



## DRAINAGE LETTER

### HOPE PHYSICAL THERAPY

4850 Austin Bluffs Pkwy  
Colorado Springs, CO 80918

---

PREPARED FOR:

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BradyShyrock@GallowayUS.com

DATE:

**March 22, 2024**

**PCD File No. PPR235**



**DESIGN ENGINEER'S STATEMENT**

*The attached drainage plan and report were prepared under my direct 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 the responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.*



\_\_\_\_\_  
Brady Shyrock, PE 38164  
For and on behalf of Galloway & Company, Inc.

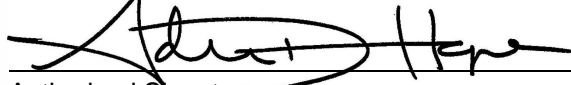
03/22/2024

\_\_\_\_\_  
Date



**OWNER//DEVELOPER'S STATEMENT**

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



\_\_\_\_\_  
Authorized Signature

3/25/2024

\_\_\_\_\_  
Date

Adrian Hope, Vice-President & Director of Operations  
Hope Physical Therapy & Wellness  
4850 Austin Bluffs Pkwy, Colorado Springs, CO 80918

**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.*

\_\_\_\_\_  
Joshua Palmer, P.E.  
County Engineer / ECM Administrator

\_\_\_\_\_  
Date



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- E. Drainage Map



# I. INTRODUCTION

## PURPOSE

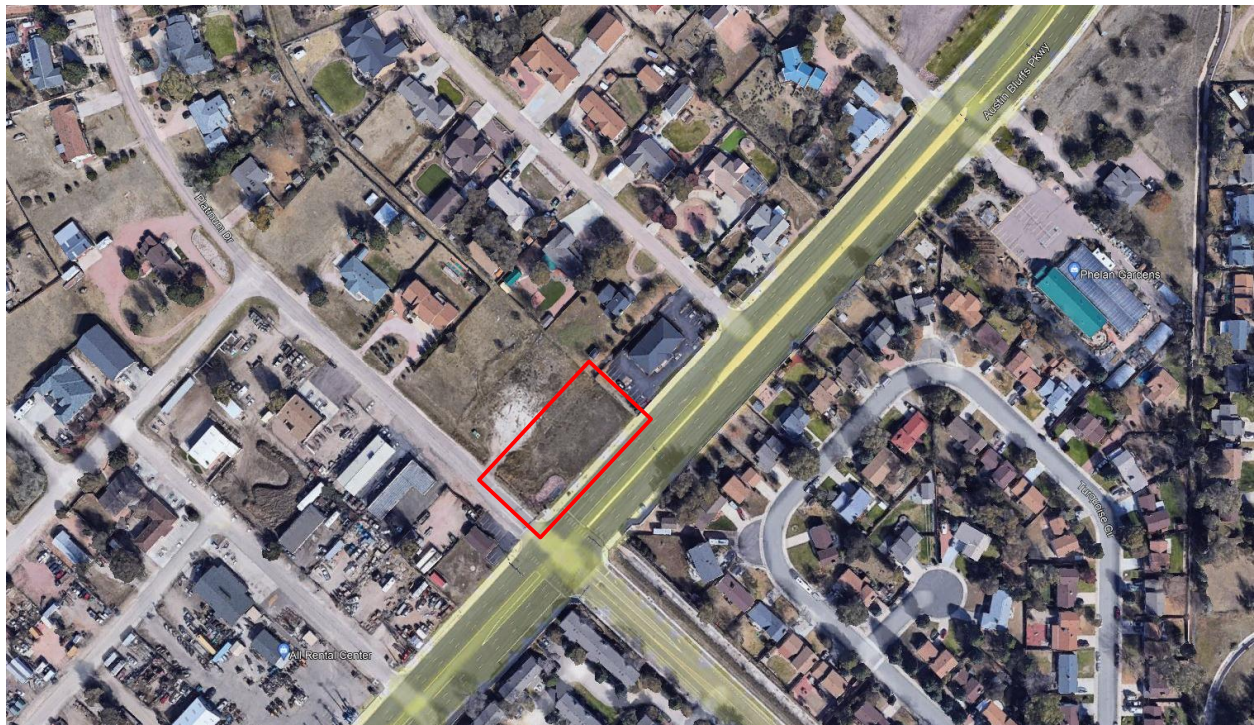
This document is the Drainage Letter for Hope Physical Therapy. The purpose of this project is to build a parking lot on an empty site. Previously, all flows were captured by an existing pond located at the corner of Platinum Drive and Austin Bluffs Parkway. With the addition of the parking lot, some of the flows will now be conveyed by a concrete channel and will flow over riprap before flowing to the existing pond. This report will identify drainage patterns and drainage features to show proposed design meets the El Paso County Drainage Criteria Manual (DCM) and Engineering Criteria Manual (ECM).

The project is currently located on 1 lot (Lot 14, Block 15, Vista Peaks Estates Addition) at the intersection of Platinum Dr and Austin Bluffs Pkwy.

The City of Colorado Springs has plans. These plans are the *“Final Drainage Report – Austin Bluffs Parkway Corridor Project Phase 3, Segment 3”* prepared by Wilson & Company, Inc., October 24, 2012. Please see Appendix D for excerpts from this document. These plans show the design flows for the existing drainage swale. A drainage letter is being provided rather than a full drainage report due to the total area of earth disturbance associated with this project is less than 1 acre (approximately 0.37 acres of disturbance) and it is not part of a larger common development or sale.

## LOCATION

The development is located in a portion of the Southeast Quarter of Section 16, Township 13 South, Range 66 West of the 6<sup>th</sup> Principal Meridian in the City of Colorado Springs, El Paso County, Colorado. The development is located at 4850 Austin Bluffs Pkwy, Colorado Springs, CO 80918, situated on the north corner of Platinum Drive and Austin Bluffs Parkway. Refer to the image below and the Vicinity Map in Appendix A.



## DESCRIPTION OF PROPERTY

The Hope Physical Therapy is bound by Platinum Drive to the southwest, Austin Bluffs Parkway to the southeast, Hope Physical Therapy to the northeast, and an empty lot to the northwest.

According to the U.S. Department of Agriculture Natural Resources Conservation Service Soil Survey of El Paso County, Colorado (See Appendix A) the primary soil found is Nunn clay loam. Nunn clay loam are classified as Soil Conservation Service (SCS) hydrologic soil group "C".

## II. EXISTING DRAINAGE PATTERNS AND FEATURES

### FLOODPLAIN INFORMATION

The proposed site is located within Zone X, as referenced from FEMA flood Insurance Rate Map (08041C0538G, with an effective date of December 7, 2018). Zone X is described as areas determined to be outside the 0.2% annual chance floodplain. See Appendix A for the Flood Insurance Rate Map Firmette and Panel.

### EXISTING DRAINAGE PATTERNS

The existing site is sloped to the south west at around 2% to 3%, the site is currently undeveloped with native vegetation from what has been observed on site. The site is bounded by Platinum Drive to the south west and Austin Bluffs Parkway to the south east. The site was previously studied in the "*Final Drainage Report – Austin Bluffs Parkway Corridor Project Phase 3, Segment 3*" by Wilson & Company, Inc., October 24, 2012 (**ABP-FDR**).

### Existing Conditions Sub-Basin Description

An existing conditions map has been provided in Appendix D and can be used to reference the basins discussed below:

Basin EX-1 (0.48 ac, Q5 = 0.3 cfs, Q100 = 1.6 cfs): A sub-basin defining the existing. Runoff is routed via sheet flow to the existing drainage structure on the south side of the site ad Design Point EX-2.

Basin OS-1 (10.07 ac, Q5 = 12.0 cfs, Q100 = 32.1 cfs): A basin consisting of off-site flows from the north west area adjacent to the property. Runoff is routed via channelized flow in the existing drainage swale along the east side of Platinum Drive to Design Point OS-1. Flows then continue through the existing road side ditch that runs within the site, along the southwest property line. Ultimately entering the existing (Public) 8'x5' RBC at the southern property corner.

Basin OS-2 (0.76 ac, Q5 = 1.1 cfs, Q100 = 3.0 cfs): A sub-basin defining the north portion of the offsite drainage. This existing subbasin consist of residential development. Runnoff is routed via sheet flow onto the site. Once on the existing site it joins the flows from EX-1 and sheet flows to the existing drainage structure on the south side of the site.

Design Point OS-1 Culvert (Q5 = 12.0 cfs, Q100 = 32.1 cfs): This design point represents off-site flows entering the site and the road side ditch on the east side of Platinum Drive, from Basin OS-1.

Design Point EX-1 (Q5 = 1.4 cfs, Q100 = 4.5 cfs): This design point is the total flows from basin EX-1 and OS-2 conveyed into the existing road side ditch on the south side of the property.

Design Point EX-2 (Q5 = 13.4 cfs, Q100 = 36.7 cfs): This design point is the total flows from Design Point EX-1 and OS-1 conveyed into the existing 8'x5' RBC(Public).

### III. DESIGN CRITERIA

#### DEVELOPMENT CRITERIA REFERENCE

The analysis and design of the stormwater management system for this project was prepared in accordance with the criteria set forth in the El Paso County Drainage Criteria Manual (DCM).

The drainage calculations were based on the City of Colorado Springs drainage criteria manual Figure 6-5 and IDF equations to determine the intensity and are listed in Table 1 below.

**Table 1 - Precipitation Data**

Return Period	One Hour Depth (in).
5-year	1.50
100-year	2.52

\*The intensities above are calculated using Tc=5 minutes

#### HYDROLOGIC CRITERIA

The rational method was used to calculate peak flows as the tributary areas are less than 100 acres. The rational method has been proven to be accurate for basins of this size and is based on the following formula from the City of Colorado Springs Drainage Criteria Manual Volume 1, Eq 6-5:

$$Q = CIA$$

Where:

- Q = Peak Discharge (cfs)
- C = Runoff Coefficient
- I = Runoff intensity (inches/hour)
- A = Drainage area (acres)

The runoff coefficients are calculated based on land use, percent imperviousness, and design storm for each basin. Composite percent impervious and composite C values were calculated using the streets, roofs, and lawn coefficients found in Table 6-6 of the DCM Vol. 1. The corresponding coefficients for the HSG A soils were used for the 5-year and 100-year storm event. The associated calculations can be found in Appendix D.

#### Time of Concentration

Time of concentrations have been adapted from the equation 6-7 of The City of Colorado Springs Drainage Criteria Manual, Volume 1 which are as follows:

$$T_c = t_i + t_t$$

Where:

- T<sub>c</sub> = time of concentration (min)
- T<sub>i</sub> = overland (initial) flow time (min)
- T<sub>t</sub> = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

**Overland (Initial) Flow Time:** from equations 6-8 from the City of Colorado Springs Drainage Criteria Manual, Volume 1.

$$t_t = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

Where:

$T_i$  = overland (initial) flow

$C_5$  = runoff coefficient for 5-year frequency

$L$  = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)

$S$  = average basin slope

### Travel Time

$$V = C_v * S_w^{0.5}$$

Where:

$V$  = Velocity (ft/s)

$C_v$  = conveyance coefficient

$S_w$  = watercourse slope (ft/ft)

The 100-year event was used as the major storm event for pipes and inlets. The 5-year event was used as the minor event. All of the flows in the Rational Method calculations were routed to account for time of concentration on the surface and travel time in the pipe. As the travel time across a basin or in a pipe increases, the peak flowrate also decreases.

## HYDRAULIC CRITERIA

Hydraulic design and analysis for this report were performed through the usage of Bentley's Flowmaster and HY-8. Sizing for culvert, riprap, and concrete pan can be found in Appendix C.

