FINAL DRAINAGE REPORT
FOR
WELSH SUBDIVISION

May 2026

Prepared For:
William Guman and Associates
Attn: Bill Guman
731 N. Weber Street, Suite 100
Colorado Springs, CO 80903

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive, Suite 235
Colorado Springs, CO 80919
719-593-2593

Project No. 25341.00
PCD File No. EA257
SF2628

J·R ENGINEERING

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 letter has been prepared according to the criteria established by El Paso County 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.

_____ _____

Bryan T. Law, Colorado P.E. # 25043 Date
For and On Behalf of JR Engineering, LLC

DEVELOPER'S STATEMENT:

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

Developer, not applicant.

Business Name: William Guman and Associates

By: _____

Title: _____

Address: 731 N. Weber Street, Suite 100
Colorado Springs, CO 80903

EL PASO COUNTY STATEMENT:

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

El Paso County Engineer/ECM Administrator

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 J. Palmer, P.E. Date
County Engineer / ECM Administrator

Conditions:

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PURPOSE

This document is the Final Drainage Report for Welsh Subdivision. The purpose of this report is to identify on-site and off-site drainage patterns, areas tributary to the site, and to safely route developed stormwater to adequate outfalls.

GENERAL SITE DESCRIPTION

GENERAL LOCATION

Welsh Subdivision (hereby referred to as the "site") is a proposed development with a total area of approximately 5 acres. The site is located in the southwest quarter of Section 14, Township 12 South, Range 66 West of the Sixth Principal Meridian in El Paso County, State of Colorado. The site is bounded by: unplatted land with a single-family residence located at 11575 Howells Road to the north, unplatted land with a single-family residence located at 4310 Saxton Hollow Road to the east, unplatted land with a single-family residence located at 11555 Howells Road to the west, and unplatted land with a single-family residence located at 3970 Mountain View Drive and 4030 Mountain View Drive to the south. Refer to the vicinity map in Appendix A for additional information.

DESCRIPTION OF PROPERTY

The site is currently an unplatted parcel with a single-family residence and associated driveway and utilities located on the site. The asphalt driveway has curb and gutter and leads to the residence as well as a gravel drive that runs north along the western property line. The eastern part of the site has steeper slopes that drain to the Kettle Creek drainageway located off-site.

The proposed site will be developed into two large single-family lots (2.5-acre minimum). The two lots (Lot 1 and 2) will be accessed by a 30 foot ingress, egress & utility easement. No construction or site improvements are proposed at this time, only the creation of the Welsh Subdivision.

Soils located on the project site are Kettle gravelly loamy sand. These soils are classified as Hydrologic Soil Group B. Group B soils exhibit moderate infiltration rates when thoroughly wet, and consist mainly of moderately deep, moderately well drained to well drained soils. Refer to the soil survey map in Appendix A for additional information.

There are no known irrigation facilities located on the project site.

FLOODPLAIN STATEMENT

Based on the FEMA FIRM Map number 08041C0507G, dated December 7, 2018, the site lies within Zone X. Zone X is defined as the area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. Refer to the FIRM Map in Appendix A for additional information.

DRAINAGE DESIGN CRITERIA

DEVELOPMENT CRITERIA REFERENCE

Storm drainage analysis and design criteria for this project were taken from the "City of Colorado Springs/El Paso County Drainage Criteria Manual" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "Urban Storm Drainage Criteria Manual" Volumes 1 to 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual" (CSDCM), dated May 2014, as adopted by El Paso County.

HYDROLOGIC CRITERIA

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. On-site drainage improvements were designed based on the 5-year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from NOAA Atlas 14-point precipitation frequency estimate for the project location. One-hour point rainfall data for the minor and major storm events is identified in the chart below. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from CSDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Table 1: 1-hr Point Rainfall Data

Storm	Rainfall (in.)
5-year	1.20
100-year	2.53

HYDRAULIC CRITERIA

The Rational Method and USDCM's SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site. Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) was used to analyze the roadside swale per criteria. See Appendix C for hydraulic calculations.

EXISTING DRAINAGE CONDITIONS

MAJOR BASIN DESCRIPTIONS

Based on the map of the Drainage Basins for El Paso County, the site lies within the Kettle Creek Drainage Basin. The Kettle Creek Drainage Basin was studied in the "Drainage Basin Planning Study for Kettle Creek Basin" by JR Engineering, dated May 2015 (see Appendix D for excerpts). The Kettle Creek originates on the southern slope of Black Forest and flows in a southwesterly direction towards the City of Colorado Springs. The Black Forest area of the watershed is dominated by ponderosa pine forest and grassland on undeveloped large lot single-family residential lots. Towards Powers Boulevard, the watershed shifts to mostly undeveloped grassland. Downstream of Powers Blvd, the watershed once again shifts to single-family residences, commercial centers, and vacant land. The Kettle Creek watershed has a contributing area of approximately 16.4 square miles at the junction with I-25.

The site specifically is located near the center of the Kettle Creek Drainage Basin, within a portion of Basin 17 as shown in the "Drainage Basin Planning Study for Kettle Creek Basin". The site is located to the east of junction J13 and south of junction J14 as notated in the Kettle Creek DBPS. The existing drainage patterns shall be preserved. The entire site is composed of NRCS Type B soils which are great for permeable surfaces and landscape areas. Runoff from the impervious surfaces from the future development will flow over existing naturally vegetated areas to slow the runoff and promote infiltration before outfalling to Kettle Creek. The Kettle Creek DBPS also acknowledges that grading and grade control structures may not be feasible in Kettle Creek due to the disturbance they would cause with the presence of the Preble's jumping mouse and habitats.

EXISTING SUB-BASIN DRAINAGE

The site was analyzed to consider off-site tributary area as well as on-site drainage patterns. The existing basin delineation for the site as shown on the map within Appendix E is as follows:

Basin OS1 is approximately 0.17 acres with a 10% assumed impervious and is comprised of a portion of the developed 5-acre single-family lot south of the site and a swale along the on-site asphalt drive. Runoff generated by this basin (Q_5=0.1 cfs, Q_{100}=0.4 cfs) flows overland to the northwest and then west along the existing swale at DPO1. Flows combine at DP1.1 to the west of the site.

Basin A is approximately 0.43 acres with a 41% impervious and is comprised of an asphalt driveway, gravel driveway, swale and a portion of the single-family residence. Runoff generated by this basin (Q_5=0.8 cfs, Q_{100}=2.0 cfs) flows overland and then to the asphalt curb and gutter at DP1. Flows from DPO1 and DP1 combine at DP1.1 (Q_5=0.8 cfs, Q_{100}=2.1 cfs) to the west of the site.

Basin B is approximately 0.19 acres with a 23% impervious and is comprised of a gravel driveway and undeveloped land. Runoff generated by this basin (Q_5=0.2 cfs, Q_{100}=0.7 cfs) flows overland to the western site boundary at DP2 and then flows off-site to the northwest.

Basin OS2 is approximately 1.27 acres with a 10% assumed impervious and is comprised of a portion of the developed 5-acre single-family lot south of the site. Runoff generated by this basin (Q_5=0.8 cfs, Q_{100}=3.3 cfs) flows overland to the northwest and then flows on-site at DPO2. Flows combine at DP3.1 on the northern boundary of the site.

Basin C is approximately 3.54 acres with a 3% impervious and is comprised of a portion of the gravel driveway, a portion of the single-family residence and undeveloped land. Runoff generated by this basin (Q_5=1.3 cfs, Q_{100}=7.9 cfs) flows overland towards the northern site boundary at DP3. Flows from DPO2 and DP3 combine at DP3.1 (Q_5=2.0 cfs, Q_{100}=11.1 cfs) at the northern property boundary. Flows then continue flowing off-site to the north.

Basin D is approximately 0.84 acres with a 2% impervious and is comprised of steeper undeveloped land. Runoff generated by this basin (Q_5=0.3 cfs, Q_{100}=2.1 cfs) flows overland to the site boundary at DP4 and then flows off-site to the northeast. Flows continue flowing off-site towards the Kettle Creek drainageway.

