multiple residential lots that collect and flow east in existing swales and then south in existing swales to Design Point E3 and into the well-defined channel along the Four Winds Way ROW. Basin OS-6 is combined with basin OS-5 (0.42 Acres, Q_5=0.2 cfs, Q_{100}=1.3 cfs) at DP E3(Q_5=2.1 cfs, Q_{100}=8.7 cfs) and into the well-defined channel along the Four Winds Way ROW.

Basin EX1 (0.18 Acres, Q_5=0.1 cfs, Q_{100}=0.5 cfs) consists of that portion of Lot 1 that sheet flows southwest to Design Point E1 where it combines with flow from offsite basin OS-1. Combined flows from DP E1 of Q_5=0.1 cfs and Q_{100}=0.9 cfs is conveyed south into adjacent residential parcels.

Basin EX2 (0.53 Acres, Q_5=0.2 cfs, Q_{100}=1.6 cfs) consists of that portion of Lot 1 that sheet flows south to Design Point E2 where it combines with flow from offsite basins OS-2 and OS-4. Combined flows from DP E2 of Q_5=0.4 cfs and Q_{100}=2.4 cfs is conveyed south into adjacent residential parcels.

DEVELOPED DRAINAGE BASINS

The proposed lot grading has been designed to accommodate house construction. The developed drainage basin design reflects increases in impervious area based on house location and paved driveway construction. Offsite Basins OS1 and OS2 have been revised to reflect increase in impervious area for construction of paved driveway rather than existing gravel drive.

Basin OS-1 (0.15 Acres, Q_5=0.1 cfs, Q_{100}=0.4 cfs) consists of that portion of the northern adjacent common area lot (parcel #7101302073) sheet flow southwest and across the parcel to adjacent southwesterly lot 174. The basin was modeled as containing an additional 0.002 acres of paved driveway. No increase in runoff from historic analysis was exhibited in proposed Basin OS-1. Basin OS-1 is conveyed as sheetflow to proposed design point 1.

Design Point 1 represents combined flows from basins OS-1 and A1 ; are Q_5=0.1 cfs and Q_{100}=0.9 and are equal to historic flows at DP-E` of Q_5=0.1 cfs, Q_{100}=0.9 cfs.

Typo

Basin OS-2 (0.25 Acres, Q_5=0.2 cfs, Q_{100}=0.8 cfs) consists of a portion of the northern adjacent common area lot (parcel #7101302073), another portion of the access easement and the western limits of the neighboring lot 167. Basin OS-2 was modeled as containing 0.02 acres of paved driveway replacing the existing gravel driveway. No increase in runoff from historic analysis is proposed in Basin OS-2.

Basin OS-A (0.10 Acres, Q_5=0.3 cfs, Q_{100}=0.6 cfs) consists of flag pole lot access north of parcel 167 that sheet flow east and south along the Four Winds Way drainage. Basin OS-A was modeled as containing 0.06 acres of paved driveway replacing the existing gravel driveway. Basin OS-A exhibits an increase in flow of 0.1 cfs in the minor storm event and 0.1 cfs in the major storm event over the previously named Basin OS-3.

Basin OS-B (0.02 Acres, Q_5=0.1 cfs, Q_{100}=0.1 cfs) consists of a small portion of the northern adjacent common area lot (parcel #7101302073) that sheet flows south and slightly east into basin EX-2 and subsequently to Design Point 2. Basin OS-B was modeled as containing 0.01 acres of paved driveway replacing the existing gravel driveway. Basin OS-B exhibits an increase in flow of 0.1 cfs in the minor storm event and 0.0 cfs in the major storm event over the previously named Basin OS-4.

Basin OS-5 (0.42 Acres, Q_5=0.2 cfs, Q_{100}=1.3 cfs) consists of portions of the northern adjacent common area lot (parcel #7101302073) and Lot 158 which sheet flow east and south to a proposed 18" HDPE culvert and protected outfall at Design Point 3 and then into the well-defined channel along the Four Winds Way ROW. No increase in runoff from historic analysis is proposed in Basin OS-5. Culvert calculations for Design Point 3 are provided in the appendix.

Basin OS-6 (2.89 Acres, Q_5=1.9 cfs, Q_{100}=7.7 cfs) consists of portions of the northern adjacent common area lot (parcel #7101302073) and multiple residential lots that collect and flow south to a proposed 18" culvert and protected outfall at Design Point 3 and into the well-defined channel along the Four Winds Way ROW. No increase in runoff from historic analysis is proposed in Basin OS-6.

Design Point 3 represents combined flows from basins OS-5 and OS-6; are Q_5=2.1 cfs and Q_{100}=8.7 and are equal to historic flows at DP-E3 of Q_5=2.1 cfs, Q_{100}=8.7 cfs.

Basin A1 (0.18 Acres, Q_5=0.1 cfs, Q_{100}=0.5 cfs) consists of that portion of Lot 1 that sheet flows southwest to adjacent lot 174. Disturbed areas within Basin A1 will be revegetated with erosion control cover. Design Point 1 represents combined flows from basins OS-1 and A1. Runoff from Design Point 1 of Q_5=0.1 cfs and Q_{100}=0.9 and are equal to historic flows at DP-E` of Q_5=0.1 cfs, Q_{100}=0.9 cfs.

Typo

Basin A2 (0.53 Acres, Q_5=0.5 cfs, Q_{100}=1.9 cfs) consists of that portion of Lot 1 to be developed with residential construction that flows south to Design Point 2. The basin was modeled with inclusion of 0.02 acres of proposed paved driveway and 0.06 acres of proposed building footprint. Basin A2 exhibits an increase in flow of 0.3 cfs in the minor storm event and 0.4 cfs in the major storm event over historic basin EX2.

Design Point 2 represents combined flows from basins OS-2, OS-B, and A2. Combined flows at Design Point 2 of Q_5=0.7 cfs and Q_{100}=2.8 represent an increase of 0.3 cfs in the minor event and 0.4 cfs in the major event, when compared to DP-E2 of Q_5=0.4 cfs, Q_{100}=2.4 cfs. Combined flows are directed to existing historic swale at Design Point E2.

The rational methodology was utilized in analyzing on-site basins for development of on-site improvements. The minor increase in impervious area due to driveway and homesite development within the 31,772 square foot lot would not substantially impact historic drainage patterns. Detention is not typically pursued in small single family existing lot home construction.

County LIDAR topography (2011) was utilized to show historic contours of the subject site. County LIDAR and limited USGS quadrangle mapping was utilized in development of offsite basins.

See Appendix for Calculations.

Are these flow increases acceptable? Does the existing swale have capacity for it? Discuss. Acceptable to state something like "increases are considered negligable based on engineering judgement."