In accordance with the El Paso County Drainage Criteria Manual (DCM; Table 6-4), the maximum depth of overtopping for culverts during the major storm event (100-yr) within Local Residential and Collector Roadways is 6-inches of depth at the street. For the proposed 14"x23" HE-RCP culvert at the west side of the parking lot, there is 0.39' (4.68") of depth at the street in the major storm event. (see Appendix C for calculations).

## IV. PROPOSED DRAINAGE PLAN

### GENERAL CONCEPT

The proposed onsite improvements are all included within 3 basins. The site is proposed to be turned into a parking lot for the adjacent Physical Therapy building. The site will gain an access to Platinum Drive, this access point will be where the proposed culvert will be placed. The site grading has a general flow from the edges of the property to the valley pan in the center of the parking lot. This valley pan discharges into the current drainage swale on the south east corner of the property which will direct flows to an existing 5' x 8' (Public) RBC located at the south corner of the site. Off-site flows from (2) basins will continue to flow across the site as they do in the existing condition. A detailed summary of the proposed sub-basins are provided below with on site flows denoted as 'A' and off-site flows denoted as 'OS'. The proposed drainage map is provided in Appendix D as a reference.

**Basin A-1 (0.48 ac, Q5 = 1.0 cfs, Q100 = 1.9 cfs):** A sub-basin defining the proposed site. This sub-basin consists of paved parking, sidewalk, and landscape. Runoff from this basin sheet flows to a proposed concrete crosspan within the center of the parking lot. The flows are then conveyed to the west where they then discharge into an existing road side ditch at Design Point A1.

**Basin OS-1 (10.07 ac, Q5 = 12.0 cfs, Q100 = 32.1 cfs):** A basin consisting of off-site flows from the north west area adjacent to the property. Runoff is routed via channelized flow in the existing drainage swale along the east side of Platinum Drive to a proposed pipe culvert at Design Point OS-1.

**Basin OS-2 (0.76 ac, Q5 = 1.1 cfs, Q100 = 3.0 cfs):** A sub-basin defining the north portion of the offsite drainage. This existing subbasin consist of residential development. Runoff is routed via sheet flow onto the existing site. Once on the existing site it joins the flows from Basin A-1 and flows to the existing road side ditch at Design Point A1.

**Design Point OS-1 Culvert (Q5 = 12.0 cfs, Q100 = 32.1 cfs):** This design point represents off-site flows entering the proposed pipe culvert from Basin OS-1.

**Design Point A-1 (Q5 = 1.9 cfs, Q100 = 4.9 cfs):** This design point is the total flows from basin A-1 and OS-2 conveyed into the existing roadside ditch on the south side of the property via the proposed 6' concrete pan. The calculated spread associated with the 100-yr event within the proposed concrete pan is 16.35' at a depth of 0.17' (2.04"). See proposed drainage conditions map for delineation.

**Design Point A-2 (Q5 = 13.9 cfs, Q100 = 37.0 cfs):** This design point represents the total combined flows from Design Point A-1 and Design Point OS-1 conveyed into the existing 8'x5' RBC(Public). Surface runoff is captured at Design Point A2 (a.k.a. Design Point 22 in the **ABP-FDR**) by the existing 7.5'x16' sloping inlet with trash rack (connected to the existing 8'x5' RCBC). The total capacity at this location is 290 cfs (**ABP-FDR**). In the **ABP-FDR**, the upstream tributary area is defined as Basins S & V (I-SV1 & I-SV2 in the interim condition, which includes this project site as the ultimate storm sewer system within Platinum Drive has not been constructed). The additional runoff resulting from the development of this project (parking lot) site does not exceed the 290 cfs capacity. Design flows at this Design Point have not been significantly altered as represented in the table below.



**Table 1 – Summary Table**

<b>Design Point</b>	<b>Design Flow Rate (5-yr)</b>	<b>Ex. Flow Rate (5-yr)</b>	<b>Design Flow Rate (100-yr)</b>	<b>Ex. Flow Rate (100-yr)</b>	<b>Drainage Report</b>
DP22		24 cfs		290 cfs	Wilson
OS1		12.0 cfs		32.1 cfs	Galloway
EX1		0.3 cfs		13.4 cfs	Galloway
EX2		1.6 cfs		36.7 cfs	Galloway
A1	1.0 cfs		1.9 cfs		Galloway
A2	13.9 cfs		37.0 cfs		Galloway

## **V. CONCLUSION**

This drainage letter for the Hope Physical Therapy project has been prepared using the criteria and methods set forth in El Paso County Drainage Criteria Manual (DCM). The runoff from this project will not adversely affect the surrounding and downstream developments.

## **VARIANCES**

No variance(s) requested at this time.

## VI. REFERENCES

1. Drainage Criteria Manual Volume 1. Of El Paso County
2. Drainage Criteria Manual Volume 2 Stormwater Quality Policies, Procedures and Best Management Practices.
3. Drainage Criteria Manual Volume 1, City of Colorado Springs, rev. January 2021.
4. Urban Storm Drainage Criteria Manual, Volumes 1 - 3, Mile High Flood District Urban Storm Drainage Criteria Manual, January 2016 (with current revisions).
5. Flood Insurance Rate Map – El Paso County, Colorado and Incorporated Areas Community Panel No. 08041C0538G, Effective December 7, 2018.
6. Soil Map – El Paso County Area, Colorado as available through the Natural Resources Conservation Service National Cooperative Soil Survey web site via Web Soil Survey 2.0.
7. *“Final Drainage Report – Austin Bluffs Parkway Corridor Project Phase 3, Segment 3”* by Wilson & Company, Inc., October 24, 2012

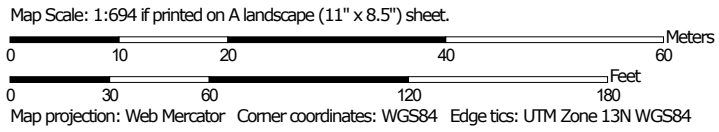
**APPENDIX A**  
**Exhibits and Figures**



Hydrologic Soil Group—El Paso County Area, Colorado  
(Hope Physical Therapy)




Soil Map may not be valid at this scale.



Hydrologic Soil Group—El Paso County Area, Colorado  
(Hope Physical Therapy)

### 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 20, Sep 2, 2022

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
59	Nunn clay loam, 0 to 3 percent slopes	C	0.8	100.0%
<b>Totals for Area of Interest</b>			<b>0.8</b>	<b>100.0%</b>

### 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

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services  
NOAA, N/NGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

**Base Map** information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

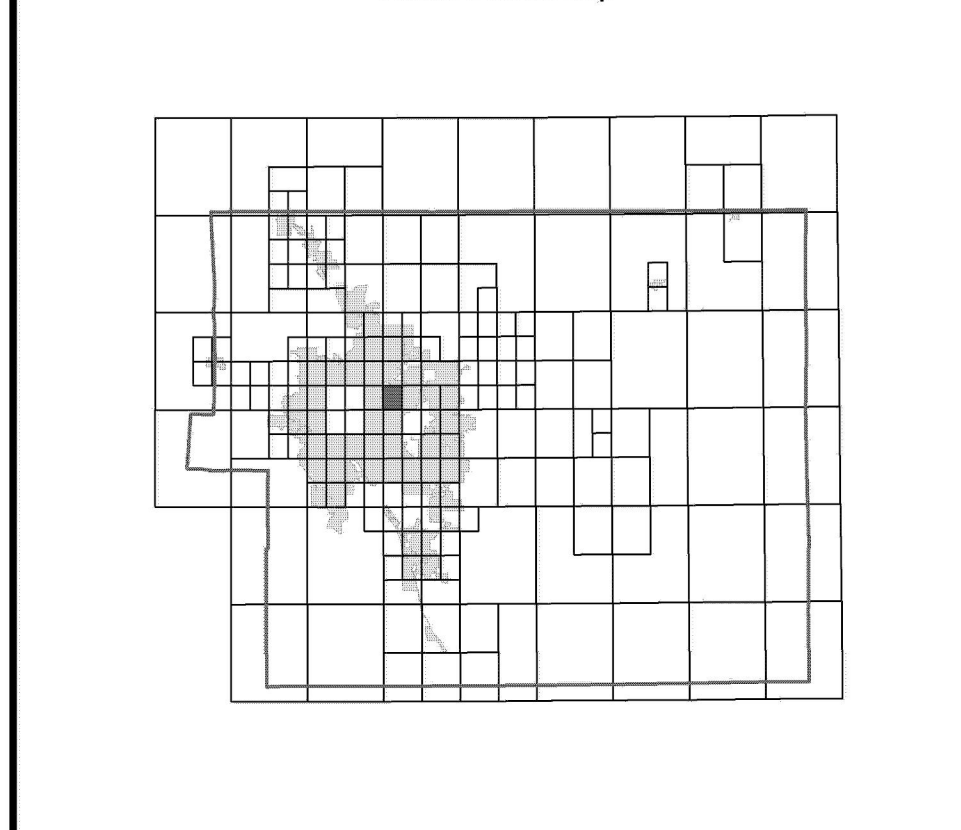
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/mfp>.

El Paso County Vertical Datum Offset Table	
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

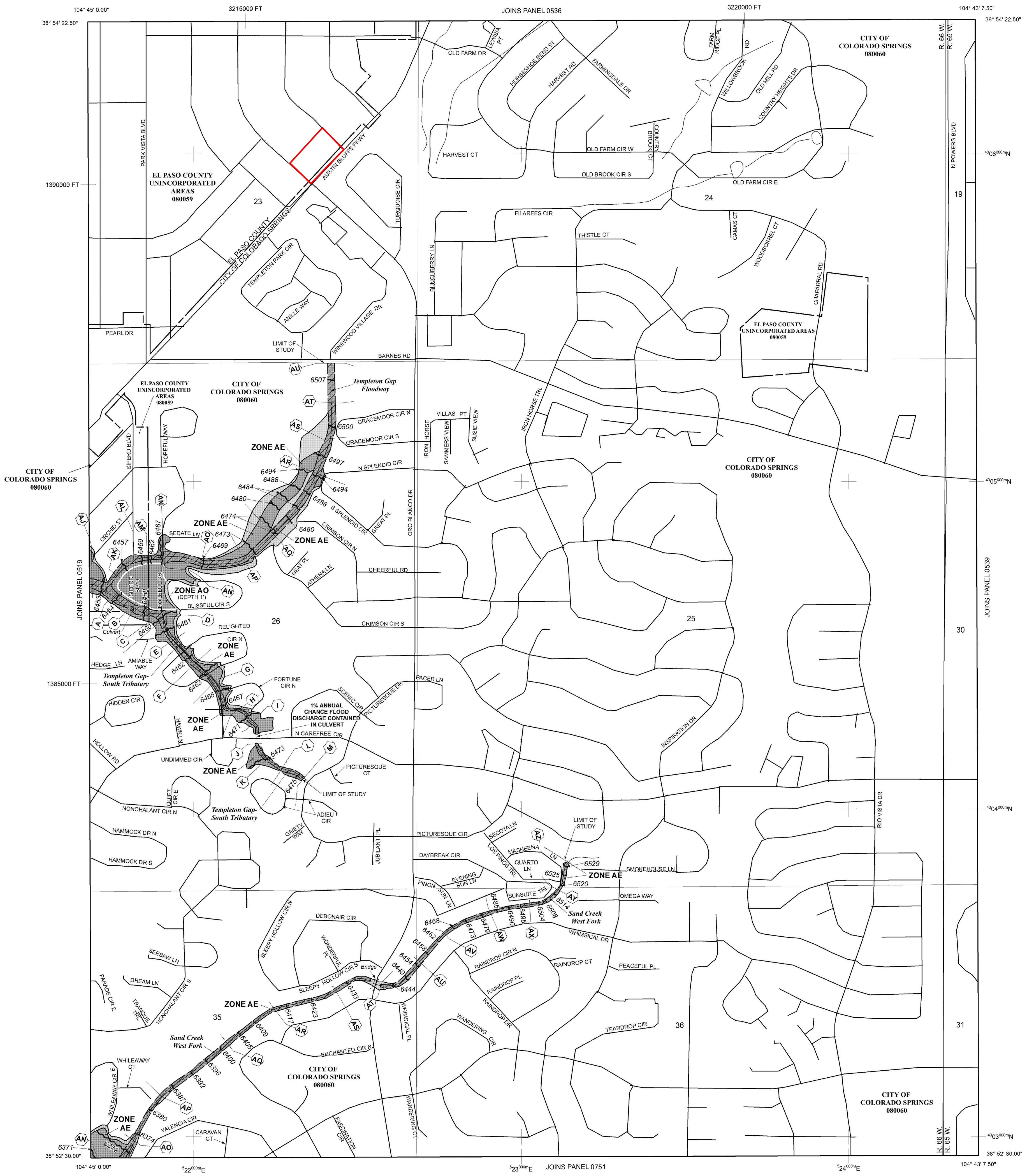
**Panel Location Map**



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 66 WEST.