PROPOSED DRAINAGE CONDITIONS

PROPOSED DRAINAGE CONVEYANCE AND SUB-BASIN DRAINAGE

This development is only for the creation of the Welsh Subdivision Lot 1 and 2, no construction or site improvements are proposed at this time. Therefore, the proposed drainage conditions and sub-basins are the same as the existing condition. The proposed basin delineation for the site is shown on the map within Appendix E.

Proposed conditions must account for a single family home/driveway on the new lot as that is the ultimate purpose of this subdivision. Please update/revise.

Please include the comparison between existing vs. developed flows in cfs and percentage for the 5 and 100 year events.

COMPARISON OF FLOWS

There are several locations where the ex

- Flows travel west off-site at DP1.1 at the asphalt curb and gutter and driveway swale.
- Flows travel northwest off-site at DP2 sheet flowing overland.
- Flows travel north off-site at DP3.1 sheet flowing overland.
- Flows travel northeast off-site at DP4 to the Kettle Creek drainageway.

This development is only for the creation of the Welsh Subdivision, no construction or site improvements are proposed at this time. Therefore, there is no difference in the flows when comparing the existing and proposed conditions.

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

The proposed stormwater conveyance system was designed to follow the historic drainage paths and thus minimize the possibility of adverse effects downstream. Due to this, there are no drainage problems anticipated downstream of the site.

The drainage report must clearly state that there will be no adverse impacts to downstream properties.

SPECIFIC DETAILS

Four Step Process to Minimize Adverse Impacts of Urbanization

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

Step 1: Reducing Runoff Volumes - The site development consists of minimal drive aisles to provide access for the single-family residence within the development. This layout will allow for increased infiltration and reduce runoff volume as the amount of development is limited.

It's section I.6.1.B.5 in the updated appendix I

Step 2: Treat the WQCV - The 2.5-acre (minimum) residential houses on Lot 1 and 2 will be limited to a maximum of 10% imperviousness to meet the requirements of Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure for water quality through a plat note. Should Lot 1 or 2 exceed 10% imperviousness, a lot specific drainage report addressing the increased imperviousness must be submitted.

Step 3: Stabilize Drainageways – The site lies within the Kettle Creek Drainage Basin. The drainage fees for Kettle Creek are identified in the tables within the Drainage and Bridge Fees section below. The site does not affect the discharge directly into the open drainageway of Kettle Creek; therefore, no downstream stabilization will be required with this project.

this is the final drainage report.

Step 4: Implementing Long Term Source Controls - A site specific stormwater quality and erosion control plan and narrative shall be prepared in conjunction with the future final drainage report when construction occurs. Site specific temporary source control BMPs will be detailed in that plan and narrative to protect receiving waters.

Please see DCM 1.4.2. DEVELOPERS IN AND ALONG A DRAINAGEWAY ARE REQUIRED TO IMPLEMENT THE PROPER MEASURES TO MAINTAIN OR CREATE STABLE CHARACTERISTICS OF THE DRAINAGEWAY. THE PRINCIPAL OBJECTIVE IS TO LIMIT EXCESSIVE EROSION IN AND ALONG THE CHANNEL.

The soils report section 6.8 indicates accelerated erosion along the NE corner of the property. Analyze the stability of the slope/channel and provide recommendations mitigate the accelerated erosion regardless of whether the flows will be increased in this area by this subdivision. Please revise narrative as needed.

Water Quality

As previously stated, the applicable exclusions for Basins A-C within Lot 1 and 2 fall under Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure for areas with large single-family lots (2.5-acre min.). In addition, Basin D falls under the Section I.7.1.B.7 of the ECM Stormwater Quality Policy and Procedure for sites with land disturbance to undeveloped land that will remain undeveloped. See Table 2 below for the water quality treatment summary table indicating which basins are excluded.

Table 2: Water Quality Treatment Summary Table

PBMP Summary Table		
Basins	Tributary Area (area)	PBMP
A-C	4.16	Excluded*
D	0.84	Excluded**
*Excluded based on large lot single family sites per ECM App. I.7.B.5 **Excluded based on land disturbance to undeveloped land that will remain undeveloped per ECM App. I.7.B.7		

The large lot exclusion can only be applied to the entire lot. Since it appears that basin D qualifies for the large lot exclusion, I recommend that it is applied to the entire site.

6

Erosion Control Plan

We respectfully request that the Final Erosion Control Plan and associated Cost Estimate to be submitted in conjunction with the construction drawings prior to obtaining a grading permit at the time of development.

Operation & Maintenance

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as; inspection, routine maintenance, restorative maintenance, rehabilitation, and repair are required. All proposed drainage structures within easements will be owned and maintained by the property owner unless another party accepts such responsibility in writing and responsibility is properly assigned through legal documentation. Inspection access for El Paso County will be provided through a maintenance easement.

Drainage and Bridge Fees

The site lies within the Kettle Creek Drainage Basin. See Table 3 and 4 for the calculated fees per impervious acre, using the maximum allowed for large single-family lots.

Table 3: Site Impervious Acres

Welsh Subdivision - Impervious Area Calculation			
Breakdown	Area (acres)	% Impervious	Impervious Acres
Lot 1	2.5027	10%	0.25
Lot 2	2.5050	10%	0.25
Total	**5.0077**		**0.50**

Table 4: Kettle Creek Drainage Basin fees.

a 25% reduction applies to the basin fee for lots 2.5 acres and greater.

2026 Drainage and Bridge Fee – Welsh Subdivision				
Impervious Acres (ac.)	Kettle Creek Drainage Fee (Per Imp. Acre)	Kettle Creek Bridge Fee (Per Imp. Acre)	Welsh Subdivision Drainage Fee	Welsh Subdivision Bridge Fee
0.50	$14,733	$0	$7,377.84	$0.00

Construction Cost Opinion

We respectfully request that the Construction Cost Opinion to be submitted in conjunction with the construction drawings and at the time of development.

SUMMARY

The proposed Welsh Subdivision drainage improvements were designed to meet or exceed the El Paso County Drainage Criteria. The proposed development will not adversely affect the off-site drainageways or surrounding developments. This report is in conformance and meets the latest El Paso County Storm Drainage Criteria requirements for this site.