WATER QUALITY/4-STEP PROCESS

The development addresses Low Impact Development strategies primarily through the utilization of large pervious areas and utilization of landscape area receiving runoff generated within impervious roadways and residential roofs.

Step 1-Employ Runoff Reduction Practices
Impervious areas generated within the development will flow across pervious disconnected areas prior to offsite discharge.

Step2-Stabilize Drainageway
The unnamed tributaries of Dirty Woman Creek receiving parcel runoff are not directly adjacent to the parcel and reduced runoff due to substantial conveyance across both onsite and offsite

pervious area will mitigate minor increases in impervious area with single homesite development and not affect the drainageways.

Step3-Provide Water Quality Capture Volume
Permanent water quality facility is not proposed for development of single existing platted homesite. The impervious area of proposed paved driveways and residence are identified as disconnected impervious areas draining to and conveyed across receiving impervious areas.

Step4-Consider Need for Industrial and Commercial BMP's
A Grading, Erosion Control, and Stormwater Quality Plan and narrative have been submitted concurrently for the development and will be subject to county approval prior to any soil disturbance. The erosion control plan included specific source control BMP's as well as defined overall site management practices for the construction period. No industrial or Commercial density development is proposed.

COST ESTIMATE

No drainage improvements are proposed with development of 5-acre residential lots.

DRAINAGE FEE CALCULATION

No platting is proposed with development of single-family residence on an existing platted lot.

DRAINAGE METHODOLOGY

This drainage report was prepared in accordance to the criteria established in the El Paso County Drainage Criteria Manual Volumes 1 and 2, as revised May 2014.

The rational method for drainage basin study areas of less than 100 acres was utilized in the on-site analysis. For the Rational Method, flows were calculated for the 5 and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report.

SUMMARY

Development of a homesite on the existing platted lot (168, Top O the Moor II) consists of a single residence and driveway improvements with minor increases in impervious areas consistent with surrounding development. The development will not adversely affect downstream properties or facilities.

REFERENCES:

County of El Paso Drainage Criteria Manual Volumes 1 and 2, revised May 2014

Flood Insurance rate map 08041C00277 G, December 07. 2018

Natural Resources Conservation Service Web Soil Survey

APPENDIX

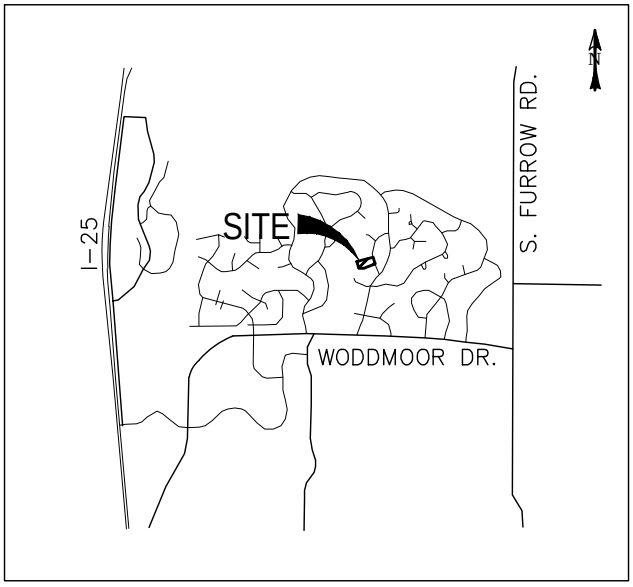
EXISTING HYDROLOGY

PROPOSED HYDROLOGY

HYDRAULIC CALCULATIONS

DRAINAGE MAPS

APPENDIX



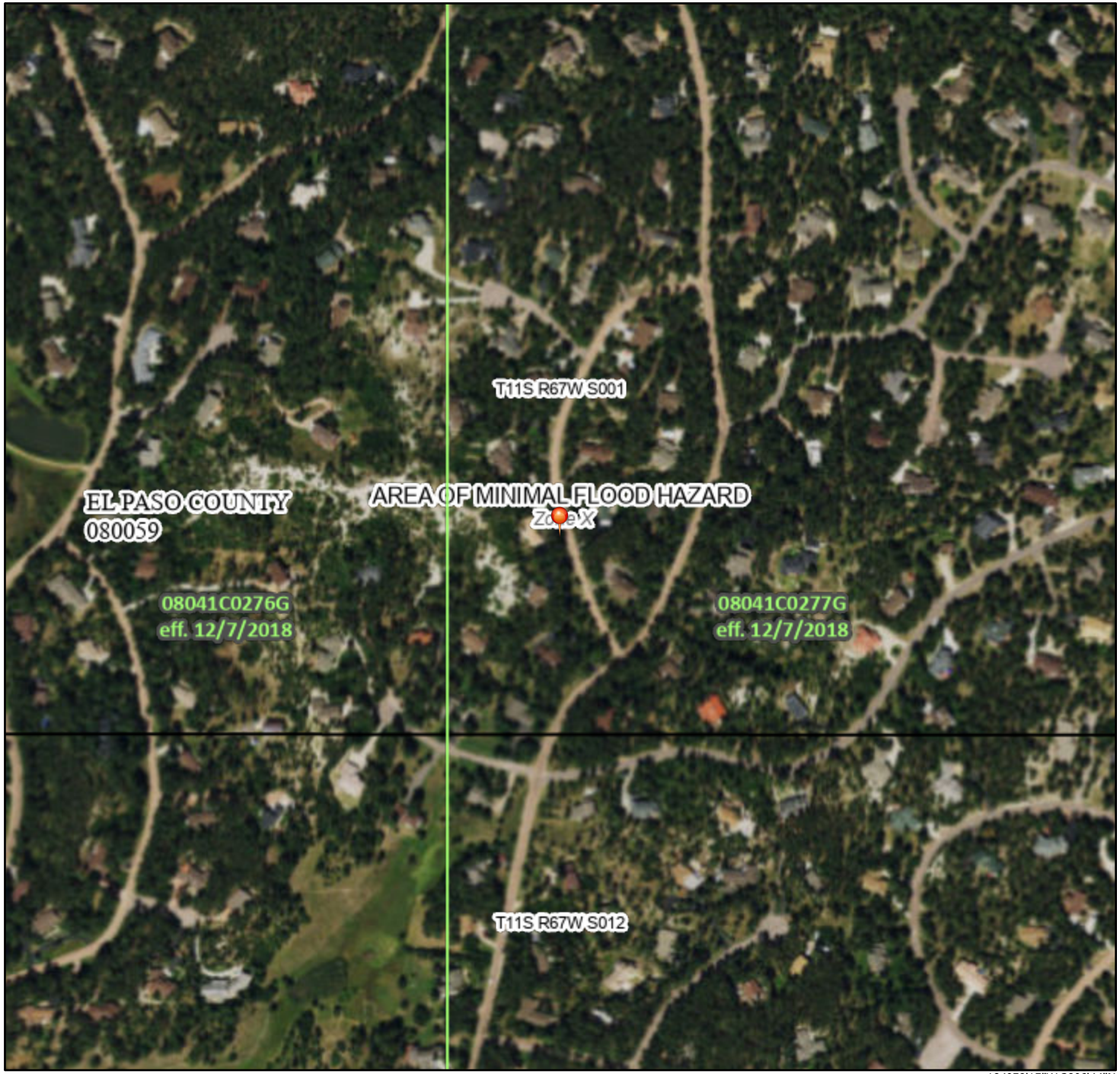
VICINITY MAP
SCALE: N.T.S.