**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

**ZONE A** No Base Flood Elevations determined.  
**ZONE AE** Base Flood Elevations determined.  
**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.  
**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.  
**ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently derelictified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.  
**ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.  
**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.  
**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**

**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.  
**ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary  
 Floodway boundary  
 Zone D Boundary  
 CBRS and OPA boundary  
 Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flow velocities.  
 ~~~~~ 513 ~~~~~ Base Flood Elevation line and value; elevation in feet\* (EL 987)  
 ~~~~~ Base Flood Elevation value where uniform within zone; elevation in feet\*

\* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

○ A ○ A Cross section line  
 23-23 Transsect line  
 97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)  
 4750000N 1000-meter Universal Transverse Mercator grid ticks, zone 13  
 6000000 FT 5000-foot grid ticks; Colorado State plane coordinate system, central zone (FIPSZONE 6502), Lambert Conformal Conic Projection  
 DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)  
 ● M1.5 River Mile

MAP REPOSITORIES  
 Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP  
**MARCH 17, 1997**

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL  
**DECEMBER 7, 2018** - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

**MAP SCALE 1" = 500'**

250 0 500 1000 FEET  
 150 0 150 300 METERS

**NFP**

**PANEL 0538G**

**FIRM**  
**FLOOD INSURANCE RATE MAP**  
**EL PASO COUNTY, COLORADO AND INCORPORATED AREAS**

**PANEL 538 OF 1300**  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY                 | NUMBER | PANEL | SUFFIX |
|---------------------------|--------|-------|--------|
| COLORADO SPRINGS, CITY OF | 08060  | 0538  | G      |
| EL PASO COUNTY            | 08059  | 0538  | G      |

Notice: This map was released on 05/15/2020 to make a correction. This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
**08041C0538G**

**MAP REVISED**  
**DECEMBER 7, 2018**

Federal Emergency Management Agency



**APPENDIX B**  
**Hydrological Computations**

## COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Lot 14, Block 15, Vista Peaks Estates Addition  
Location: CO, Colorado Springs

Project Name: Hope Physical Therapy  
Project No.: HPT01  
Calculated By: BAS  
Checked By: THE  
Date: 2/16/24

| Basin ID                  | Total Area (ac) | Paved Roads |           |                 | Lawns  |           |                 | Off-Site Flow Analysis |           |                 | Basins Total<br>Weighted % Imp. |
|---------------------------|-----------------|-------------|-----------|-----------------|--------|-----------|-----------------|------------------------|-----------|-----------------|---------------------------------|
|                           |                 | % Imp.      | Area (ac) | Weighted % Imp. | % Imp. | Area (ac) | Weighted % Imp. | % Imp.                 | Area (ac) | Weighted % Imp. |                                 |
| <b>Existing Condition</b> |                 |             |           |                 |        |           |                 |                        |           |                 |                                 |
| OS1                       | 10.07           | 100         | 0.00      | 0.0             | 2      | 0.00      | 0.0             | 45                     | 10.07     | 45.00           | 45.0                            |
| OS2                       | 0.76            | 100         | 0.00      | 0.0             | 2      | 0.00      | 0.0             | 45                     | 0.76      | 45.00           | 45.0                            |
| EX1                       | 0.48            | 100         | 0.00      | 0.0             | 2      | 0.48      | 2.0             | 45                     | 0.00      | 0.00            | 2.0                             |
| <b>Proposed Condition</b> |                 |             |           |                 |        |           |                 |                        |           |                 |                                 |
| A1                        | 0.48            | 100         | 0.25      | 52.1            | 2      | 0.23      | 1.0             | 45                     | 0.00      | 0.00            | 53.1                            |

STANDARD FORM SF-2  
TIME OF CONCENTRATION

Subdivision: Lot 14, Block 15, Vista Peaks Estates Addition  
Location: CO, Colorado Springs

Project Name: Hope Physical Therapy  
Project No.: HPT01  
Calculated By: BAS  
Checked By: THE  
Date: 2/16/24

| SUB-BASIN          |           |                        |                |                  |                | INITIAL/OVERLAND  |       |                      | TRAVEL TIME       |       |                |            |                      | T <sub>c</sub> CHECK       |                   |                                | FINAL                |
|--------------------|-----------|------------------------|----------------|------------------|----------------|-------------------|-------|----------------------|-------------------|-------|----------------|------------|----------------------|----------------------------|-------------------|--------------------------------|----------------------|
| DATA               |           |                        |                |                  |                | (T <sub>i</sub> ) |       |                      | (T <sub>t</sub> ) |       |                |            |                      | (URBANIZED BASINS)         |                   |                                |                      |
| BASIN ID           | D.A. (AC) | Hydrologic Soils Group | Impervious (%) | C <sub>100</sub> | C <sub>5</sub> | L (FT)            | S (%) | T <sub>i</sub> (MIN) | L (FT)            | S (%) | C <sub>v</sub> | VEL. (FPS) | T <sub>t</sub> (MIN) | COMP. T <sub>c</sub> (MIN) | TOTAL LENGTH (FT) | Urbanized T <sub>c</sub> (MIN) | T <sub>c</sub> (MIN) |
| Existing Condition |           |                        |                |                  |                |                   |       |                      |                   |       |                |            |                      |                            |                   |                                |                      |
| OS1                | 10.07     | C                      | 45.0           | 0.59             | 0.37           | 100               | 2.0   | 10.6                 | 1393              | 2.0   | 20.0           | 2.8        | 8.2                  | 18.8                       | 1493.0            | 18.3                           | 18.3                 |
| OS2                | 0.76      | C                      | 45.0           | 0.59             | 0.37           | 100               | 2.0   | 10.6                 | 187               | 1.6   | 20.0           | 2.5        | 1.2                  | 11.8                       | 287.0             | 11.6                           | 11.6                 |
| EX1                | 0.48      | C                      | 2.0            | 0.51             | 0.16           | 100               | 3.7   | 11.1                 | 126               | 2.0   | 20.0           | 2.8        | 0.7                  | 11.9                       | 226.0             | 11.3                           | 11.3                 |
| Proposed Condition |           |                        |                |                  |                |                   |       |                      |                   |       |                |            |                      |                            |                   |                                |                      |
| A1                 | 0.48      | C                      | 53.1           | 0.61             | 0.41           | 35                | 2.7   | 5.4                  | 142               | 3.7   | 20.0           | 3.8        | 0.6                  | 6.0                        | 177.0             | 11.0                           | 6.0                  |

NOTES:

$$T_i = (0.395 * (1.1 - C_5) * (L)^{0.5}) / ((S)^{0.33}), S \text{ in ft/ft}$$

$$T_t = L / 60V \text{ (Velocity From Fig. 501)}$$

$$\text{Velocity } V = C_v * S^{0.5}, S \text{ in ft/ft}$$

$$T_c \text{ Check} = 10 + L / 180$$

For Urbanized basins a minimum T<sub>c</sub> of 5.0 minutes is required.

For non-urbanized basins a minimum T<sub>c</sub> of 10.0 minutes is required

STANDARD FORM SF-3  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

Subdivision: Lot 14, Block 15, Vista Peaks Estates Addition  
 Location: CO, Colorado Springs  
 Design Storm: 5-Year

Project Name: Hope Physical Therapy  
 Project No.: HPT01  
 Calculated By: BAS  
 Checked By: THE  
 Date: 2/16/24

| STREET             | Design Point | DIRECT RUNOFF |           |               |          |          |           |         | TOTAL RUNOFF |          |           |         | STREET    |                   | PIPE              |           | REMARKS                                        |
|--------------------|--------------|---------------|-----------|---------------|----------|----------|-----------|---------|--------------|----------|-----------|---------|-----------|-------------------|-------------------|-----------|------------------------------------------------|
|                    |              | Basin ID      | Area (Ac) | Runoff Coeff. | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Tc (min)     | C*A (Ac) | I (in/hr) | Q (cfs) | Slope (%) | Street Flow (cfs) | Design Flow (cfs) | Slope (%) |                                                |
| Existing Condition |              |               |           |               |          |          |           |         |              |          |           |         |           |                   |                   |           |                                                |
|                    | OS1          | OS1           | 10.07     | 0.37          | 18.3     | 3.73     | 3.22      | 12.0    |              |          |           | 12.0    |           |                   |                   |           | Off-site Flow<br>Road Side Flows entering site |
|                    |              | OS2           | 0.76      | 0.37          | 11.6     | 0.28     | 3.91      | 1.1     |              |          |           |         |           |                   |                   |           |                                                |
|                    | EX1          | EX1           | 0.48      | 0.16          | 11.3     | 0.08     | 3.95      | 0.3     | 11.6         | 0.36     | 3.91      | 1.4     |           |                   |                   |           | Combined Flow of Basin OS2 & EX1               |
|                    | EX2          |               |           |               |          |          |           |         |              |          |           | 13.4    |           |                   |                   |           | Combined Flow of Design Point EX1 & OS1        |
| Proposed Condition |              |               |           |               |          |          |           |         |              |          |           |         |           |                   |                   |           |                                                |
|                    | OS1          | OS1           | 10.07     | 0.37          | 18.3     | 3.73     | 3.22      | 12.0    |              |          |           | 12.0    |           |                   |                   |           | Off-site Flow<br>Road Side Flows entering site |
|                    |              | OS2           | 0.76      | 0.37          | 11.6     | 0.28     | 3.91      | 1.1     |              |          |           |         |           |                   |                   |           |                                                |
|                    | A1           | A1            | 0.48      | 0.41          | 6.0      | 0.20     | 4.90      | 1.0     | 11.6         | 0.48     | 3.91      | 1.9     |           |                   |                   |           | Combined Flow of Basin OS2 & A1                |
|                    | A2           |               |           |               |          |          |           |         |              |          |           | 13.9    |           |                   |                   |           | Combined Flow of Design Point A1 & OS1         |

STANDARD FORM SF-3  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

Subdivision: Lot 14, Block 15, Vista Peaks Estates Addition  
 Location: CO, Colorado Springs  
 Design Storm: 5-Year