REFERENCES

1. Engineering Criteria Manual, El Paso County, October 14, 2020.

2. City of Colorado Springs Drainage Criteria Manual: Volume 1, City of Colorado Springs, CO, May 2014.

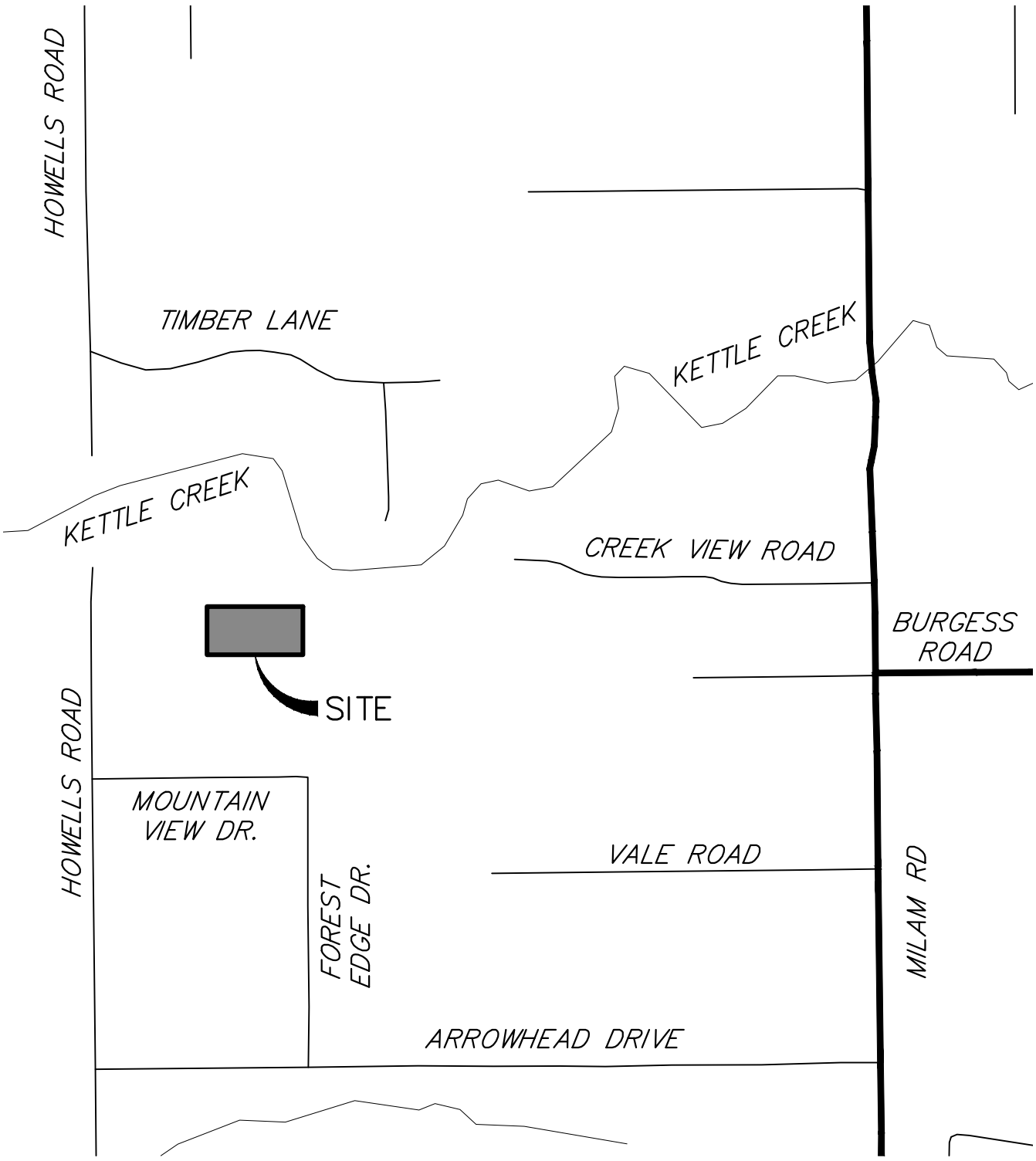
3. Urban Storm Drainage Criteria Manual: Volume 1, 2 and 3, Urban Drainage and Flood Control District, Latest Revisions.

4. "Soil Survey of El Paso County Area, Colorado," by the USDA Natural Resources Conservation Service.

5. Drainage Basin Planning Study for Kettle Creek Basin, prepared by JR Engineering LLC and dated May 5, 2015.

Appendix A

Vicinity Map, Soil Descriptions, FEMA Floodplain Map



1000 500 0 1000

ORIGINAL SCALE: 1" = 1000'

WELSH SUBDIVISION
VICINITY MAP
25341.00
05/04/2026
SHEET 1 OF 1

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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 0.0' 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 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.

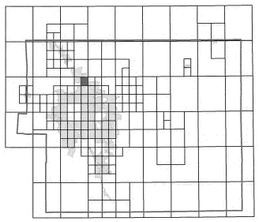
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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/nfip.

El Paso County Vertical Datum Offset Table

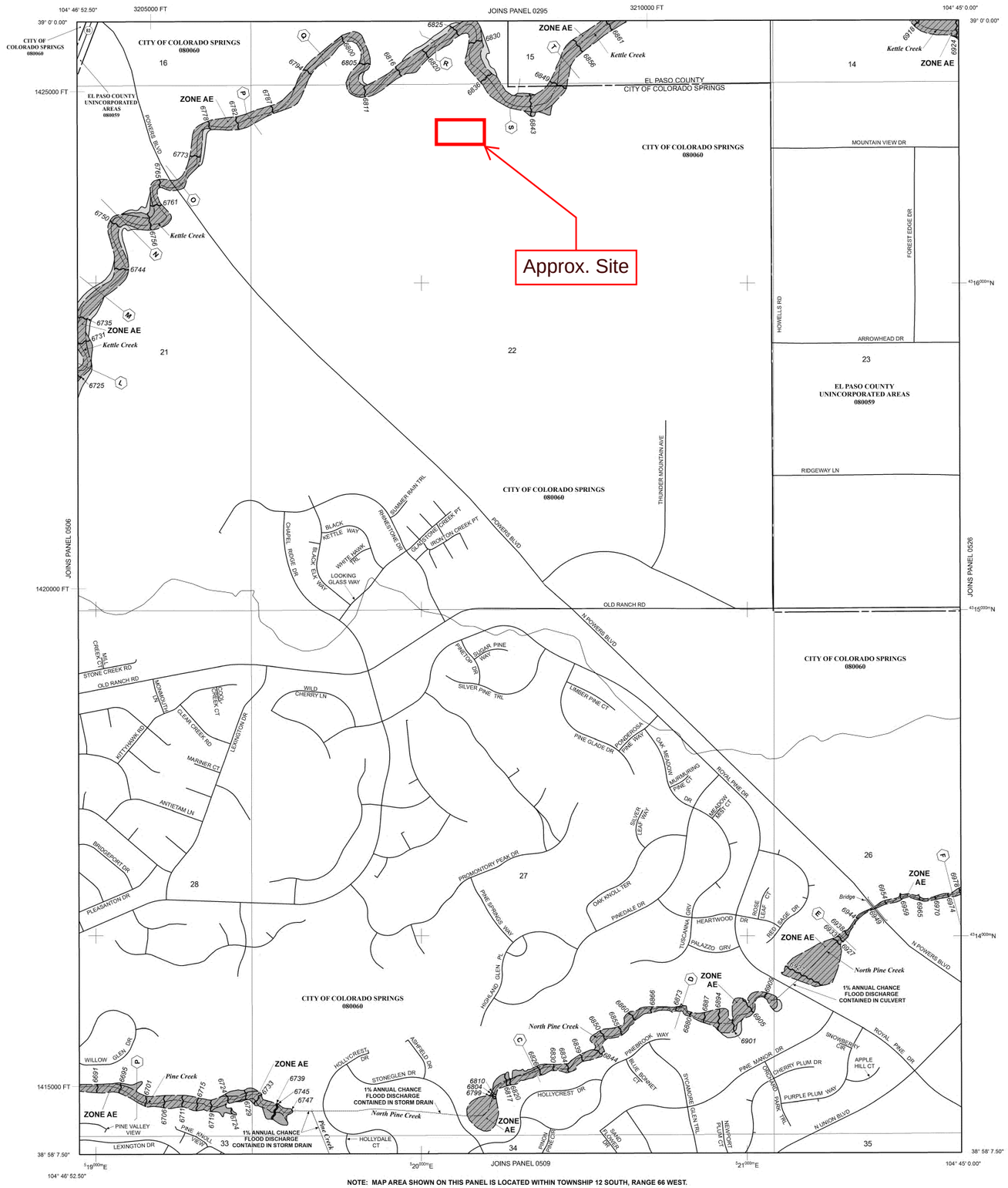
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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 12 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 decertified. 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 flood 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 — Transect line
- 97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), 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 COUNTYWIDE 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

NFIP

PANEL 0507G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 507 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0507	G
EL PASO COUNTY	080059	0507	G