CATAMOUNT ENGINEERING PO BOX 692 DIVIDE, CO 80814 (719) 426-2124	19580 FOUR WINDS WAY	SCALE: N/A	DATE: 11/03/20
	VICINITY MAP	JOB NO.: **21-337**	SHEET: 1 OF 1

National Flood Hazard Layer FIRMette

FEMA

104°50'52"W 39°7'12"N



104°50'15"W 39°6'44"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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
- 17.5 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

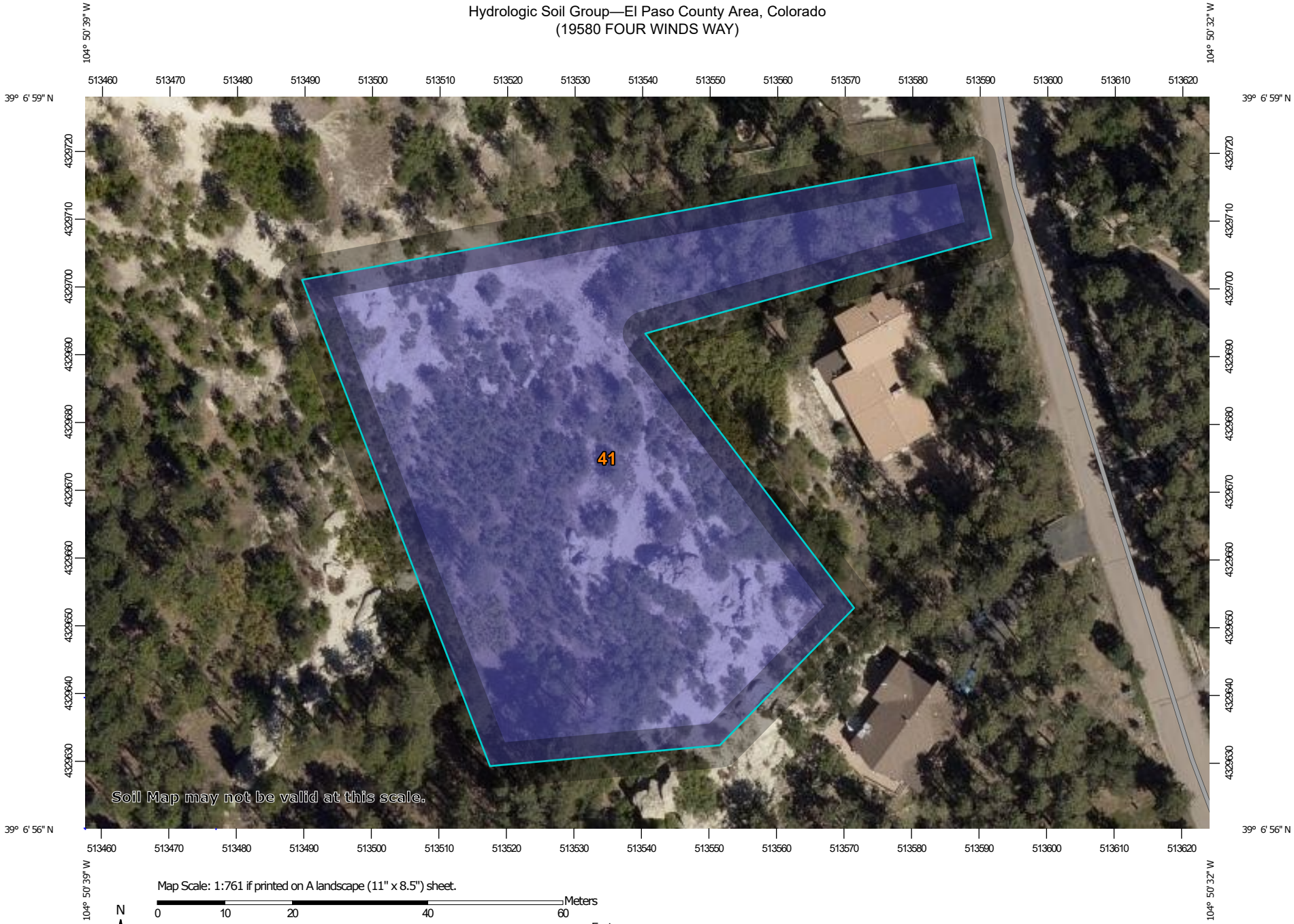
N

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 2/28/2022 at 11:45 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.



Map Scale: 1:761 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	1.2	100.0%
Totals for Area of Interest			**1.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EXISTING HYDROLOGY

EXISTING BASIN RATIONAL CALCULATIONS

												CONVEYANCE TC						TT	INTENSITY						TOTAL FLOWS					
BASIN	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
OS-1	0.15		**0.09**				**0.36**	77	11	7.2	125	20	10	16.0%	4.0	0.5	7.8		4.5				7.6		**0.1**				**0.4**
undeveloped	0.15		0.09				0.36			*DP-E1*	*161*	*22*	10	13.7%	3.7	0.7	8.5												
OS-2	0.25		**0.13**				**0.39**	65	16	5.6	105	20	10	19.0%	4.4	0.4	6.0		4.9				8.2		**0.2**				**0.8**
undeveloped	0.23		0.09				0.36			*DP-E2*	*141*	*22*	10	15.6%	4.0	0.6	6.6												
gravel	0.02		0.59				0.70																						
OS-3	0.10		**0.39**				**0.56**	35	6	4.6	160	22	10	13.8%	3.7	0.7	5.3		5.1				8.5		**0.2**				**0.5**
undeveloped	0.04		0.09				0.36																						
gravel	0.06		0.59				0.70																						
OS-4	0.02		**0.09**				**0.36**	44	10	4.7	54	14	7	25.9%	3.6	0.3	5.0		5.2				8.7		**0.0**				**0.1**
undeveloped	0.02		0.09				0.36			*DP-E2*																			
OS-5	0.42		**0.10**				**0.35**	22	6	3.1	200	42	7	21.0%	3.2	1.0	5.0		5.2				8.7		**0.2**				**1.3**
undeveloped	0.39		0.09				0.36			*DP-E1*							*min*												
roof	0.01		0.73				0.81																						
OS-6	2.89		**0.18**				**0.42**	191	23	12.1	202	32	10	15.8%	4.0	0.8	12.9		3.7				6.3		**1.9**				**7.7**
undeveloped	2.53		0.09				0.36			*DP-E2*																			
drives and walks	0.17		0.90				0.96																						
roof	0.19		0.73				0.81																						
EX1	0.18		**0.09**				**0.36**	75	14	6.5	108	18	7	16.7%	2.9	0.6	7.2		4.6				7.8		**0.1**				**0.5**
undeveloped	0.18		0.09				0.36			*DP-E1*																			
EX-2	0.53		**0.09**				**0.36**	59	14	5.4	183	28	7	15.3%	2.7	1.1	6.5		4.8				8.0		**0.2**				**1.5**
undeveloped	0.53		0.09				0.36			*DP-E2*																			