Project Name: Hope Physical Therapy  
 Project No.: HPT01  
 Calculated By: BAS  
 Checked By: THE  
 Date: 2/16/24

| STREET             | Design Point | DIRECT RUNOFF |           |               |          |          |           |         | TOTAL RUNOFF |          |           |         | STREET    |                   | PIPE              |           | REMARKS |                                                |
|--------------------|--------------|---------------|-----------|---------------|----------|----------|-----------|---------|--------------|----------|-----------|---------|-----------|-------------------|-------------------|-----------|---------|------------------------------------------------|
|                    |              | Basin ID      | Area (Ac) | Runoff Coeff. | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Tc (min)     | C*A (Ac) | I (in/hr) | Q (cfs) | Slope (%) | Street Flow (cfs) | Design Flow (cfs) | Slope (%) |         | Pipe Size (inches)                             |
| Existing Condition |              |               |           |               |          |          |           |         |              |          |           |         |           |                   |                   |           |         |                                                |
|                    | OS1          | OS1           | 10.07     | 0.37          | 18.3     | 3.73     | 3.22      | 12.0    |              |          |           | 12.0    |           |                   |                   |           |         | Off-site Flow<br>Road Side Flows entering site |
|                    |              | OS2           | 0.76      | 0.37          | 11.6     | 0.28     | 3.91      | 1.1     |              |          |           |         |           |                   |                   |           |         |                                                |
|                    | EX1          | EX1           | 0.48      | 0.16          | 11.3     | 0.08     | 3.95      | 0.3     | 11.6         | 0.36     | 3.91      | 1.4     |           |                   |                   |           |         | Combined Flow of Basin OS2 & EX1               |
|                    | EX2          |               |           |               |          |          |           |         |              |          |           | 13.4    |           |                   |                   |           |         | Combined Flow of Design Point EX1 & OS1        |
| Proposed Condition |              |               |           |               |          |          |           |         |              |          |           |         |           |                   |                   |           |         |                                                |
|                    | OS1          | OS1           | 10.07     | 0.37          | 18.3     | 3.73     | 3.22      | 12.0    |              |          |           | 12.0    |           |                   |                   |           |         | Off-site Flow<br>Road Side Flows entering site |
|                    |              | OS2           | 0.76      | 0.37          | 11.6     | 0.28     | 3.91      | 1.1     |              |          |           |         |           |                   |                   |           |         |                                                |
|                    | A1           | A1            | 0.48      | 0.41          | 6.0      | 0.20     | 4.90      | 1.0     | 11.6         | 0.48     | 3.91      | 1.9     |           |                   |                   |           |         | Combined Flow of Basin OS2 & A1                |
|                    | A2           |               |           |               |          |          |           |         |              |          |           | 13.9    |           |                   |                   |           |         | Combined Flow of Design Point A1 & OS1         |

## PIPE OUTFALL RIPRAP SIZING CALCULATIONS

**Subdivision:** Lot 14, Block 15, Vista Peaks Estates Addition  
**Location:** CO, Colorado Springs

**Project Name:** Hope Physical Therapy  
**Project No.:** HPT01  
**Calculated By:** MRW  
**Checked By:** MJP  
**Date:** 3/31/23

| STORM DRAIN SYSTEM          |          |  |  |                                              |
|-----------------------------|----------|--|--|----------------------------------------------|
| DP-OS1                      |          |  |  |                                              |
| Q100 (cfs)                  | 20.2     |  |  | Flows are the greater of proposed vs. future |
| D or H (in)                 | 14       |  |  |                                              |
| W (ft)                      | 1.92     |  |  |                                              |
| Slope (%)                   | 2.00     |  |  |                                              |
| Yn (in)                     | 0.68     |  |  |                                              |
| Yt (ft)                     | 1.37     |  |  | If "unknown" Yt/D=0.4                        |
| Yt/D, Yt/H                  | 1.17     |  |  | Per section 11-3                             |
| Supercritical               | Yes      |  |  |                                              |
| $Q/D^{2.5}, Q/WH^{1.5}$     | 8.36     |  |  |                                              |
| $Q/D^{1.5}, Q/WH^{0.5}$     |          |  |  |                                              |
| Da, Ha (in) *               | 7.34     |  |  | Da=0.5(D+Yn), Ha=0.5(H+Yn)                   |
| $Q/Da^{1.5}, Q/WHa^{0.5}$ * | 13.48    |  |  |                                              |
| d50 (in), Required          | 1.93     |  |  |                                              |
| Required Riprap Size        | L        |  |  | Fig. 8-34                                    |
| <b>Use Riprap Size</b>      | <b>L</b> |  |  |                                              |
| d50 (in)                    | 9        |  |  | Fig. 8-34                                    |
| $1/(2 \tan q)$              | 6.00     |  |  | Fig. 9-35 OR Fig 9-36                        |
| Erosive Soils               | Yes      |  |  |                                              |
| At                          | 3.67     |  |  | At=Q/5.5                                     |
| L                           | 4.6      |  |  | $L=(1/(2 \tan q))(At/Yt - D)$                |
| Min L                       | 3.5      |  |  | Min L=3D or 3H                               |
| Max L                       | 11.7     |  |  | Max L=10D or 10H                             |
| Length (ft)                 | 5.0      |  |  |                                              |
| Bottom Width (ft)           | 3.5      |  |  | Width=3D (Minimum)                           |
| Riprap Depth (in)           | 18       |  |  | Depth=2(d50)                                 |
| Type II Base Depth (in)     | 6        |  |  | Table 8-34 fine grained soils)               |
| Cutoff Wall                 | No       |  |  |                                              |
| Cutoff Wall Depth (ft)      |          |  |  | Depth of Riprap and Base                     |
| Cutoff Wall Width (ft)      |          |  |  |                                              |

**APPENDIX C**  
**Hydraulic Computations**

# Channel Report

## HOPE PHYSICAL THERAPY PARKING LOT, CENTER CONCRETE PAN

### Triangular

Side Slopes (z:1) = 48.08, 48.08  
Total Depth (ft) = 0.17

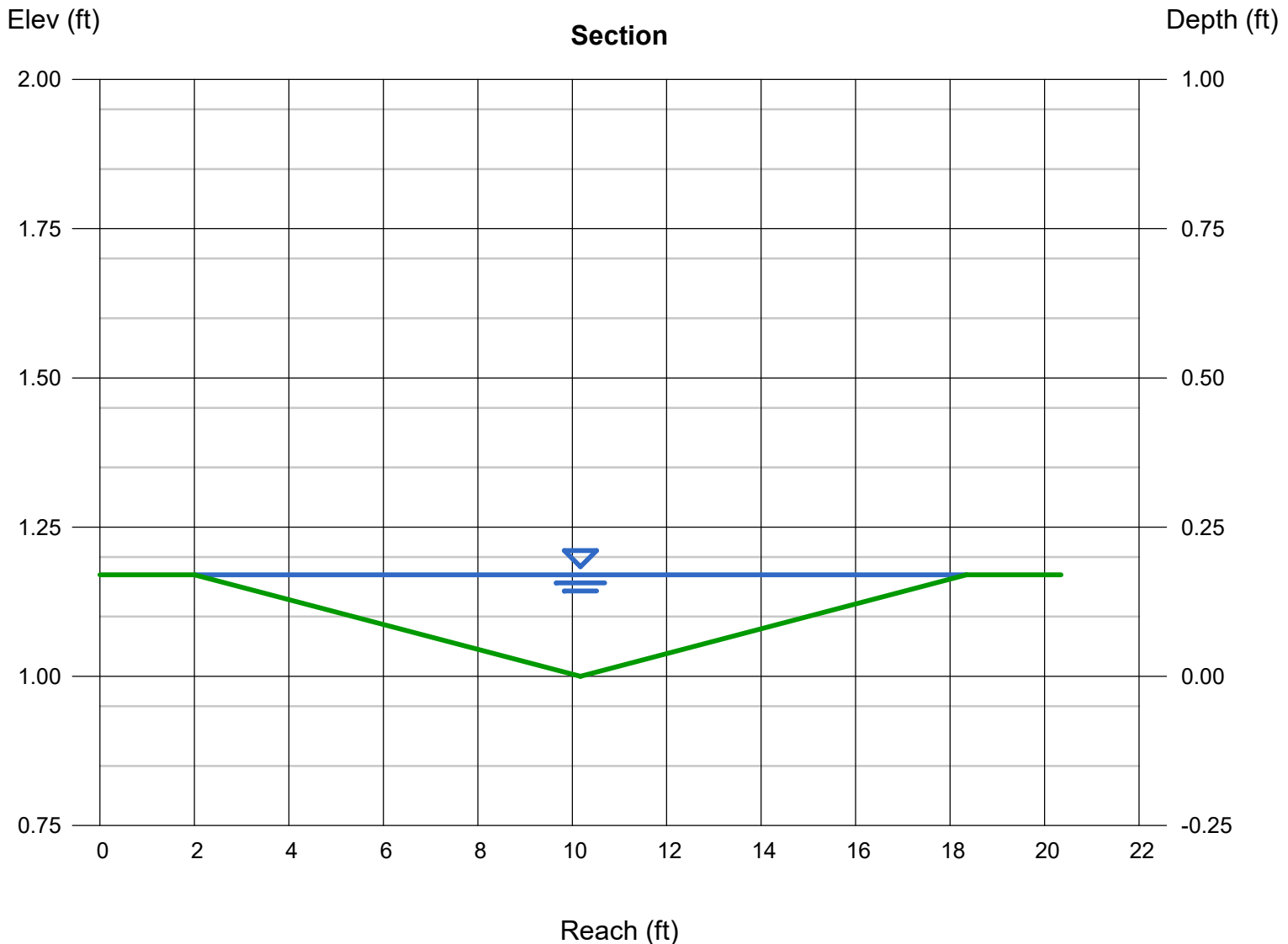
Invert Elev (ft) = 1.00  
Slope (%) = 3.50  
N-Value = 0.013

### Calculations

Compute by: Known Q  
Known Q (cfs) = 4.90

### Highlighted

Depth (ft) = 0.17  
Q (cfs) = 4.900  
Area (sqft) = 1.39  
Velocity (ft/s) = 3.53  
Wetted Perim (ft) = 16.35  
Crit Depth, Yc (ft) = 0.17  
Top Width (ft) = 16.35  
EGL (ft) = 0.36





# HY-8 Culvert Analysis Report

---

## Culvert Data: Culvert 1

### Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 6654.82 ft

Outlet Station: 39.80 ft

Outlet Elevation: 6654.04 ft

Number of Barrels: 1

### Culvert Data Summary - Culvert 1

Barrel Shape: Elliptical

Barrel Span: 23.00 in

Barrel Rise: 14.00 in

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

**Table 1 - Culvert Summary Table: Culvert 1**

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------------|-------------------------|--------------------------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 12.00 cfs             | 9.43 cfs                | 6656.66                  | 0.65              | 0.99                | 0.70              | 0.95                 | 8.46                   | 3.16                      |
| 14.01 cfs             | 9.61 cfs                | 6656.70                  | 0.66              | 0.99                | 0.71              | 1.06                 | 8.50                   | 3.32                      |
| 16.02 cfs             | 9.77 cfs                | 6656.73                  | 0.67              | 1.00                | 0.72              | 1.16                 | 8.54                   | 3.45                      |

|                     |           |         |      |      |      |      |      |      |
|---------------------|-----------|---------|------|------|------|------|------|------|
| <b>18.03</b><br>cfs | 9.91 cfs  | 6656.77 | 0.67 | 1.01 | 0.73 | 1.26 | 8.57 | 3.58 |
| <b>20.04</b><br>cfs | 10.04 cfs | 6656.80 | 0.68 | 1.01 | 1.17 | 1.36 | 5.65 | 3.69 |
| <b>22.05</b><br>cfs | 10.16 cfs | 6656.83 | 0.69 | 1.02 | 1.17 | 1.46 | 5.71 | 3.79 |
| <b>24.06</b><br>cfs | 10.28 cfs | 6656.85 | 0.69 | 1.02 | 1.17 | 1.55 | 5.78 | 3.88 |
| <b>26.07</b><br>cfs | 10.38 cfs | 6656.88 | 0.69 | 1.03 | 1.17 | 1.64 | 5.83 | 3.96 |
| <b>28.08</b><br>cfs | 10.48 cfs | 6656.90 | 0.70 | 1.03 | 1.17 | 1.74 | 5.89 | 4.04 |
| <b>30.09</b><br>cfs | 10.58 cfs | 6656.93 | 0.70 | 1.03 | 1.17 | 1.83 | 5.95 | 4.12 |
| <b>32.10</b><br>cfs | 10.67 cfs | 6656.95 | 0.71 | 1.04 | 1.17 | 1.92 | 6.00 | 4.19 |