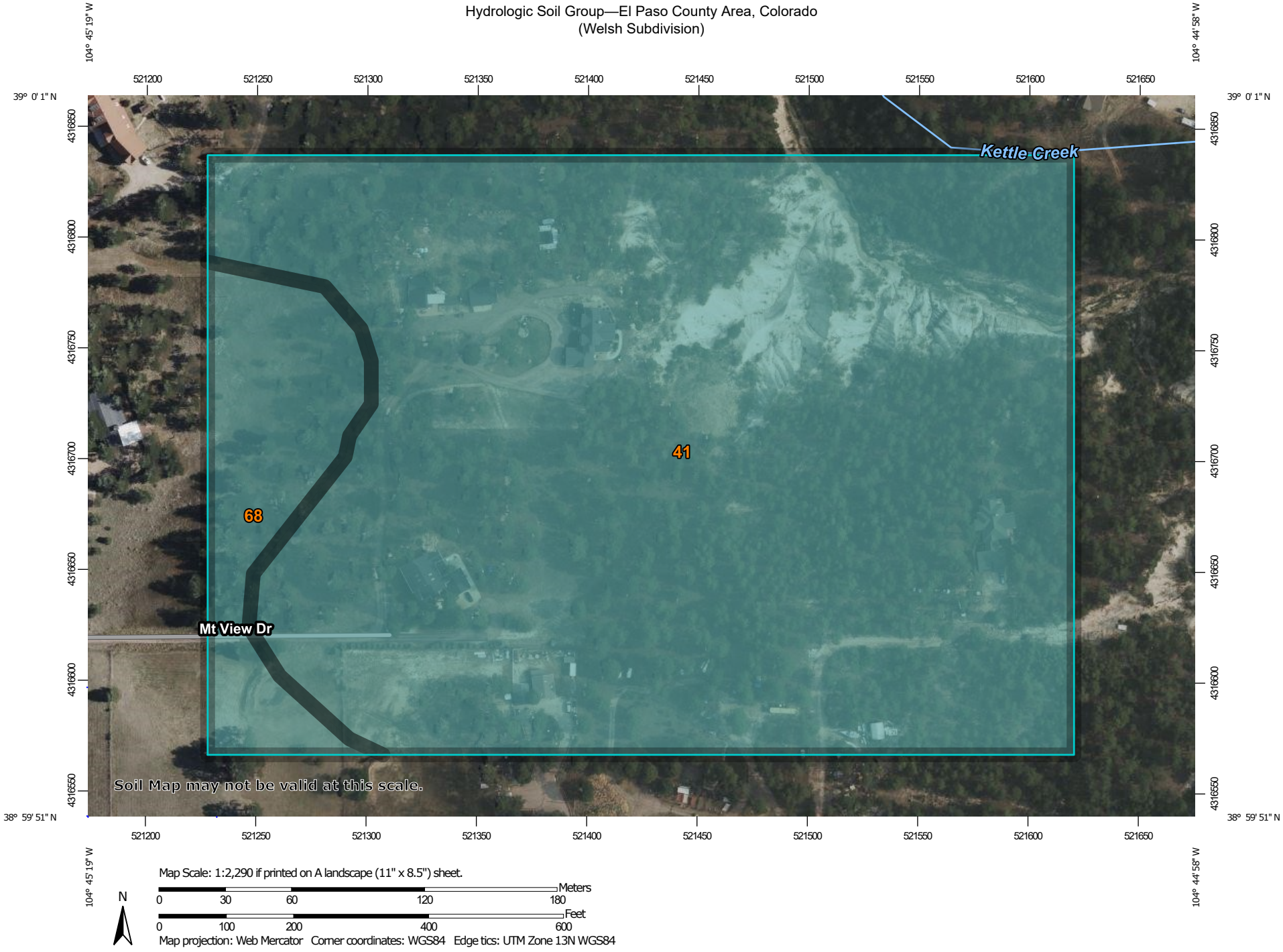
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0507G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

Hydrologic Soil Group—El Paso County Area, Colorado
(Welsh Subdivision)



Map Scale: 1:2,290 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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 23, Aug 29, 2025

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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	23.7	90.0%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	2.6	10.0%
Totals for Area of Interest			**26.4**	**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

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 38.9986°, Longitude: -104.7537°
Elevation: 7013 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.235 (0.194-0.288)	0.290 (0.238-0.354)	0.383 (0.314-0.469)	0.465 (0.379-0.573)	0.585 (0.462-0.752)	0.683 (0.525-0.887)	0.786 (0.582-1.04)	0.894 (0.634-1.22)	1.05 (0.711-1.47)	1.17 (0.769-1.65)
10-min	0.345 (0.284-0.421)	0.424 (0.349-0.518)	0.561 (0.460-0.687)	0.681 (0.555-0.839)	0.857 (0.677-1.10)	1.00 (0.769-1.30)	1.15 (0.853-1.53)	1.31 (0.929-1.79)	1.53 (1.04-2.15)	1.71 (1.13-2.42)
15-min	0.420 (0.346-0.513)	0.517 (0.426-0.632)	0.684 (0.561-0.838)	0.831 (0.677-1.02)	1.04 (0.826-1.34)	1.22 (0.938-1.58)	1.40 (1.04-1.87)	1.60 (1.13-2.18)	1.87 (1.27-2.62)	2.08 (1.37-2.95)
30-min	0.598 (0.492-0.730)	0.734 (0.604-0.897)	0.969 (0.795-1.19)	1.18 (0.959-1.45)	1.48 (1.17-1.90)	1.73 (1.33-2.24)	1.99 (1.47-2.64)	2.26 (1.60-3.09)	2.64 (1.80-3.71)	2.95 (1.95-4.18)
60-min	0.769 (0.634-0.939)	0.924 (0.761-1.13)	1.20 (0.988-1.48)	1.46 (1.19-1.80)	1.85 (1.47-2.40)	2.18 (1.68-2.85)	2.53 (1.88-3.39)	2.92 (2.08-4.00)	3.47 (2.36-4.88)	3.91 (2.58-5.54)
2-hr	0.940 (0.779-1.14)	1.12 (0.923-1.35)	1.44 (1.19-1.75)	1.75 (1.43-2.14)	2.22 (1.78-2.87)	2.63 (2.05-3.43)	3.08 (2.31-4.11)	3.58 (2.56-4.89)	4.29 (2.95-6.01)	4.87 (3.24-6.86)
3-hr	1.04 (0.866-1.26)	1.21 (1.01-1.47)	1.55 (1.28-1.88)	1.88 (1.55-2.29)	2.41 (1.95-3.11)	2.87 (2.25-3.74)	3.38 (2.55-4.51)	3.96 (2.86-5.41)	4.80 (3.32-6.72)	5.50 (3.67-7.71)
6-hr	1.23 (1.03-1.47)	1.41 (1.18-1.70)	1.78 (1.48-2.15)	2.16 (1.79-2.61)	2.77 (2.26-3.58)	3.32 (2.62-4.31)	3.94 (3.00-5.23)	4.64 (3.37-6.31)	5.66 (3.95-7.89)	6.52 (4.38-9.09)
12-hr	1.44 (1.22-1.72)	1.67 (1.40-1.99)	2.11 (1.77-2.52)	2.55 (2.12-3.06)	3.25 (2.66-4.15)	3.87 (3.07-4.98)	4.56 (3.49-6.00)	5.34 (3.91-7.20)	6.48 (4.54-8.96)	7.42 (5.02-10.3)
24-hr	1.69 (1.43-2.00)	1.98 (1.67-2.34)	2.52 (2.12-2.99)	3.03 (2.54-3.61)	3.82 (3.13-4.80)	4.49 (3.58-5.70)	5.23 (4.02-6.80)	6.04 (4.44-8.06)	7.22 (5.08-9.88)	8.18 (5.57-11.2)
2-day	1.97 (1.68-2.31)	2.33 (1.98-2.74)	2.98 (2.52-3.50)	3.56 (3.00-4.21)	4.42 (3.63-5.48)	5.14 (4.11-6.45)	5.91 (4.56-7.59)	6.74 (4.97-8.89)	7.91 (5.60-10.7)	8.85 (6.07-12.1)
3-day	2.16 (1.85-2.53)	2.56 (2.18-2.99)	3.24 (2.76-3.80)	3.86 (3.26-4.55)	4.77 (3.93-5.88)	5.52 (4.43-6.89)	6.33 (4.89-8.08)	7.19 (5.32-9.43)	8.39 (5.96-11.3)	9.36 (6.45-12.7)
4-day	2.33 (2.00-2.72)	2.73 (2.34-3.19)	3.44 (2.94-4.03)	4.08 (3.46-4.79)	5.02 (4.14-6.17)	5.80 (4.66-7.21)	6.63 (5.14-8.45)	7.52 (5.58-9.84)	8.77 (6.25-11.8)	9.77 (6.76-13.3)
7-day	2.74 (2.36-3.18)	3.17 (2.73-3.68)	3.92 (3.37-4.56)	4.60 (3.92-5.37)	5.60 (4.65-6.84)	6.44 (5.20-7.95)	7.32 (5.71-9.27)	8.27 (6.18-10.8)	9.61 (6.89-12.8)	10.7 (7.43-14.4)
10-day	3.11 (2.69-3.59)	3.57 (3.08-4.12)	4.38 (3.76-5.07)	5.09 (4.36-5.93)	6.16 (5.12-7.48)	7.03 (5.70-8.65)	7.96 (6.22-10.0)	8.95 (6.71-11.6)	10.3 (7.44-13.8)	11.5 (8.00-15.4)
20-day	4.15 (3.61-4.76)	4.76 (4.13-5.46)	5.78 (5.00-6.64)	6.66 (5.73-7.69)	7.92 (6.60-9.49)	8.92 (7.26-10.8)	9.97 (7.83-12.4)	11.1 (8.32-14.2)	12.5 (9.07-16.5)	13.7 (9.64-18.3)
30-day	5.01 (4.37-5.72)	5.75 (5.01-6.56)	6.96 (6.05-7.98)	7.98 (6.90-9.18)	9.40 (7.85-11.2)	10.5 (8.57-12.7)	11.6 (9.15-14.4)	12.8 (9.64-16.2)	14.3 (10.4-18.7)	15.5 (10.9-20.6)
45-day	6.09 (5.33-6.92)	6.99 (6.12-7.95)	8.45 (7.37-9.63)	9.64 (8.36-11.0)	11.2 (9.39-13.2)	12.5 (10.2-14.9)	13.7 (10.8-16.8)	14.8 (11.2-18.7)	16.4 (11.9-21.3)	17.5 (12.4-23.2)
60-day	7.00 (6.15-7.93)	8.04 (7.06-9.12)	9.69 (8.48-11.0)	11.0 (9.58-12.6)	12.8 (10.7-14.9)	14.1 (11.5-16.7)	15.3 (12.1-18.7)	16.5 (12.5-20.8)	18.0 (13.1-23.4)	19.1 (13.6-25.3)