Calculated by: DLM/SLP

Date: 6/22/2022

		WEIGHTED						TT	INTENSITY						TOTAL FLOWS					
DESIGN POINT	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
E1	**0.33**		**0.09**				**0.36**	7.8		4.5				7.6		**0.1**				**0.9**
BASIN EX-1	0.18		0.09				0.36	7.2												
BASIN OS-1	0.15		0.09				0.36	7.8												
E2	**0.80**		**0.10**				**0.37**	6.6		4.8				8.0		**0.4**				**2.4**
BASIN EX-2	0.53		0.09				0.36	6.5												
BASIN OS-2	0.25		0.13				0.39	6.6												
BASIN OS-4	0.02		0.09				0.36	5.0												
E3	**3.31**		**0.17**				**0.42**	12.9		3.7				6.3		**2.1**				**8.7**
BASIN OS-5	0.42		0.10				0.35	5.0												
BASIN OS-6	2.89		0.18				0.42	12.9												

Calculated by: DLM

Date: 4/2/2018

PROPOSED HYDROLOGY

PROPOSED BASIN RATIONAL CALCULATIONS

											CONVEYANCE TC						TT	INTENSITY						TOTAL FLOWS					
BASIN	**AREA TOTAL (Acres)**	C_2	C_5	C_{10}	C_{25}	C_{50}	C_{100}	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	C_V	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	I_2 **(in/hr)**	I_5 **(in/hr)**	I_{10} **(in/hr)**	I_{25} **(in/hr)**	I_{50} **(in/hr)**	I_{100} **(in/hr)**	Q_2 **(c.f.s.)**	Q_5 **(c.f.s.)**	Q_{10} **(c.f.s.)**	Q_{25} **(c.f.s.)**	Q_{50} **(c.f.s.)**	Q_{100} **(c.f.s.)**
OS-1	0.15		**0.10**				**0.37**	77	11	7.2	125	20	10	16.0%	4.0	0.5	7.8		4.4				7.6		**0.1**				**0.4**
undeveloped	0.15		0.09				0.36			*DP-E1*	*161*	*22*	10	13.7%	3.7	0.7	8.5												
paved	0.002		0.90				0.96																						
OS-2	0.25		**0.15**				**0.41**	59	14	5.4	202	32	20	15.8%	8.0	0.4	5.8		4.8				8.3		**0.2**				**0.8**
undeveloped	0.23		0.09				0.36			*DP-E2*	*141*	*22*	10	15.6%	4.0	0.6	6.4												
paved	0.02		0.90				0.96																						
OS-A	0.10		**0.58**				**0.72**	35	6	4.6	160	22	20	13.8%	7.4	0.4	5.0		5.2				8.7		**0.3**				**0.6**
undeveloped	0.04		0.09				0.36																						
paved	0.06		0.90				0.96																						
OS-B	0.02		**0.50**				**0.66**	44	10	4.7	54	14	7	25.9%	3.6	0.3	5.0		5.2				8.7		**0.1**				**0.1**
undeveloped	0.01		0.09				0.36																						
paved	0.01		0.90				0.96																						
OS-5	0.42		**0.10**				**0.35**	22	6	3.1	200	42	7	21.0%	3.2	1.0	5.0		5.2				8.7		**0.2**				**1.3**
undeveloped	0.39		0.09				0.36			*DP-E1*							*min*												
roof	0.01		0.73				0.81																						
OS-6	2.89		**0.18**				**0.42**	191	23	12.1	202	32	10	15.8%	4.0	0.8	12.9		3.7				6.3		**1.9**				**7.7**
undeveloped	2.53		0.09				0.36			*DP-E2*																			
drives and walks	0.17		0.90				0.96																						
roof	0.19		0.73				0.81																						
A1	0.18		**0.08**				**0.35**	75	14	6.5	108	18	7	16.7%	2.9	0.6	7.2		4.6				7.8		**0.1**				**0.5**
landscape	0.18		0.08				0.35																						
A2	0.53		**0.19**				**0.43**	41	7	5.0	215	35	10	16.3%	4.0	0.9	5.9		4.9				8.3		**0.5**				**1.9**
landscape	0.45		0.08				0.35																						
paved	0.02		0.90				0.96																						
roof	0.06		0.73				0.81																						

Calculated by: DLM

Date: 2/28/2022

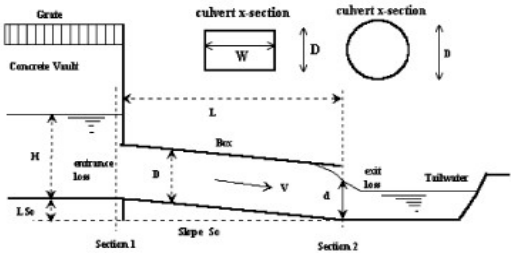
		WEIGHTED						TT	INTENSITY						TOTAL FLOWS					
DESIGN POINT	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
1	**0.33**		**0.09**				**0.36**	7.8		4.5				7.6		**0.1**				**0.9**
BASIN A1	0.18		0.08				0.35	5.0												
BASIN OS-1	0.15		0.10				0.37	7.8												
2	**0.80**		**0.18**				**0.43**	5.9		4.9				8.3		**0.7**				**2.8**
BASIN A2	0.53		0.19				0.43	5.9												
BASIN OS-2	0.25		0.15				0.41	5.8												
BASIN OS-4	0.02		0.50				0.66	5.0												
3	**3.31**		**0.17**				**0.42**	12.9		3.7				6.3		**2.1**				**8.7**
BASIN OS-5	0.42		0.10				0.35	*5.0*												
BASIN OS-6	2.89		0.18				0.42	*12.9*												

Calculated by: DLM

Date: 6/23/2022

CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: 19584 FOUR WINDS WAY
Basin ID: DP-3
Status:



Design Information (Input):