### Culvert Barrel Data

Culvert Barrel Type Straight Culvert

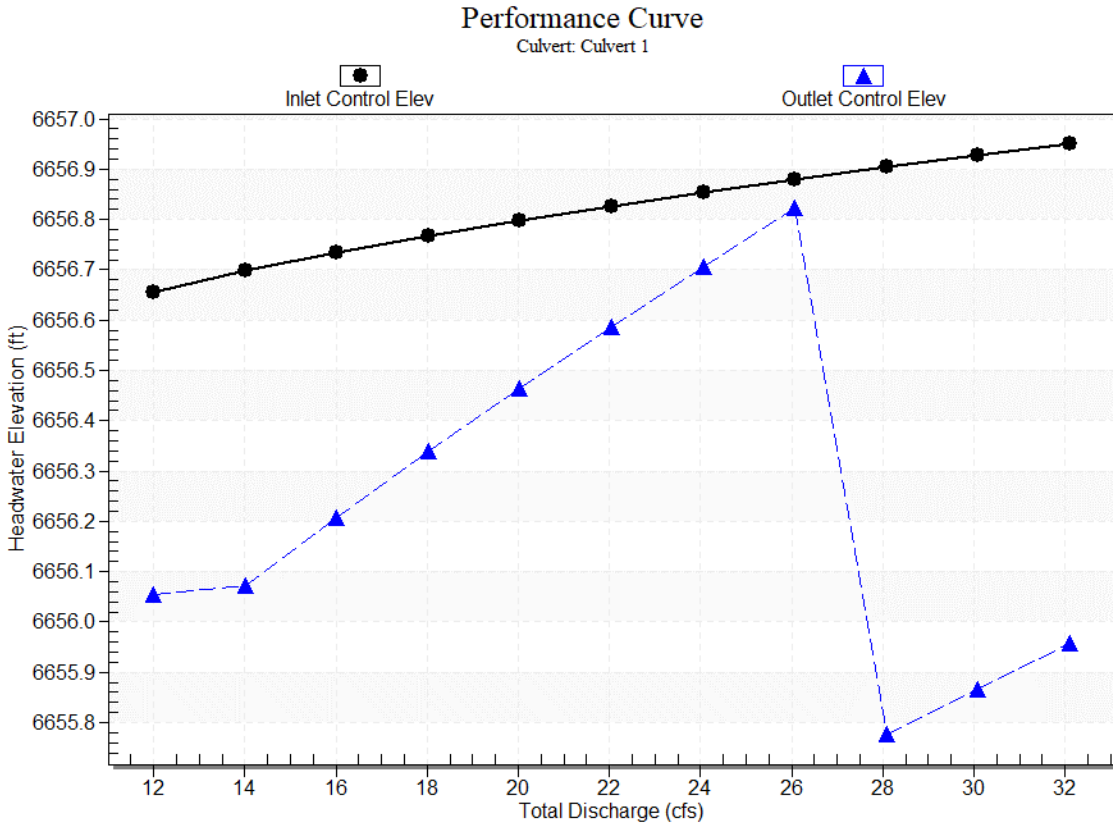
Inlet Elevation (invert): 6654.82 ft,

Outlet Elevation (invert): 6654.04 ft

Culvert Length: 39.81 ft,

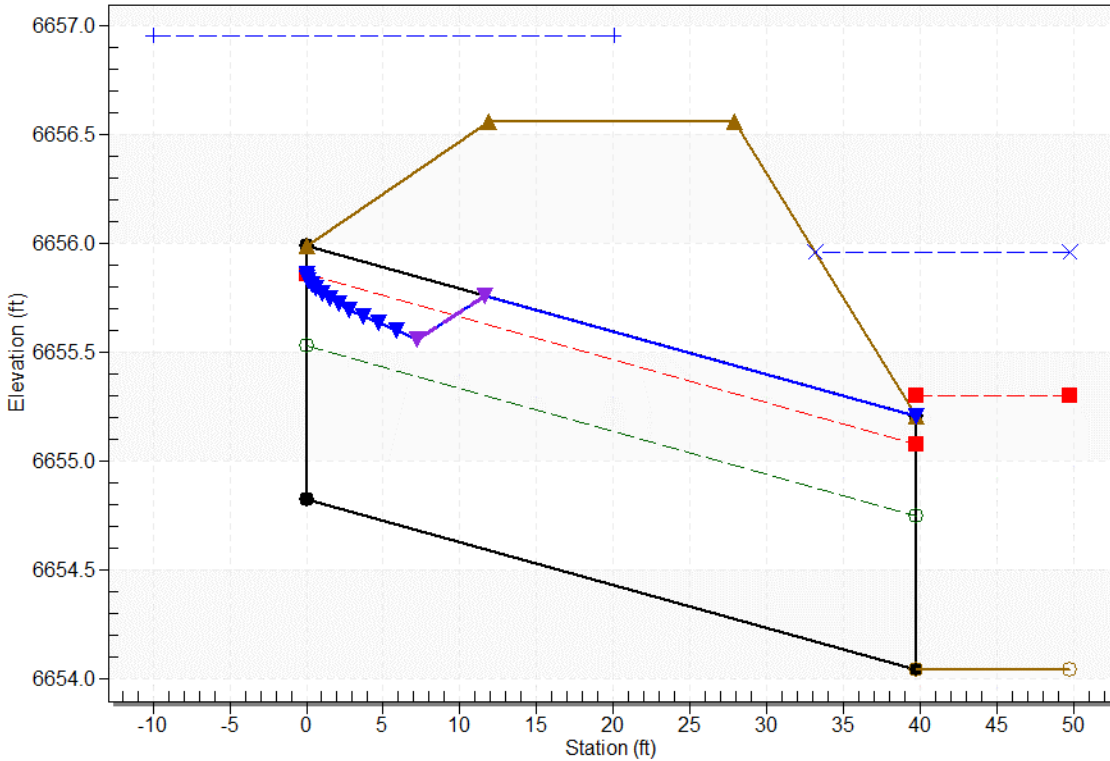
Culvert Slope: 0.0196

### Culvert Performance Curve Plot: Culvert 1



### Water Surface Profile Plot for Culvert: Culvert 1

Crossing - Crossing 1, Design Discharge - 32.1 cfs  
 Culvert - Culvert 1, Culvert Discharge - 10.7 cfs



### Tailwater Data for Crossing: Crossing 1

Table 1 - Downstream Channel Rating Curve (Crossing: Crossing 1)

| Flow (cfs) | Water Surface Elev (ft) | Velocity (ft/s) | Depth (ft) | Shear (psf) | Froude Number |
|------------|-------------------------|-----------------|------------|-------------|---------------|
| 12.00      | 6654.99                 | 0.95            | 3.16       | 0.59        | 0.57          |
| 14.01      | 6655.10                 | 1.06            | 3.32       | 0.66        | 0.57          |
| 16.02      | 6655.20                 | 1.16            | 3.45       | 0.72        | 0.57          |
| 18.03      | 6655.30                 | 1.26            | 3.58       | 0.79        | 0.56          |
| 20.04      | 6655.40                 | 1.36            | 3.69       | 0.85        | 0.56          |
| 22.05      | 6655.50                 | 1.46            | 3.79       | 0.91        | 0.55          |
| 24.06      | 6655.59                 | 1.55            | 3.88       | 0.97        | 0.55          |
| 26.07      | 6655.68                 | 1.64            | 3.96       | 1.03        | 0.54          |
| 28.08      | 6655.78                 | 1.74            | 4.04       | 1.08        | 0.54          |
| 30.09      | 6655.87                 | 1.83            | 4.12       | 1.14        | 0.54          |
| 32.10      | 6655.96                 | 1.92            | 4.19       | 1.20        | 0.53          |

### Tailwater Channel Data - Crossing 1

Tailwater Channel Option: Rectangular Channel

Bottom Width: 4.00 ft

Channel Slope: 0.0100

Channel Manning's n: 0.0350

Channel Invert Elevation: 6654.04 ft

### Roadway Data for Crossing: Crossing 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 29.00 ft

Crest Elevation: 6656.56 ft

Roadway Surface: Paved

Roadway Top Width: 16.00 ft

### Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 12.00 cfs

Design Flow: 32.10 cfs

Maximum Flow: 32.10 cfs

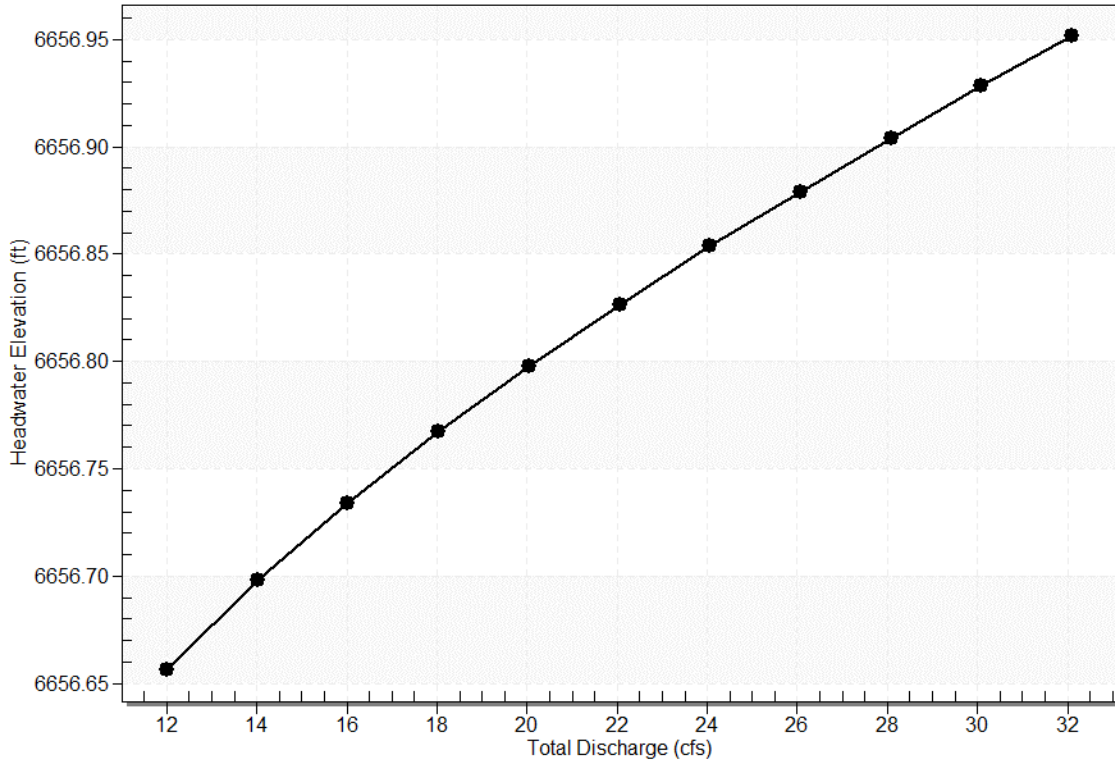
**Table 2 - Summary of Culvert Flows at Crossing: Crossing 1**

| <b>Headwater Elevation (ft)</b> | <b>Total Discharge (cfs)</b> | <b>Culvert 1 Discharge (cfs)</b> | <b>Roadway Discharge (cfs)</b> | <b>Iterations</b> |
|---------------------------------|------------------------------|----------------------------------|--------------------------------|-------------------|
| 6656.66                         | 12.00                        | 9.43                             | 2.56                           | 13                |
| 6656.70                         | 14.01                        | 9.61                             | 4.39                           | 6                 |
| 6656.73                         | 16.02                        | 9.77                             | 6.24                           | 5                 |
| 6656.77                         | 18.03                        | 9.91                             | 8.11                           | 5                 |
| 6656.80                         | 20.04                        | 10.04                            | 9.98                           | 4                 |
| 6656.83                         | 22.05                        | 10.16                            | 11.88                          | 4                 |
| 6656.85                         | 24.06                        | 10.28                            | 13.78                          | 4                 |
| 6656.88                         | 26.07                        | 10.38                            | 15.69                          | 4                 |
| 6656.90                         | 28.08                        | 10.48                            | 17.60                          | 4                 |
| 6656.93                         | 30.09                        | 10.58                            | 19.51                          | 4                 |
| 6656.95                         | 32.10                        | 10.67                            | 21.42                          | 3                 |
| 6656.56                         | 8.98                         | 8.98                             | 0.00                           | Overtopping       |