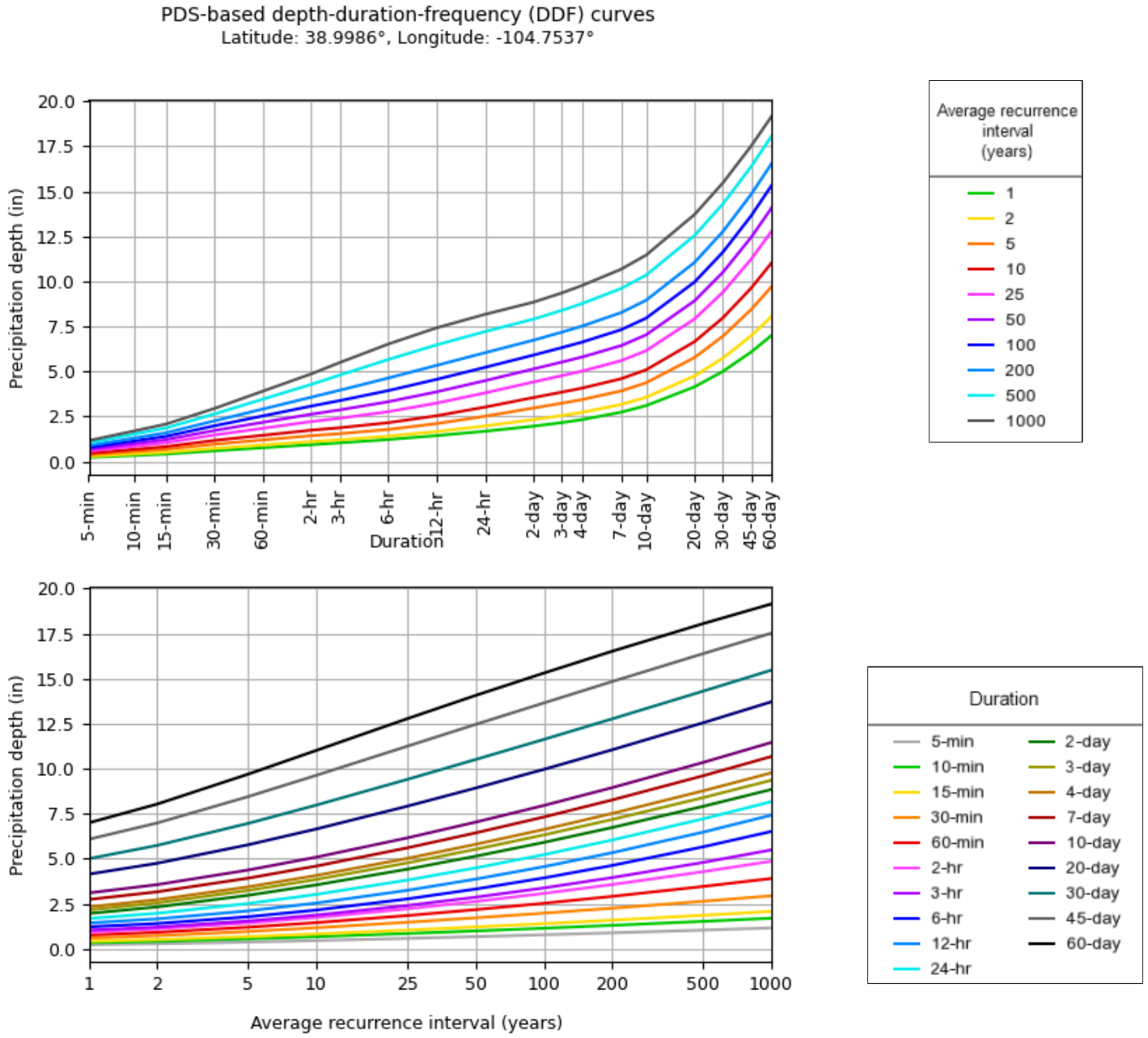
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



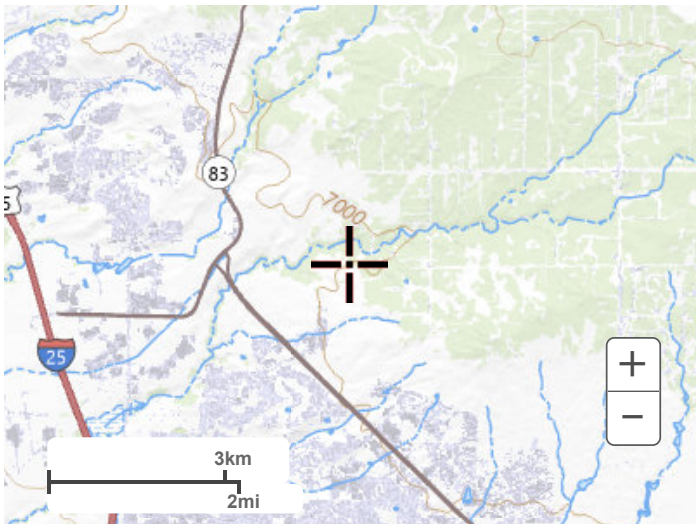
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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Appendix B

Hydrologic Calculations

PRE-DEVELOPMENT COMPOSITE % IMPERVIOUS & COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Welsh Subdivision
Location: El Paso County