Circular Culvert: Barrel Diameter in Inches — D = 18 inches
Inlet Edge Type (choose from pull-down list) — Grooved End Projection

OR:

Box Culvert: Barrel Height (Rise) in Feet — Height (Rise) = ft.
Barrel Width (Span) in Feet — Width (Span) = ft.
Inlet Edge Type (choose from pull-down list) — Square Edge w/ 30-78 deg. Flared Wingwall

Number of Barrels	No =	1	
Inlet Elevation at Culvert Invert	Inlet Elev =	7402.1	ft. elev.
Outlet Elevation at Culvert Invert **OR** Slope of Culvert (ft v./ft h.)	Outlet Elev =	7400.2	ft. elev.
Culvert Length in Feet	L =	32	ft.
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	K_b =	0	
Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.49
Sum of All Loss Coefficients	K_s =	1.69
Orifice Inlet Condition Coefficient	C_d =	0.96
Minimum Energy Condition Coefficient	KE_{low} =	-0.1741

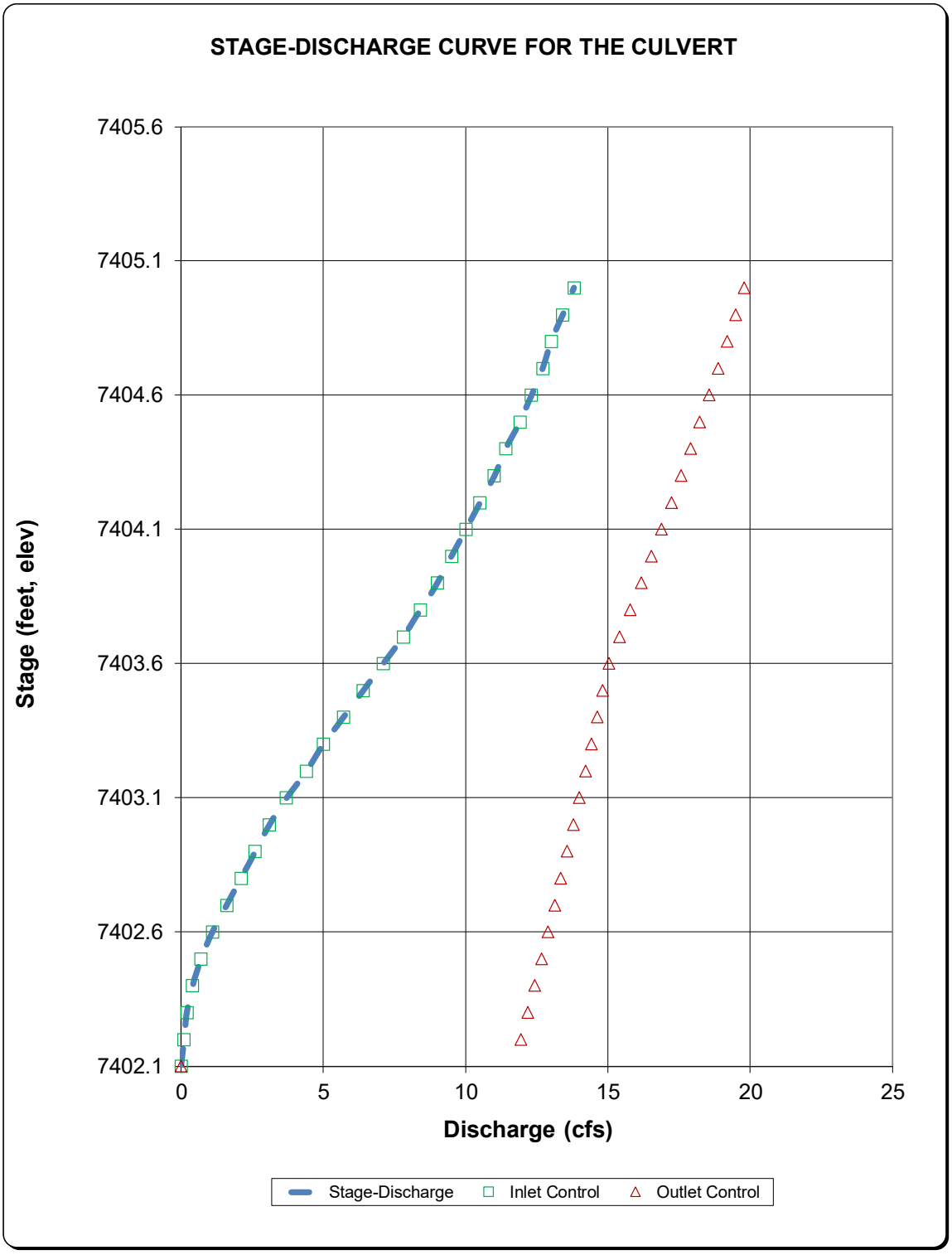
Calculations of Culvert Capacity (output):

Water Surface Elevation (ft., linked)	Tailwater Surface Elevation ft	Culvert Inlet-Control Flowrate cfs	Culvert Outlet-Control Flowrate cfs	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used:	Flow Control Used
7402.10		0.00	0.00	**0.00**	No Flow (WS < inlet)	N/A
7402.20		0.10	11.94	**0.10**	Min. Energy. Eqn.	INLET
7402.30		0.20	12.19	**0.20**	Min. Energy. Eqn.	INLET
7402.40		0.40	12.44	**0.40**	Min. Energy. Eqn.	INLET
7402.50		0.70	12.67	**0.70**	Min. Energy. Eqn.	INLET
7402.60		1.10	12.89	**1.10**	Min. Energy. Eqn.	INLET
7402.70		1.60	13.13	**1.60**	Min. Energy. Eqn.	INLET
7402.80		2.10	13.35	**2.10**	Min. Energy. Eqn.	INLET
7402.90		2.60	13.57	**2.60**	Regression Eqn.	INLET
7403.00		3.10	13.80	**3.10**	Regression Eqn.	INLET
7403.10		3.70	14.00	**3.70**	Regression Eqn.	INLET
7403.20		4.40	14.21	**4.40**	Regression Eqn.	INLET
7403.30		5.00	14.42	**5.00**	Regression Eqn.	INLET
7403.40		5.70	14.63	**5.70**	Regression Eqn.	INLET
7403.50		6.40	14.82	**6.40**	Regression Eqn.	INLET
7403.60		7.10	15.03	**7.10**	Regression Eqn.	INLET
7403.70		7.80	15.42	**7.80**	Regression Eqn.	INLET
7403.80		8.40	15.79	**8.40**	Regression Eqn.	INLET
7403.90		9.00	16.17	**9.00**	Regression Eqn.	INLET
7404.00		9.50	16.53	**9.50**	Regression Eqn.	INLET
7404.10		10.00	16.89	**10.00**	Regression Eqn.	INLET
7404.20		10.50	17.23	**10.50**	Regression Eqn.	INLET
7404.30		11.00	17.58	**11.00**	Regression Eqn.	INLET
7404.40		11.40	17.91	**11.40**	Regression Eqn.	INLET
7404.50		11.90	18.23	**11.90**	Regression Eqn.	INLET
7404.60		12.30	18.56	**12.30**	Regression Eqn.	INLET
7404.70		12.70	18.88	**12.70**	Regression Eqn.	INLET
7404.80		13.00	19.19	**13.00**	Regression Eqn.	INLET
7404.90		13.40	19.49	**13.40**	Regression Eqn.	INLET
7405.00		13.80	19.80	**13.80**	Regression Eqn.	INLET