### Rating Curve Plot for Crossing: Crossing 1

#### Total Rating Curve

Crossing: Crossing 1



## **APPENDIX D**

### **Excerpts from Final Drainage Report – Austin Bluffs Parkway Corridor Project Phase 3**

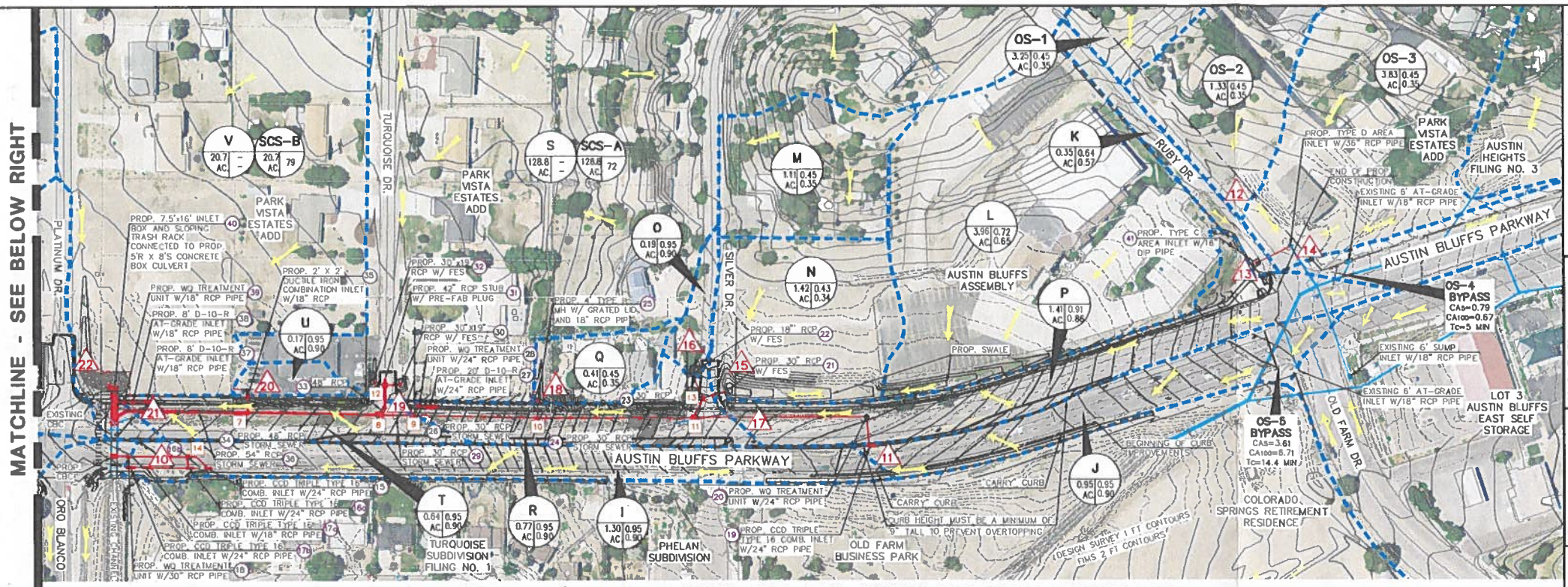
**LEGEND**

- EXISTING GROUND CONTOUR: 5908
- PROPOSED FINISHED CONTOUR: 5910
- PROPERTY LINES: ---
- DRAINAGE BASIN BOUNDARY: - - - -
- DIRECTION OF DRAINAGE: →
- EXISTING STORM SEWER: —
- EXISTING STORM INLET: □
- PROPOSED STORM SEWER W/ MANHOLE: —●—
- MANHOLE I.D.: □
- PIPE RUN I.D.: ( )
- SURFACE FLOW DESIGN POINT: Δ

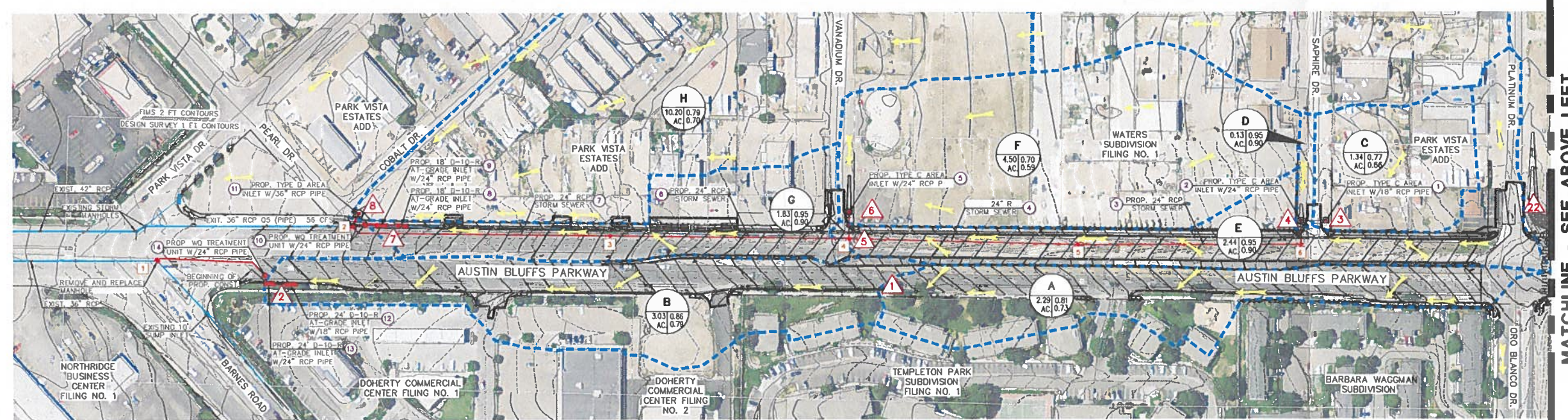
**SCALE: 1" = 200'**

**Basin Summary Legend:**

- SUB-BASIN ID: M
- BASIN IDENTIFIER: M
- AREA IN ACRES: 1.11
- 100-YR RUNOFF COEFFICIENT: 0.45
- 5-YR RUNOFF COEFFICIENT: 0.35



**PLATINUM DR./ORO BLANCO DR. TO RUBY DR./OLD FARM DR.**



**BARNES RD. TO PLATINUM DR./ORO BLANCO DR.**

**BASIN RUNOFF SUMMARY**

| BASIN | Q5 (CFS) | Q100 (CFS) |
|-------|----------|------------|
| A     | 9        | 17         |
| B     | 12       | 24         |
| C     | 5        | 9          |
| D     | 1        | 1          |
| E     | 11       | 21         |
| F     | 11       | 23         |
| G     | 8        | 16         |
| H     | 27       | 55         |
| I     | 4        | 8          |
| J     | 4        | 8          |
| K     | 1        | 2          |
| L     | 11       | 22         |
| M     | 2        | 4          |

**BASIN RUNOFF SUMMARY**

| BASIN | Q5 (CFS) | Q100 (CFS) |
|-------|----------|------------|
| N     | 2        | 5          |
| O     | 1        | 2          |
| P     | 6        | 12         |
| Q     | 1        | 2          |
| R     | 4        | 7          |
| S     | 74       | 94         |
| T     | 3        | 6          |
| U     | 1        | 1          |
| V     | 24       | 71         |
| OS-1  | 4        | 10         |
| OS-2  | 2        | 5          |
| OS-3  | 5        | 13         |

**SURFACE FLOW DESIGN POINT SUMMARY**

| DESIGN POINT | Q5 (CFS)        | Q100 (CFS) |
|--------------|-----------------|------------|
| 1            | 9               | 17         |
| 2            | 19              | 37         |
| 3            | 5               | 9          |
| 4            | 1               | 1          |
| 5            | 11              | 21         |
| 6            | 11              | 23         |
| 7            | 18              | 35         |
| 8            | 27              | 55         |
| 9            | THIS # NOT USED |            |
| 10           | 9               | 32         |
| 11           | 15              | 46         |

**SURFACE FLOW DESIGN POINT SUMMARY**

| DESIGN POINT | Q5 (CFS) | Q100 (CFS) |
|--------------|----------|------------|
| 12           | 6        | 14         |
| 13           | 1        | 2          |
| 14           | 11       | 26         |
| 15           | 14       | 29         |
| 16           | 1        | 2          |
| 17           | 12       | 22         |
| 18           | 1        | 2          |
| 19           | 15       | 27         |
| 20           | 1        | 1          |
| 21           | 3        | 6          |
| 22           | 31*/24** | 71*/290**  |

**PIPE RUN SUMMARY**

| PIPE | Q5 | PIPE SIZE |
|------|----|-----------|
| 1    | 5  | 18"       |
| 2    | 5  | 24"       |
| 3    | 5  | 24"       |
| 4    | 5  | 24"       |
| 5    | 11 | 24"       |
| 6    | 15 | 24"       |
| 7    | 15 | 24"       |

**PIPE RUN SUMMARY**

| PIPE | Q5 | PIPE SIZE |
|------|----|-----------|
| 8    | 12 | 24"       |
| 9    | 19 | 24"       |
| 10   | 19 | 24"       |
| 11   | 27 | 36"       |
| 12   | 13 | 18"       |
| 13   | 19 | 24"       |
| 14   | 19 | 24"       |

**PIPE RUN SUMMARY**

| PIPE | Q5 | Q100 | PIPE SIZE |
|------|----|------|-----------|
| 15   | 6  | 14   | 24"       |
| 16a  | 3  | 9    | 24"       |
| 16b  | 9  | 23   | 30"       |
| 17a  | 1  | 6    | 18"       |
| 17b  | 1  | 8    | 24"       |
| 18   | 9  | 31   | 30"       |
| 19   | 9  | 20   | 24"       |
| 20   | 9  | 20   | 24"       |
| 21   | 14 | 29   | 30"       |
| 22   | 1  | 2    | 18"       |

**PIPE RUN SUMMARY**

| PIPE | Q5 | Q100 | PIPE SIZE |
|------|----|------|-----------|
| 23   | 15 | 30   | 30"       |
| 24   | 21 | 44   | 30"       |
| 25   | 1  | 2    | 18"       |
| 26   | 22 | 45   | 30"       |
| 27   | 10 | 15   | 24"       |
| 28   | 10 | 15   | 24"       |
| 29   | 28 | 55   | 30"       |
| 30   | 12 | 14   | 30"x19"   |
| 31   | 83 | 83   | 42"       |
| 32   | 12 | 14   | 30"x19"   |