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Roofs (90% Impervious)				Streets-Gravel (80% Impervious)				Rural 5-Acre Lots (10% Impervious)				Historical Analysis (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A	0.43	0.90	0.96	0.10	23.3%	0.73	0.81	0.06	12.6%	0.59	0.70	0.02	3.7%	0.16	0.41	0.00	0.0%	0.09	0.36	0.25	1.2%	0.39	0.58	40.7%
B	0.19	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.05	21.1%	0.16	0.41	0.00	0.0%	0.09	0.36	0.14	1.5%	0.22	0.45	22.5%
C	3.54	0.90	0.96	0.00	0.0%	0.73	0.81	0.05	1.3%	0.59	0.70	0.01	0.2%	0.16	0.41	0.00	0.0%	0.09	0.36	3.48	2.0%	0.10	0.37	3.5%
D	0.84	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.00	0.0%	0.16	0.41	0.00	0.0%	0.09	0.36	0.84	2.0%	0.09	0.36	2.0%
OS1	0.17	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.00	0.0%	0.16	0.41	0.17	10.0%	0.09	0.36	0.00	0.0%	0.16	0.41	10.0%
OS2	1.27	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.00	0.0%	0.16	0.41	1.27	10.0%	0.09	0.36	0.00	0.0%	0.16	0.41	10.0%
TOTAL ON-SITE	5.00																							7.1%
TOTAL OFF-SITE	1.44																							10.0%

PRE-DEVELOPMENT
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Welsh Subdivision
Location: El Paso County

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A	0.43	B	41%	0.39	0.58	35	2.2%	5.8	150	5.0%	20.0	4.5	0.6	6.4	185.0	19.8	6.4
B	0.19	B	23%	0.22	0.45	100	8.0%	8.0	15	7.0%	15.0	4.0	0.1	8.0	115.0	22.2	8.0
C	3.54	B	3%	0.10	0.37	100	4.0%	11.4	375	6.0%	10.0	2.4	2.6	14.0	475.0	28.1	14.0
D	0.84	B	2%	0.09	0.36	205	21.0%	9.6	0	0.0%	10.0	0.0	0.0	9.6	205.0	25.7	10.0
OS1	0.17	B	10%	0.16	0.41	100	3.8%	10.9	260	4.5%	15.0	3.2	1.4	12.3	360.0	26.3	12.3
OS2	1.27	B	10%	0.16	0.41	100	3.3%	11.4	175	2.0%	15.0	2.1	1.4	12.8	275.0	26.3	12.8

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

PRE-DEVELOPMENT STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Welsh Subdivision
Location: El Paso County
Design Storm: 5-Year

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	O1	OS1	0.17	0.16	12.3	0.03	3.82	0.1															Sheet flows overland then to swale at O1 Combines flow within the swale off-site at DP1.1
	1	A	0.43	0.39	6.4	0.17	4.80	0.8															Flows over the drives and to the curb and gutter then off-site Combines flow within the swale off-site at DP1.1
	1.1								12.3	0.20	3.82	0.8											Combines flow of DPO1 and DP1 within off-site swale Continues flowing west and south off-site
	2	B	0.19	0.22	8.0	0.04	4.45	0.2															Sheet flows overland to property boundary at DP2 Continues flowing west and north off-site
	O2	OS2	1.27	0.16	12.8	0.20	3.76	0.8															Sheet flows overland then flows on-site at DPO2 Combines flow at northern property line at DP3.1
	3	C	3.54	0.10	14.0	0.36	3.63	1.3															Sheet flows overland to property boundary at DP3 Combines flow at northern property line at DP3.1
	3.1								14.0	0.56	3.63	2.0											Combines flow of DPO2 and DP3 at the northern property line Continues flowing north off-site to Kettle Creek
	4	D	0.84	0.09	10.0	0.08	4.13	0.3															Sheet flows overland to basin boundary at DP4 Continues flowing northeast off-site to Kettle Creek

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

PRE-DEVELOPMENT STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Welsh Subdivision
Location: El Paso County
Design Storm: 100-Year

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	O1	OS1	0.17	0.41	12.3	0.07	6.41	0.4															Sheet flows overland then to swale at O1 Combines flow within the swale off-site at DP1.1
	1	A	0.43	0.58	6.4	0.25	8.06	2.0															Flows over the drives and to the curb and gutter then off-site Combines flow within the swale off-site at DP1.1
	1.1								12.3	0.32	6.41	2.1											Combines flow of DPO1 and DP1 within off-site swale Continues flowing west and south off-site
	2	B	0.19	0.45	8.0	0.09	7.48	0.7															Sheet flows overland to property boundary at DP2 Continues flowing west and north off-site
	O2	OS2	1.27	0.41	12.8	0.52	6.31	3.3															Sheet flows overland then flows on-site at DPO2 Combines flow at northern property line at DP3.1
	3	C	3.54	0.37	14.0	1.30	6.09	7.9															Sheet flows overland to property boundary at DP3 Combines flow at northern property line at DP3.1
	3.1								14.0	1.82	6.09	11.1											Combines flow of DPO2 and DP3 at the northern property line Continues flowing north off-site to Kettle Creek
	4	D	0.84	0.36	10.0	0.30	6.93	2.1															Sheet flows overland to basin boundary at DP4 Continues flowing northeast off-site to Kettle Creek

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

PLATTED DEVELOPMENT COMPOSITE % IMPERVIOUS & COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Welsh Subdivision
Location: El Paso County

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Roofs (90% Impervious)				Streets-Gravel (80% Impervious)				Rural 5-Acre Lots (10% Impervious)				Historical Analysis (2% Impervious)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A	0.43	0.90	0.96	0.10	23.3%	0.73	0.81	0.06	12.6%	0.59	0.70	0.02	3.7%	0.16	0.41	0.00	0.0%	0.09	0.36	0.25	1.2%	0.39	0.58	40.7%
B	0.19	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.05	21.1%	0.16	0.41	0.00	0.0%	0.09	0.36	0.14	1.5%	0.22	0.45	22.5%
C	3.54	0.90	0.96	0.00	0.0%	0.73	0.81	0.05	1.3%	0.59	0.70	0.01	0.2%	0.16	0.41	0.00	0.0%	0.09	0.36	3.48	2.0%	0.10	0.37	3.5%
D	0.84	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.00	0.0%	0.16	0.41	0.00	0.0%	0.09	0.36	0.84	2.0%	0.09	0.36	2.0%
OS1	0.17	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.00	0.0%	0.16	0.41	0.17	10.0%	0.09	0.36	0.00	0.0%	0.16	0.41	10.0%
OS2	1.27	0.90	0.96	0.00	0.0%	0.73	0.81	0.00	0.0%	0.59	0.70	0.00	0.0%	0.16	0.41	1.27	10.0%	0.09	0.36	0.00	0.0%	0.16	0.41	10.0%
TOTAL ON-SITE	5.00																							7.1%
TOTAL OFF-SITE	1.44																							10.0%

PLATTED DEVELOPMENT
STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Welsh Subdivision
Location: El Paso County

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A	0.43	B	41%	0.39	0.58	35	2.2%	5.8	150	5.0%	20.0	4.5	0.6	6.4	185.0	19.8	6.4
B	0.19	B	23%	0.22	0.45	100	8.0%	8.0	15	7.0%	15.0	4.0	0.1	8.0	115.0	22.2	8.0
C	3.54	B	3%	0.10	0.37	100	4.0%	11.4	375	6.0%	10.0	2.4	2.6	14.0	475.0	28.1	14.0
D	0.84	B	2%	0.09	0.36	205	21.0%	9.6	0	0.0%	10.0	0.0	0.0	9.6	205.0	25.7	10.0
OS1	0.17	B	10%	0.16	0.41	100	3.8%	10.9	260	4.5%	15.0	3.2	1.4	12.3	360.0	26.3	12.3
OS2	1.27	B	10%	0.16	0.41	100	3.3%	11.4	175	2.0%	15.0	2.1	1.4	12.8	275.0	26.3	12.8

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

PLATTED DEVELOPMENT STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Welsh Subdivision
Location: El Paso County
Design Storm: 5-Year