Processing Time: 03.59 Seconds

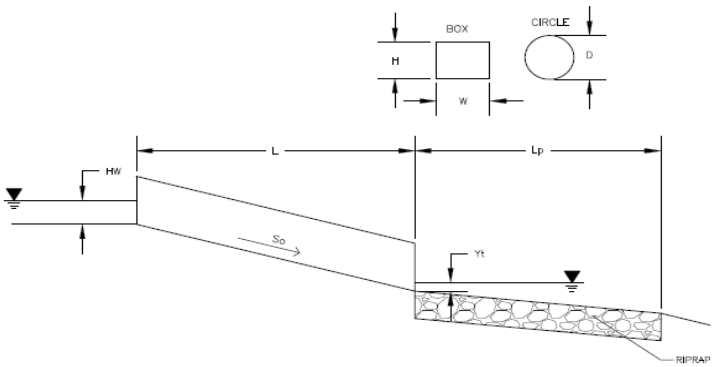
CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: 19584 FOUR WINDS WAY
Basin ID: DP-3



Determination of Culvert Headwater and Outlet Protection

Project: 1584 FOUR WINDS WAY
Basin ID: DP-3



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

Supercritical Flow! Using Da to calculate protection type.

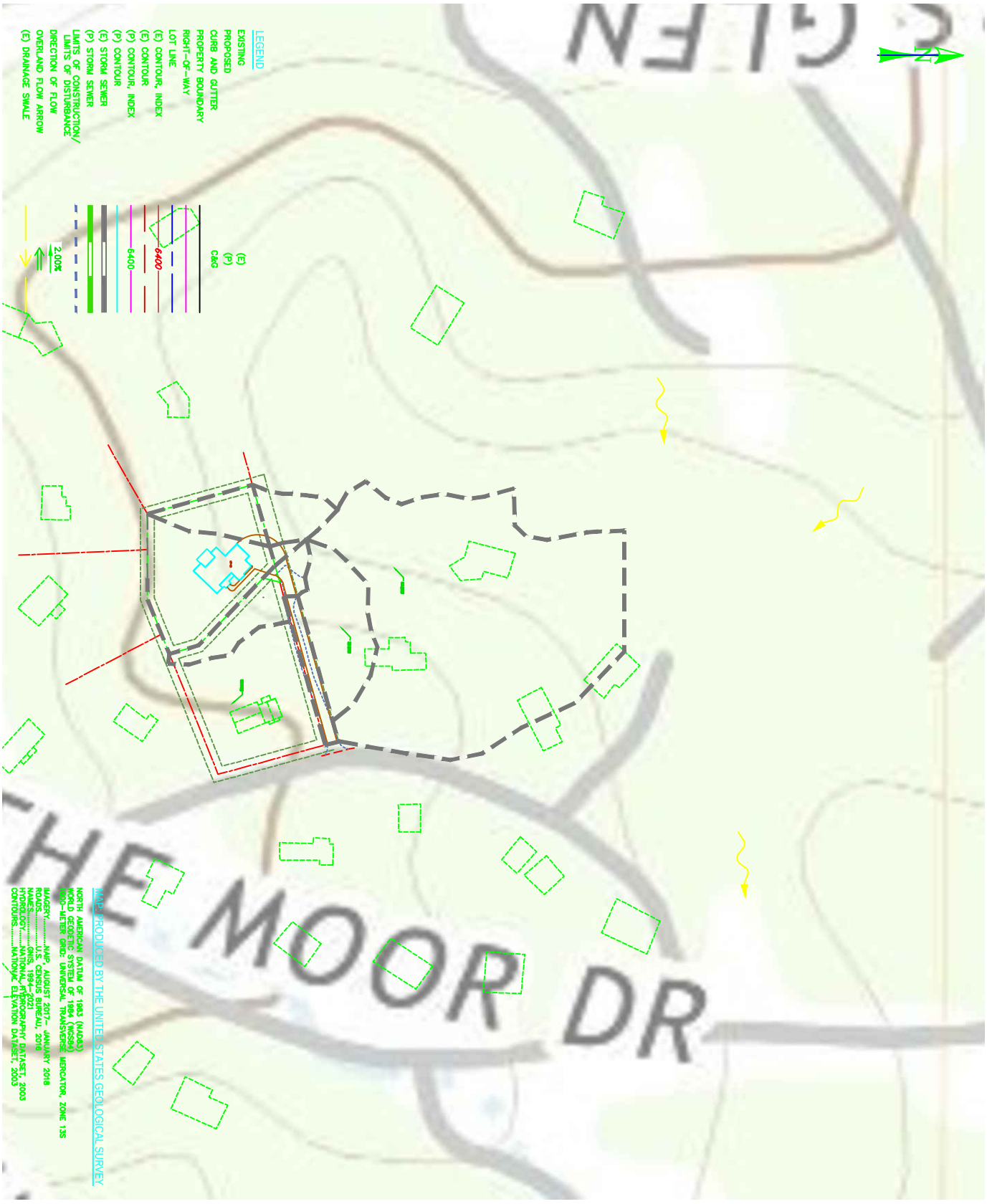
Design Information (Input):

Design Discharge	Q =	8.7	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	18	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 =	1	
Inlet Elevation	Elev IN =	7402.1	ft
Outlet Elevation **OR** Slope	Elev OUT =	7400.2	ft
Culvert Length	L =	32	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 =		ft
Max Allowable Channel Velocity	V =	5	ft/s