**PIPE RUN SUMMARY**

| PIPE | Q5  | Q100 | PIPE SIZE |
|------|-----|------|-----------|
| 33   | 107 | 112  | 48"       |
| 34   | 131 | 163  | 48"       |
| 35   | 1   | 1    | 18"       |
| 36   | 130 | 162  | 54"       |
| 37   | 2   | 4    | 18"       |
| 38   | 3   | 6    | 18"       |
| 39   | 3   | 6    | 18"       |
| 40   | 24  | 290  | 5'x8" CBC |
| 41   | 1   | 2    | 16" DIP   |

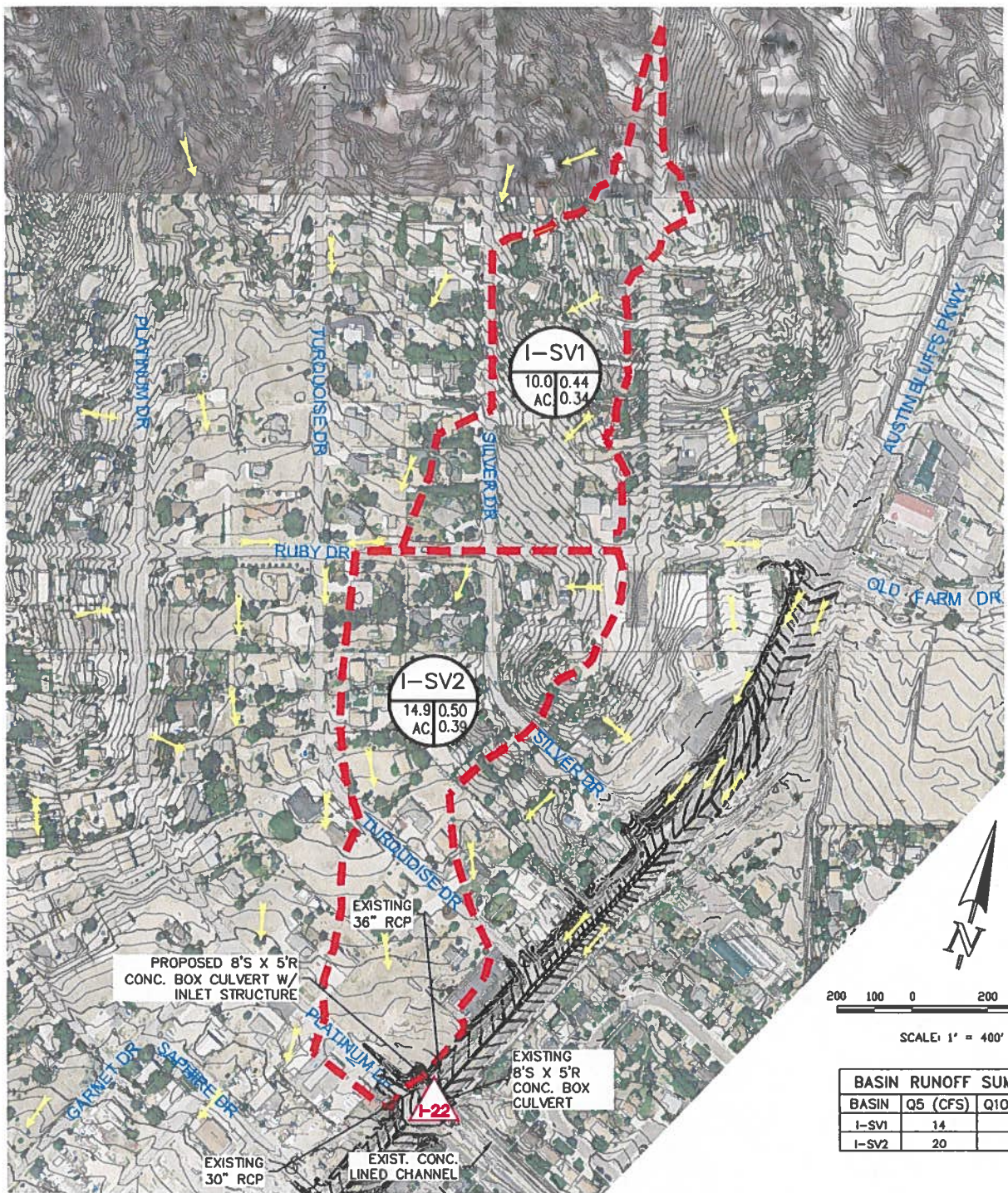
PROJECT NAME: AUSTIN BLUFFS PARKWAY CITY OF COLORADO SPRINGS, EL PASO COUNTY, COLORADO

| MARK | DATE | DESCRIPTION |
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PROJECT NO: \_\_\_\_\_  
 DESIGNED BY: DLM  
 DRAWN BY: DLM  
 CHECKED BY: VSF  
 DATE: \_\_\_\_\_  
 SHEET TITLE: DRAINAGE MAP SEGMENT 3 ONSITE AREAS  
 SHEET NO: DM 1

\*Interim Condition/\*\*Ultimate Condition





200 100 0 200 400

SCALE: 1" = 400'

| BASIN RUNOFF SUMMARY |          |            |
|----------------------|----------|------------|
| BASIN                | Q5 (CFS) | Q100 (CFS) |
| I-SV1                | 14       | 31         |
| I-SV2                | 20       | 45         |

**LEGEND**

- EXISTING GROUND CONTOUR 5910
- PROPOSED FINISHED CONTOUR 5910
- SCS BASIN BOUNDARY
- DIRECTION OF DRAINAGE
- DESIGN POINT
- SUB-BASIN ID
- BASIN IDENTIFIER
- AREA IN ACRES
  - 100-YR RUNOFF COEFFICIENT
  - 5-YR RUNOFF COEFFICIENT

| SURFACE FLOW DESIGN POINT SUMMARY |          |            |
|-----------------------------------|----------|------------|
| DESIGN POINT                      | Q5 (CFS) | Q100 (CFS) |
| I-22                              | 31       | 71         |

THIS MAP DEPICTS THE OFFSITE BASINS THAT ARE EXPECTED TO CONTRIBUTE RUNOFF TO THE WEST END OF THE BOX CULVERT AT THE COMPLETION OF THE ABP PHASE III CONSTRUCTION.

# AUSTIN BLUFFS PARKWAY SEGMENT 3 DRAINAGE MAP 2

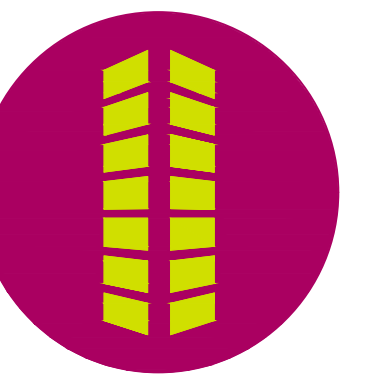
## C.B.C. INTERIM OFFSITE BASIN

**WILSON  
& COMPANY**

**APPENDIX E**  
**Drainage Maps**

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**SITE DEVELOPMENT PLAN**  
**HOPE PHYSICAL THERAPY-PARKING LOT**  
**THIRTEEN OUTLAWS, LLC**  
4850 AUSTIN BLUFFS PKWY  
COLORADO SPRINGS, CO 80918

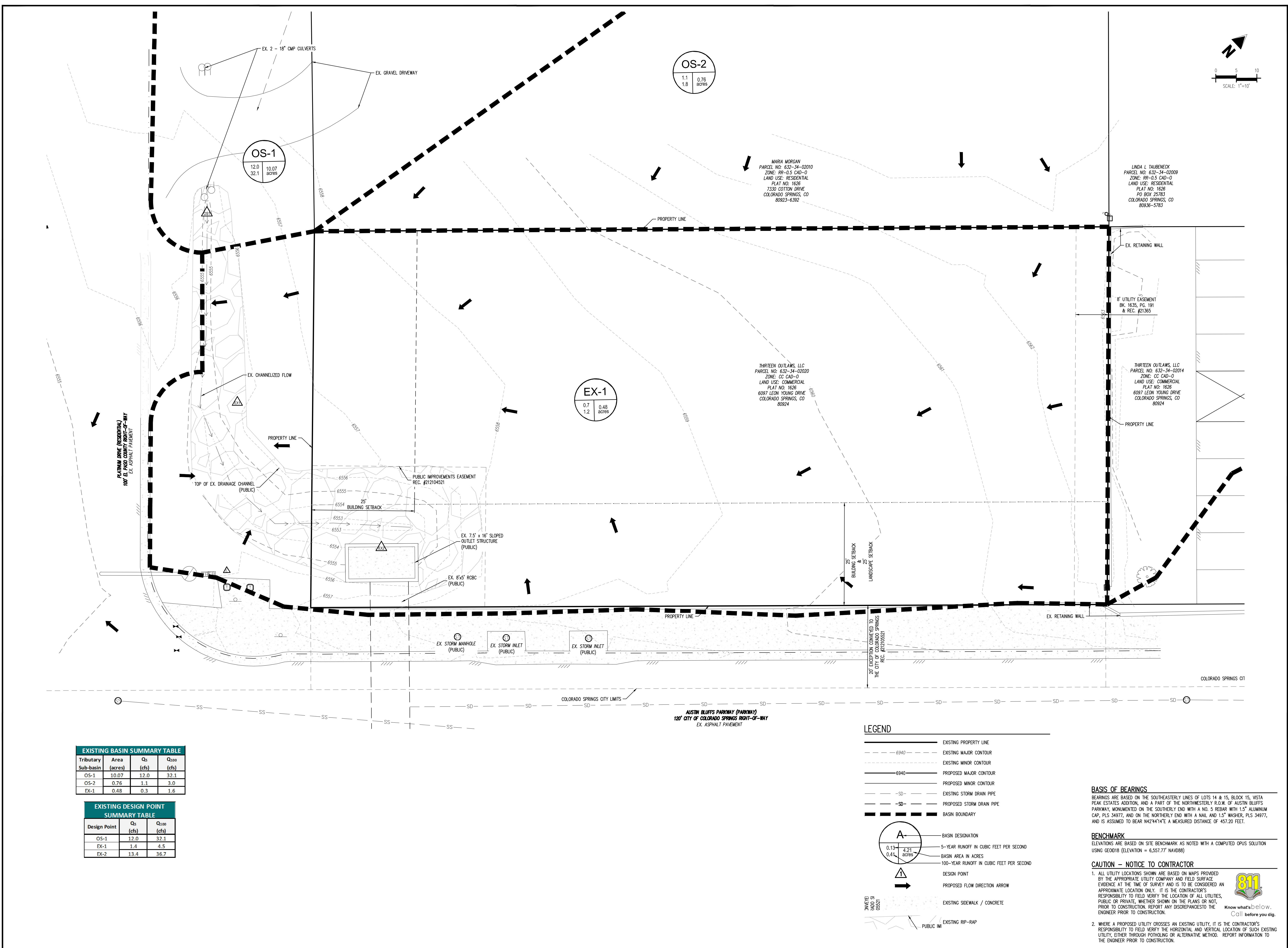
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Project No: HPT01  
Drawn By: MRW  
Checked By: MJP  
Date: AUGUST 2023

EXISTING DRAINAGE MAP



**EX-DR**



**EXISTING BASIN SUMMARY TABLE**

| Tributary Sub-basin | Area (acres) | Q <sub>s</sub> (cfs) | Q <sub>100</sub> (cfs) |
|---------------------|--------------|----------------------|------------------------|
| OS-1                | 10.07        | 12.0                 | 32.1                   |
| OS-2                | 0.76         | 1.1                  | 3.0                    |
| EX-1                | 0.48         | 0.3                  | 1.6                    |

**EXISTING DESIGN POINT SUMMARY TABLE**

| Design Point | Q <sub>s</sub> (cfs) | Q <sub>100</sub> (cfs) |
|--------------|----------------------|------------------------|
| OS-1         | 12.0                 | 32.1                   |
| EX-1         | 1.4                  | 4.5                    |
| EX-2         | 13.4                 | 36.7                   |

**LEGEND**

- EXISTING PROPERTY LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN PIPE
- BASIN BOUNDARY
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- DESIGN POINT
- PROPOSED FLOW DIRECTION ARROW
- EXISTING SIDEWALK / CONCRETE
- EXISTING RIP-RAAP

**BASIS OF BEARINGS**  
BEARINGS ARE BASED ON THE SOUTHEASTERLY LINES OF LOTS 14 & 15, BLOCK 15, VISTA PEAK ESTATES ADDITION, AND A PART OF THE NORTHWESTERLY R.O.W. OF AUSTIN BLUFFS PARKWAY, MONUMENTED ON THE SOUTHERLY END WITH A NO. 5 REBAR WITH 1.5" ALUMINUM CAP, PLS 34977, AND ON THE NORTHERLY END WITH A NAIL AND 1.5" WASHER, PLS 34977, AND IS ASSUMED TO BEAR N42°44'14"E A MEASURED DISTANCE OF 457.20 FEET.