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	O1	OS1	0.17	0.16	12.3	0.03	3.82	0.1															Sheet flows overland then to swale at O1 Combines flow within the swale off-site at DP1.1
	1	A	0.43	0.39	6.4	0.17	4.80	0.8															Flows over the drives and to the curb and gutter then off-site Combines flow within the swale off-site at DP1.1
	1.1								12.3	0.20	3.82	0.8											Combines flow of DPO1 and DP1 within off-site swale Continues flowing west and south off-site
	2	B	0.19	0.22	8.0	0.04	4.45	0.2															Sheet flows overland to property boundary at DP2 Continues flowing west and north off-site
	O2	OS2	1.27	0.16	12.8	0.20	3.76	0.8															Sheet flows overland then flows on-site at DPO2 Combines flow at northern property line at DP3.1
	3	C	3.54	0.10	14.0	0.36	3.63	1.3															Sheet flows overland to property boundary at DP3 Combines flow at northern property line at DP3.1
	3.1								14.0	0.56	3.63	2.0											Combines flow of DPO2 and DP3 at the northern property line Continues flowing north off-site to Kettle Creek
	4	D	0.84	0.09	10.0	0.08	4.13	0.3															Sheet flows overland to basin boundary at DP4 Continues flowing northeast off-site to Kettle Creek

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

PLATTED DEVELOPMENT STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Welsh Subdivision
Location: El Paso County
Design Storm: 100-Year

Project Name: Welsh Subdivision
Project No.: 25341.00
Calculated By: GAG
Checked By: BTL
Date: 5/4/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	O1	OS1	0.17	0.41	12.3	0.07	6.41	0.4															Sheet flows overland then to swale at O1 Combines flow within the swale off-site at DP1.1
	1	A	0.43	0.58	6.4	0.25	8.06	2.0															Flows over the drives and to the curb and gutter then off-site Combines flow within the swale off-site at DP1.1
	1.1								12.3	0.32	6.41	2.1											Combines flow of DPO1 and DP1 within off-site swale Continues flowing west and south off-site
	2	B	0.19	0.45	8.0	0.09	7.48	0.7															Sheet flows overland to property boundary at DP2 Continues flowing west and north off-site
	O2	OS2	1.27	0.41	12.8	0.52	6.31	3.3															Sheet flows overland then flows on-site at DPO2 Combines flow at northern property line at DP3.1
	3	C	3.54	0.37	14.0	1.30	6.09	7.9															Sheet flows overland to property boundary at DP3 Combines flow at northern property line at DP3.1
	3.1								14.0	1.82	6.09	11.1											Combines flow of DPO2 and DP3 at the northern property line Continues flowing north off-site to Kettle Creek
	4	D	0.84	0.36	10.0	0.30	6.93	2.1															Sheet flows overland to basin boundary at DP4 Continues flowing northeast off-site to Kettle Creek

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

Appendix C

Hydraulic Calculations

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, May 4 2026

DP1.1 - Existing Swale

User-defined

Invert Elev (ft)	= 7003.92
Slope (%)	= 5.50
N-Value	= 0.022

Calculations

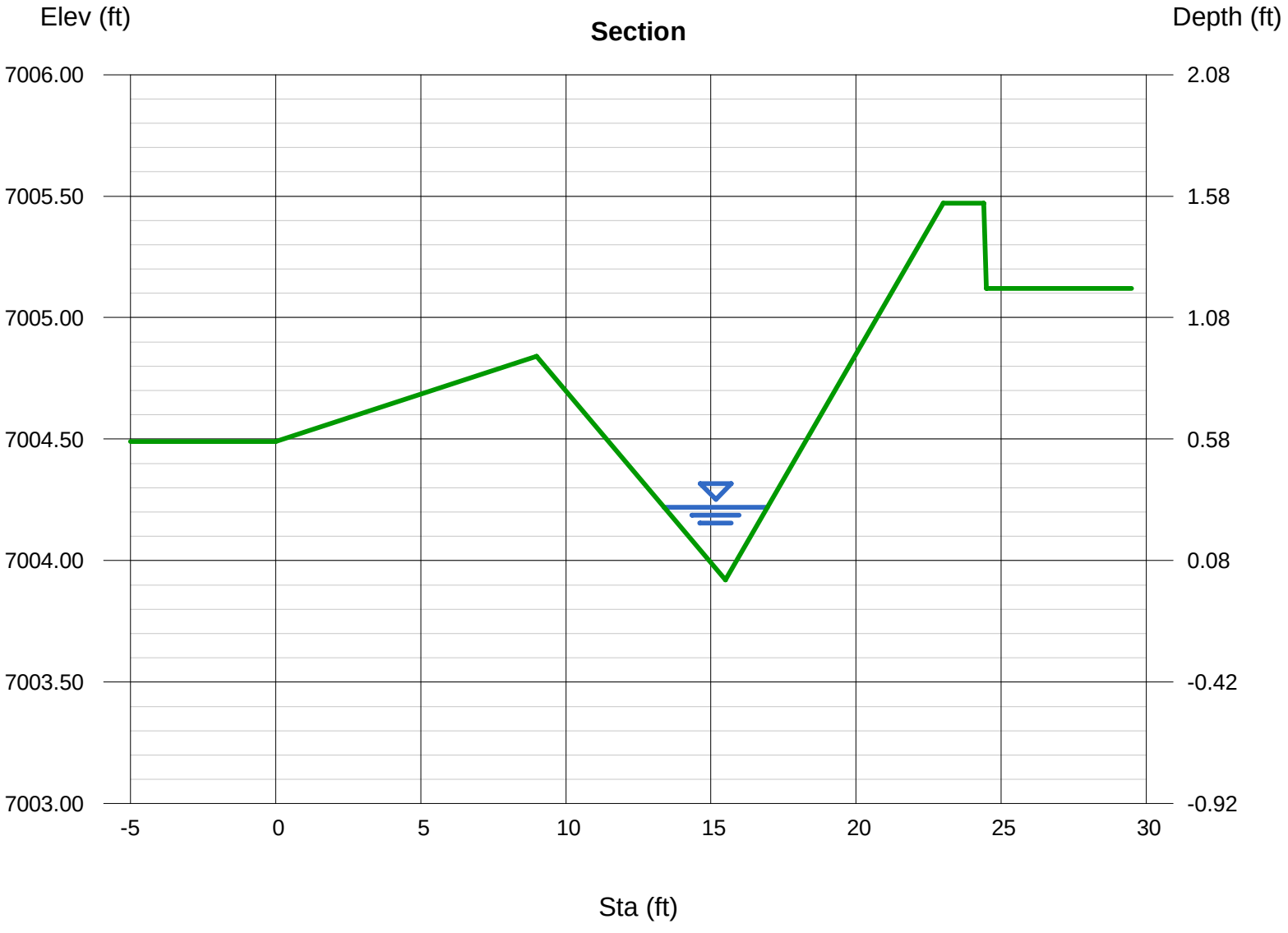
Compute by:	Known Q
Known Q (cfs)	= 2.20

Highlighted

Depth (ft)	= 0.30
Q (cfs)	= 2.200
Area (sqft)	= 0.53
Velocity (ft/s)	= 4.11
Wetted Perim (ft)	= 3.62
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 3.57
EGL (ft)	= 0.56

(Sta, El, n)-(Sta, El, n)...

(0.00, 7004.49) -(9.00, 7004.84, 0.027) -(15.50, 7003.92, 0.027) -(23.00, 7005.47, 0.013) -(24.40, 7005.47, 0.013) -(24.50, 7005.12, 0.013)



Appendix D

Reference Materials

Drainage Basin Planning Study
For
Kettle Creek Basin

Prepared for:

High Valley Land Company, Inc.
1755 Telestar Drive, Suite 211
Colorado Springs, CO 80920
Contact: Tom Taylor

Prepared by:

JR Engineering LLC
3730 Sinton Road, Suite
Colorado Springs, CO 80903
(719) 593-2593
Contact: Steve Rossoll

JR Project Number: 25100.00
May 5, 2015
X:\2510000.all\2510000\Word\Reports\Kettle Creek DBPS

1 INTRODUCTION

1.1 Contract Authorization

This Drainage Basin Planning Study was authorized under the terms of an agreement between the City of Colorado Springs Engineering Development Review and Stormwater Departments and High Valley Land Company, Inc. and paid for with private funds. This study covers drainage development only within the Kettle Creek Drainage Basin.