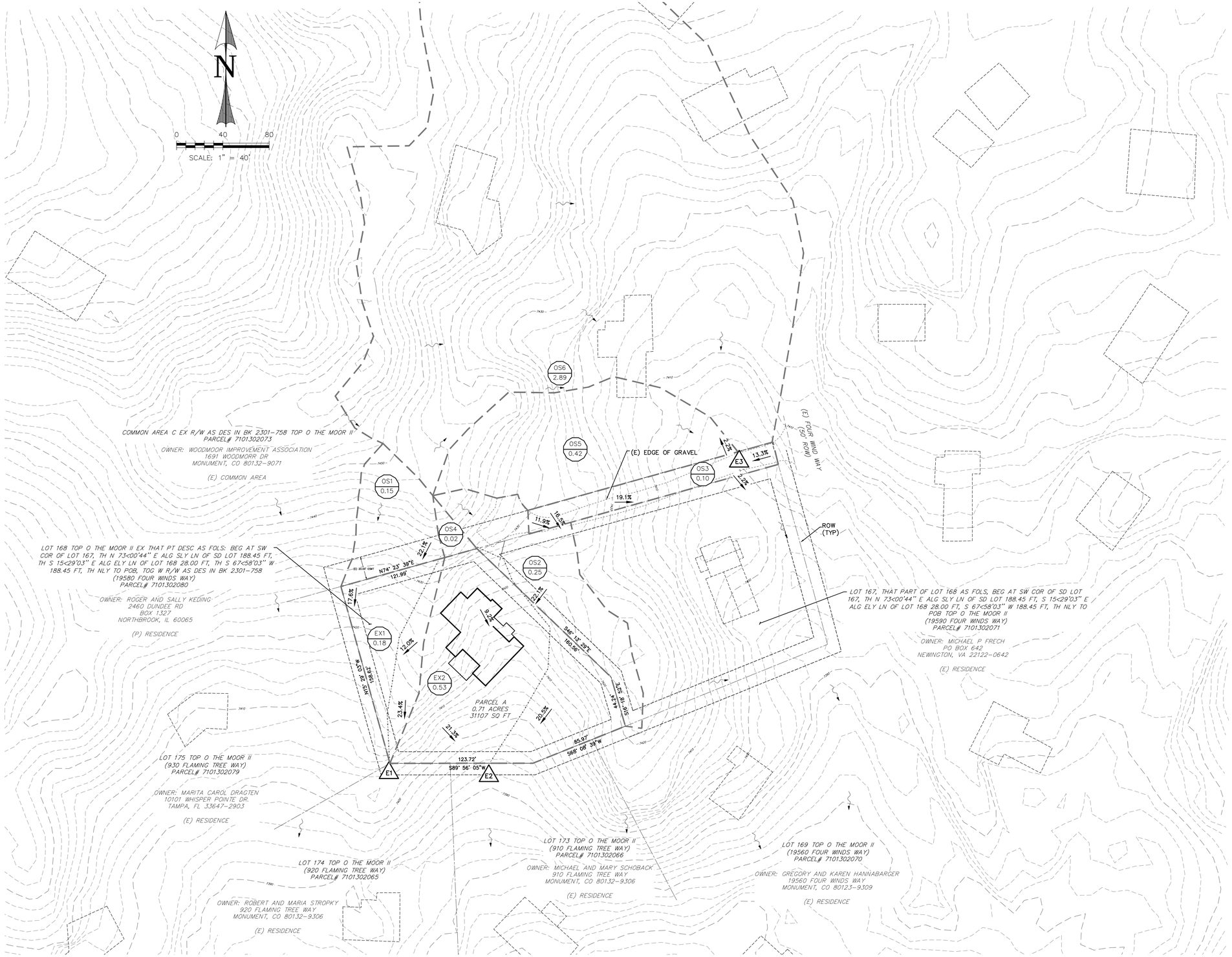
Required Protection (Output):

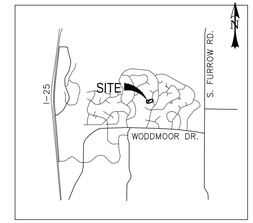
Tailwater Surface Height	Y_t =	0.60	ft
Flow Area at Max Channel Velocity	A_t =	1.74	ft^2
Culvert Cross Sectional Area Available	A =	1.77	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.49	
Sum of All Losses Coefficients	k_s =	1.69	ft
Culvert Normal Depth	Y_n =	0.58	ft
Culvert Critical Depth	Y_c =	1.14	ft
Tailwater Depth for Design	d =	1.32	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	1.04	ft
Expansion Factor	1/(2*tan(Θ)) =	6.41	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	3.16	$ft^{0.5}/s$
Froude Number	Fr =	3.74	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.58	
Inlet Control Headwater	HW_I =	1.76	ft
Outlet Control Headwater	HW_O =	0.06	
Design Headwater Elevation	**HW =**	**7,403.86**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.17**	
Minimum Theoretical Riprap Size	d_{50} =	4	in
Nominal Riprap Size	d_{50} =	6	in
UDFCD Riprap Type	**Type =**	**VL**	
Length of Protection	**L_p =**	**9**	**ft**
Width of Protection	**T =**	**3**	**ft**

DRAINAGE MAPS



CATAMOUNT ENGINEERING 321 W. HENRIETTA AVE PO BOX 221 WOODLAND PARK, CO 80866 (719)426-2124	19584 FOUR WINDS WAY MONUMENT, CO 80132	SCALE: 1"=200'	DATE: 06/22/22
	TOPOGRAPHY/ USGS EXHIBIT	JOB NO.: 21-337	SHEET: 1 OF 1





VICINITY MAP
SCALE: N.T.S.

EXISTING DRAINAGE BASINS			
BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
OS-1	0.15	0.1	0.4
OS-2	0.25	0.2	0.8
OS-3	0.10	0.2	0.5
OS-4	0.02	0.0	0.1
OS-5	0.42	0.2	1.3
OS-6	2.89	1.9	7.7
EX1	0.18	0.1	0.5
EX2	0.53	0.2	1.5

EXISTING DESIGN POINTS						
DESIGN POINT	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
E1		0.1				0.9
E2		0.4				2.4
E3		2.1				8.7

LEGEND

EXISTING	(E)
PROPOSED	(P)
BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
EASEMENT	
(E) CONTOUR, INDEX	6820
(E) CONTOUR	
(P) CONTOUR, INDEX	6820
(P) CONTOUR	
DRAINAGE PATH	
BASIN IDENTIFIER / BASIN AREA [AC]	A / 0.36
DESIGN POINT IDENTIFIERS	3
DRAINAGE BASIN BOUNDARY	
SURFACE SHEET FLOW DIRECTION	
SLOPE/DIRECTION	1.00%

SURVEY: PERFORMED BY DAVID E. ARCHER & ASSOCIATES, INC. AND DATED 12/13/21.

BASIS OF BEARING:
BEARINGS ARE PLATTED AND BASED ON THE CONSIDERATION THAT THE WEST LINE OF LOT 168 BEARS N15°29'03"W AS SHOWN HERON BETWEEN THE IDENTIFIED MONUMENTS.