**BENCHMARK**  
ELEVATIONS ARE BASED ON SITE BENCHMARK AS NOTED WITH A COMPUTED OPUS SOLUTION USING GEOID18 (ELEVATION = 6,557.77' NAVD88)

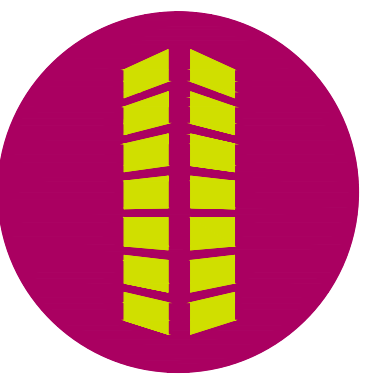
**CAUTION - NOTICE TO CONTRACTOR**

- ALL UTILITY LOCATIONS SHOWN ARE BASED ON MAPS PROVIDED BY THE APPROPRIATE UTILITY COMPANY AND FIELD SURFACE EVIDENCE AT THE TIME OF SURVEY AND IS TO BE CONSIDERED AN APPROXIMATE LOCATION ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION OF ALL UTILITIES, PUBLIC OR PRIVATE, WHETHER SHOWN ON THE PLANS OR NOT, PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO CONSTRUCTION.
- WHERE A PROPOSED UTILITY CROSSES AN EXISTING UTILITY, IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF SUCH EXISTING UTILITY, EITHER THROUGH POT-HOING OR ALTERNATIVE METHOD. REPORT INFORMATION TO THE ENGINEER PRIOR TO CONSTRUCTION.

3/18/2023 11:00 AM: 4850 Austin Bluffs Parkway, Colorado Springs, CO 80918

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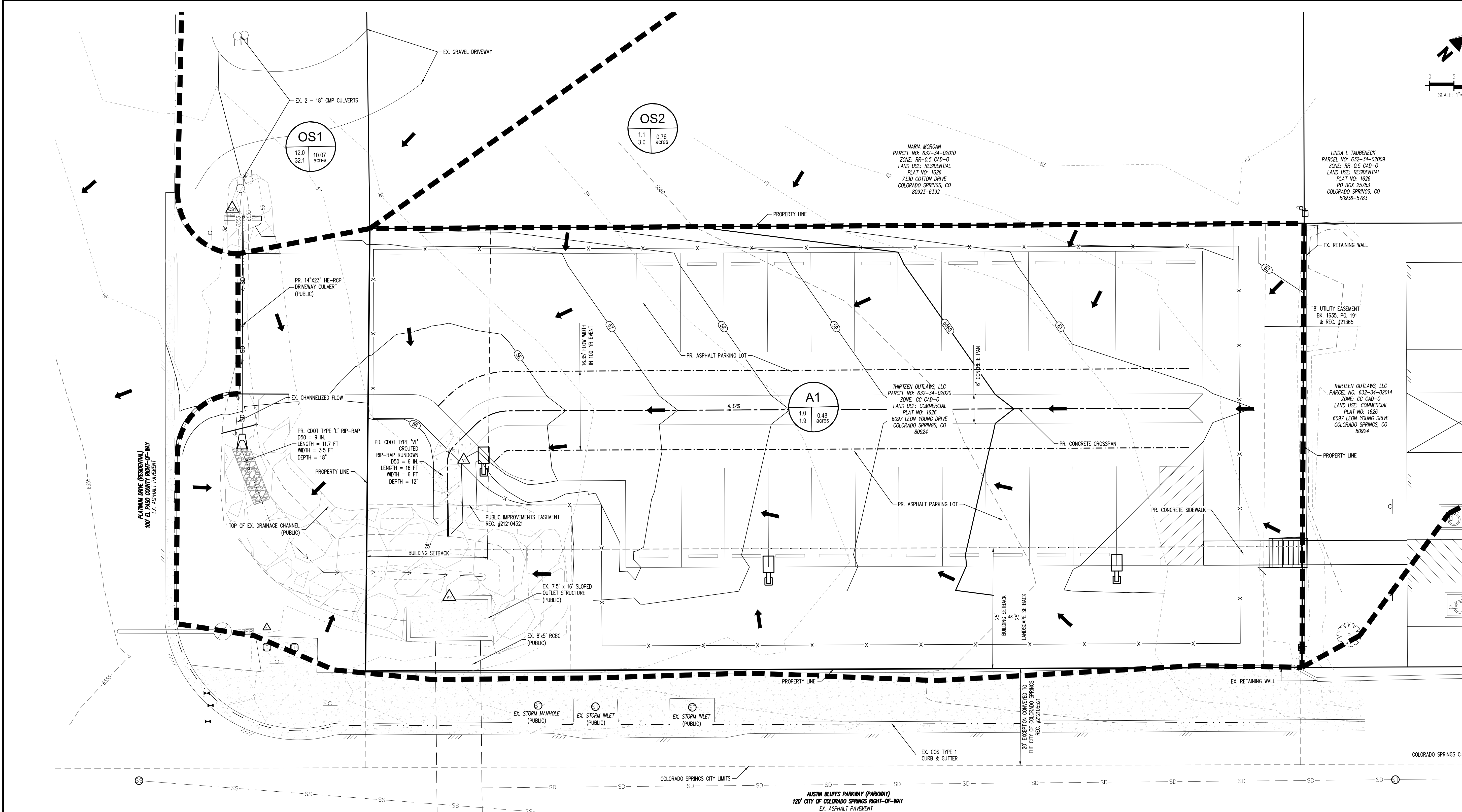
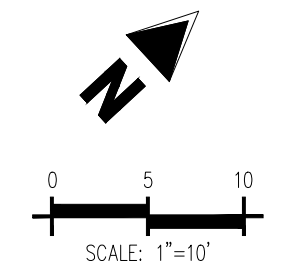
SITE DEVELOPMENT PLAN  
HOPE PHYSICAL THERAPY-PARKING LOT  
THIRTEEN OUTLAWS, LLC  
4850 AUSTIN BLUFFS PKWY  
COLORADO SPRINGS, CO 80918

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Project No: HPT01  
Drawn By: MRW  
Checked By: MJP  
Date: AUGUST 2023

DRAINAGE MAP

DR



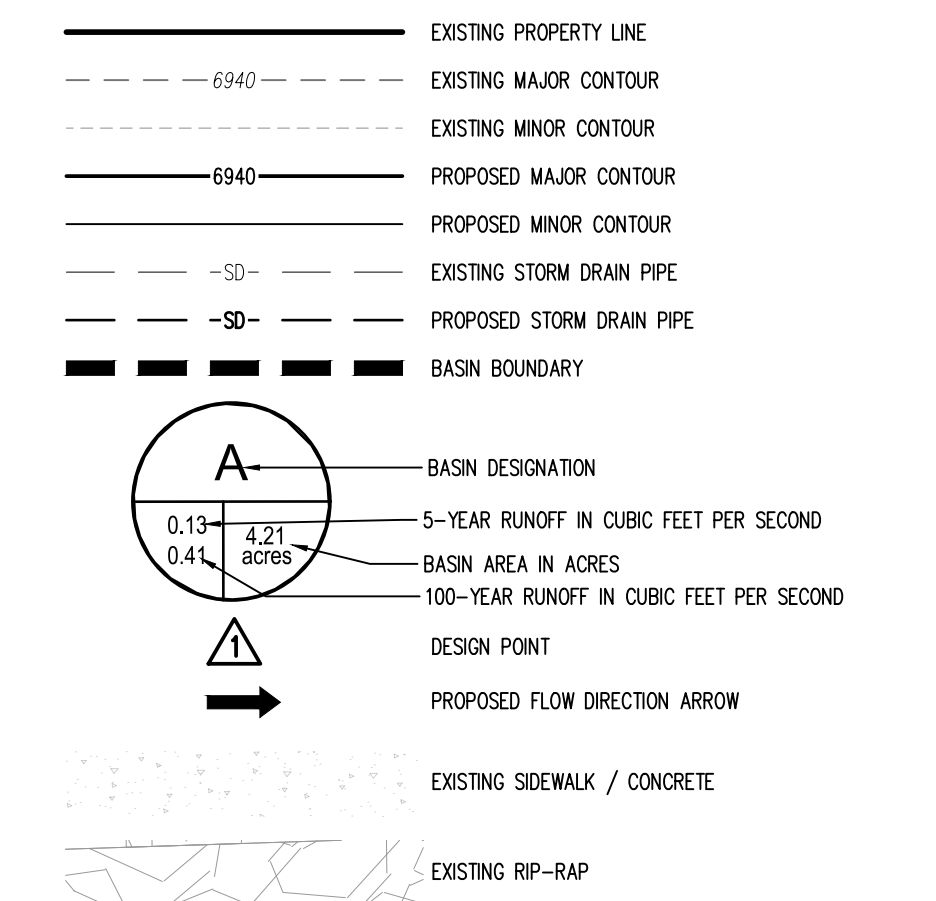
**PROPOSED BASIN SUMMARY TABLE**

| Tributary | Area (acres) | Q <sub>s</sub> (cfs) | Q <sub>100</sub> (cfs) |
|-----------|--------------|----------------------|------------------------|
| OS-1      | 10.07        | 12.0                 | 32.1                   |
| OS-2      | 0.76         | 1.1                  | 3.0                    |
| A-1       | 0.48         | 1.0                  | 1.9                    |

**PROPOSED DESIGN POINT SUMMARY TABLE**

| Design Point | Q <sub>s</sub> (cfs) | Q <sub>100</sub> (cfs) |
|--------------|----------------------|------------------------|
| OS-1         | 12.0                 | 32.1                   |
| A-1          | 1.9                  | 4.9                    |
| A-2          | 13.9                 | 37.0                   |

**LEGEND**



**BASIS OF BEARINGS**  
BEARINGS ARE BASED ON THE SOUTHEASTERLY LINES OF LOTS 14 & 15, BLOCK 15, VISTA PEAK ESTATES ADDITION, AND A PART OF THE NORTHWESTERLY R.O.W. OF AUSTIN BLUFFS PARKWAY, MONUMENTED ON THE SOUTHERLY END WITH A NO. 5 REBAR WITH 1.5" ALUMINUM CAP, PLS 34977, AND ON THE NORTHERLY END WITH A NAIL AND 1.5" WASHER, PLS 34977, AND IS ASSUMED TO BEAR N42°44'14"E A MEASURED DISTANCE OF 457.20 FEET.

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