REV.	DESCRIPTION	DATE

811 Know what's below. Call 72 hours before you dig.
For more details visit: www.call811.com

PREPARED FOR:
THE MAYNARD COMPANY
1364 OLD CEDAR GROVE
MONUMENT, CO 80132

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE, PO BOX 221, WOODLAND PARK, CO 80866, (719)426-2124

19584 FOUR WINDS WAY
MONUMENT, CO 80132

EXISTING DRAINAGE PLAN

DESIGNED BY: DLM	DRAWN BY: SLP
SCALE: 1"=40'	DATE: 04/28/22
JOB NUMBER: 21-337	SHEET: 1 OF 2

W:\Catamount Projects\Projects\21-337 19584 Four Winds Way\DWG\DRAINAGE\21-337-19584 EXISTING - DRB.dgn - Thursday, June 23, 2022 3:23:27 PM - Scott

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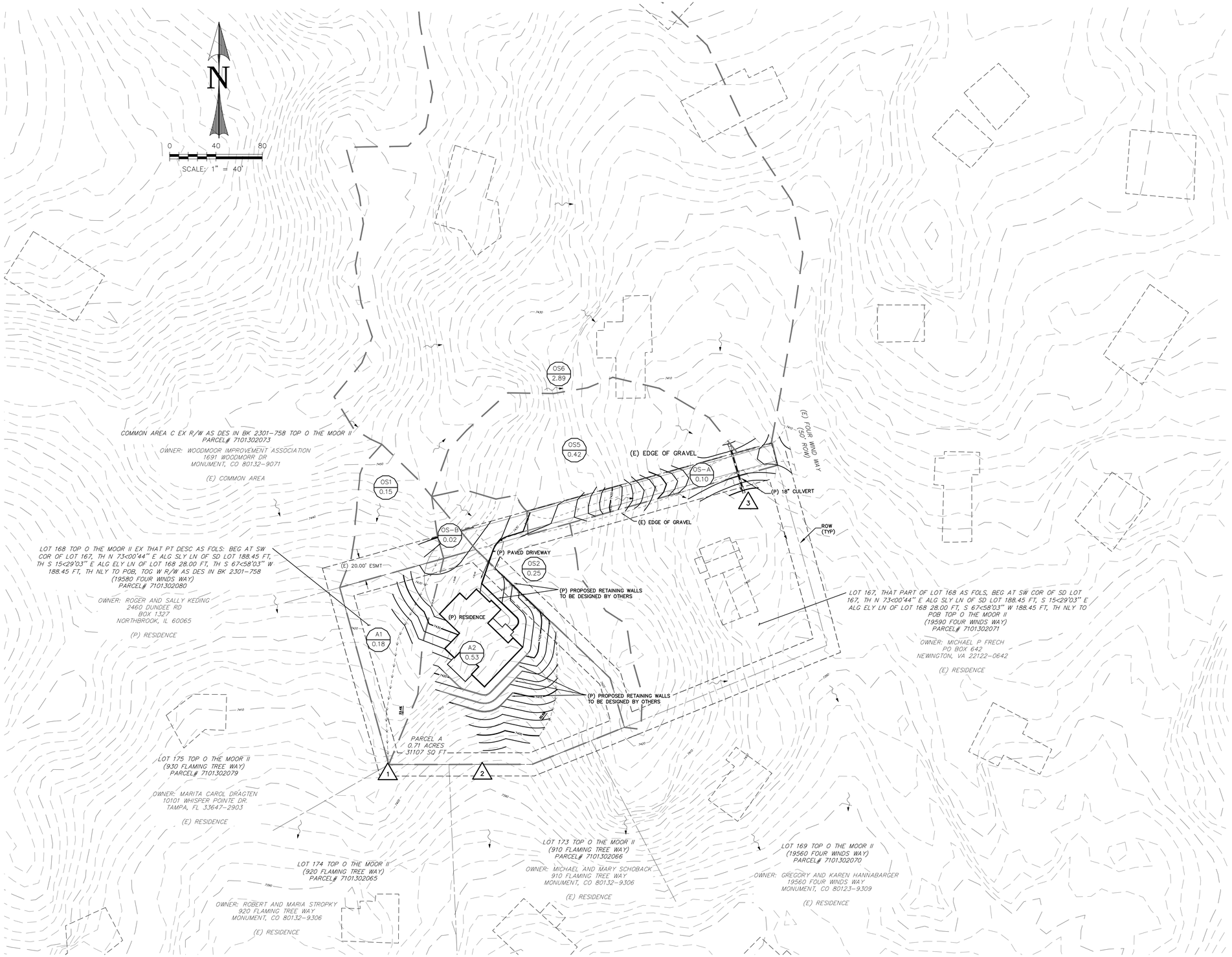

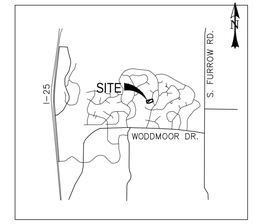

VICINITY MAP
SCALE: N.T.S.

PROPOSED DRAINAGE BASINS			
BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
OS-1	0.15	0.1	0.4
OS-2	0.25	0.2	0.8
OS-A	0.10	0.3	0.6
OS-B	0.02	0.1	0.1
OS-5	0.42	0.2	1.3
OS-6	2.89	1.9	7.7
A1	0.18	0.1	0.5
A2	0.53	0.5	1.9

PROPOSED DESIGN POINTS						
DESIGN POINT	Q2 (CFS)	Q5 (CFS)	Q10 (CFS)	Q25 (CFS)	Q50 (CFS)	Q100 (CFS)
1		0.1				0.9
2		0.7				2.7
3		2.1				8.7

LEGEND

EXISTING	(E)
PROPOSED	(P)
BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
EASEMENT	
(E) CONTOUR, INDEX	6820
(E) CONTOUR	
(P) CONTOUR, INDEX	6820
(P) CONTOUR	
DRAINAGE PATH	
BASIN IDENTIFIER	A
BASIN AREA [AC]	0.36
DESIGN POINT IDENTIFIERS	3
DRAINAGE BASIN BOUNDARY	
SURFACE SHEET FLOW DIRECTION	
SLOPE/DIRECTION	1.00%

REV.	DESCRIPTION	DATE

Know what's below. Call 72 hours before you dig.
For more details visit: www.call811.com

PREPARED FOR:
THE MAYNARD COMPANY
1364 OLD CEDAR GROVE
MONUMENT, CO 80132

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE, PO BOX 221, WOODLAND PARK, CO 80866, (719)426-2124

19584 FOUR WINDS WAY
MONUMENT, CO 80132

PROPOSED DRAINAGE PLAN

DESIGNED BY: DLM	DRAWN BY: SLP
SCALE: 1"=40'	DATE: 04/28/22
JOB NUMBER: 21-337	SHEET: 2 OF 2

N:\Catamount Projects\Projects\21-337 19584 Four Winds Way\DWG\ARA\21-337-DR-PROPOSED - DR.dwg — Tuesday, June 28, 2022 3:21:48 PM — Scott

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