1.2 Purpose and Scope

The purpose of the drainage basin planning study is to give an initial comprehensive study of the entire Kettle Creek Basin. This Study shall show the conduits, channels, natural drainage courses, detention reservoirs, easements, culverts and all other hydraulic facilities required to control surface water from the 100-year event within the Kettle Creek Basin and to carry such waters to points of insignificant impact and to develop a plan to address future stormwater and infrastructure needs within the Kettle Creek Watershed. The process used to develop a DBPS provides opportunity for interested parties to offer input on drainage issues, needs, and facilities within the watershed. The DBPS is intended to provide an inventory of required drainage facilities and determine a drainage fee per developed acre.

1.3 Past Studies

A complete Drainage Basin Planning Study (DBPS) has not been performed for the entire Kettle Creek Watershed. However, Master Development Drainage Plans (MDDP) and Final Drainage Reports (FDR) have been prepared for areas within the study area that have been developed in the last 13 years. A number of previous studies and reports were reviewed during the preparation of the current study. The most relevant studies are listed below along with a brief synopsis of the relevance of the current study. Additional reports that were reviewed are noted in the reference section of this study.

Fountain Creek Watershed Study, January 2009, U.S. Army Corps of Engineers.
The Fountain Creek Watershed Study ties together four separate studies, a hydrology report, a hydraulics report, and environmental conditions report, and a geomorphology report, into a watershed study establishing the objectives for reduced flood risk, erosion, and sedimentation in the Fountain Creek Basin. The Watershed Study presents percent change data for existing versus future peak discharges and volumes in Monument Creek and adjacent tributaries, although no Kettle Creek flow data is presented in the Watershed Study. The hydrologic study and hydraulic study were not available from the City of Colorado Springs or from the U.S. Army Corps of Engineers to compare hydrology for common basins at the time of the preparation of this DBPS.

Master Development Drainage Plan For North Fork at Briargate, May, 2014, by JR Engineering.
A proposed mixed use development comprised of a single family residential, multifamily, an elementary school, and park site. The Site covers 267 acres located north-east of Powers Boulevard and Old Ranch Road.

Kettle Creek Drainage Basin Old Ranch Road Tributary Drainage Basin Planning Study and Master Development Drainage Plan, April 2001, by JR Engineering. (Kettle Creek MDDP/DBPS)
This MDDP/DBPS covers the portion of the Kettle Creek Basin along old Ranch Road. This study provides hydrologic data for the existing and future development along Old Ranch Road, Creekside Estates, and drainage facilities at Pine Creek High School.

U.S. Air Force Academy Kettle Creek Watershed Hydrology Study Findings and Recommendations Report, March 2002, by URS Group, Inc. (AFA Study)
This report was prepared for the U.S. Air Force Academy to study the hydrologic, hydraulic, and sediment transport for the entire Kettle Creek basin. The report recommends alternatives to reduce sediment accumulation, evaluate Preble's meadow jumping mouse habitat, and enhance existing wetlands on Academy property.

Flood Insurance Study for El Paso County and Incorporated Areas
FEMA performed a Flood Insurance Study (FIS) in 1999 with detailed analysis and base flood elevations from State Highway 83 to Templeton Gap Road at the headwaters of Kettle Creek in the Black Forest. The FEMA FIRM maps and FIS data are included in **Appendix B**.

1.4 Stakeholder Process

Stakeholders who may be affected by this study results must be identified and included in numerous public meetings and presentations to committees, council and commissions. This DBPS is prepared for the High Valley Land Company, Inc. and is the only stakeholder that is affected in the Kettle Creek Basin study. Thus there are no stakeholder meetings and presentations required.

1.5 Agency Jurisdictions

Future development in the Kettle Creek basin will predominately be located within the City of Colorado Springs city limits. Improvements outside the city limits will be located and governed by El Paso County.

1.6 General Basin Description

The Kettle Creek watershed is located in the north central portion of El Paso County, Colorado. Kettle Creek and its tributaries originate on the southern slope of the Black Forest and flow in a southwesterly direction towards the City of Colorado Springs. The Kettle Creek watershed has a contributing area of approximately 16.41 square miles at its junction with Interstate Highway 25 (I-25).

The headwaters of Kettle Creek are located in the Black Forest, an area dominated by ponderosa pine forest and grassland on undeveloped large acreage tracts and 2- to 5-acre rural residential lots. In the vicinity of Powers Boulevard, the watershed changes to predominately undeveloped grassland. Downstream of Powers Boulevard, the watershed is dominated by residential development consisting of single-family homes, commercial centers, and vacant land. A vicinity map is provided in **Figure 1-1**.

The regional detention alternatives presented herein only are considered for the purposes of attenuating developed flow rates. Consideration of regional detention alternatives will have significant environmental impacts as discussed in Section 5. Sub-regional detention alone will not reduce flow rates in Kettle Creek to historic levels, as past development in the upper portion of the basin is a contributing factor to the increased flows under existing conditions. Regional detention must be owned and maintained by a public entity, with ownership and maintenance responsibilities clearly defined to ensure the proper function of the facility in perpetuity.

6.3 Sub-Regional Detention

The anticipated approach is sub-regional detention with full spectrum detention and water quality treatment. Any future development in the Kettle Creek basin within the City of Colorado Springs shall have sub-regional detention for each development/phase. Detention facilities serving drainage basins between 20 and 130 acres are considered "sub-regional detention". Sub-regional detention may be constructed by a public entity such as a municipality or special district to serve several landowners in the upstream watershed or by a single landowner. It may be possible for a single landowner to construct sub-regional detention if the upper part of the watershed is owned by others and if the necessary conditions are achieved. Sub-regional detention should be addressed in subsequent Master Development Drainage Plans (MDDP) for individual development projects. The ownership and maintenance of these ponds are anticipated to be public or quasi-public. In order to be considered for public maintenance the contributory area shall be in the range of 70-120 acres. A conceptual map illustrating the locations of required sub-regional detention facilities is shown in **Figure 6-1**.

6.3.1 Full Spectrum Detention

The full spectrum detention approach, as defined in Chapter 13 of the DCM, shall be implemented as the standard detention approach. Impervious surfaces associated with development increase peak flows, frequency of runoff and total volume of stormwater surface runoff when compared to pre-development conditions. This increase is most pronounced for the smaller, more frequent storms and can result in stream degradation and water quality impacts as well as flooding during large storm events.

In addition to detaining developed conditions stormwater discharge for flood control and for water quality considerations, it is also important to expand the focus to the range of flows responsible for transporting the most bedload in the receiving stream. This range depends on reach specific characteristics but is between the annual event and the 5-year event. Runoff events in this range can produce geomorphic changes in local receiving streams resulting in severe erosion, loss of riparian habitat, and water quality degradation.

Outflow hydrographs from traditional flood-control detention facilities tend to maintain flows near the maximum release rates for relatively long periods of time. This allows hydrographs released from multiple independent ponds to overlap and add to each other to generate flows exceeding pre-development conditions. Traditional flood-control detention concepts can result in an increase in total watershed discharges even if individual detention facilities each control peak discharges to pre-developed conditions. Full spectrum detention modeling reduces urban runoff peaks to levels similar to pre-development conditions for a wide range of storms over an entire watershed, even with multiple independent detention facilities. A result of full spectrum detention is that discharges from storms smaller than approximately the 2-year event will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainageways.

6.3.2 Water Quality

Each sub-regional detention pond shall detain flows not only for flood control, but also for water quality. The Water Quality Capture Volume (WQCV) is intended to capture most runoff events and reduce their pollutant load prior to discharging into drainageways. The size of this storage element depends primarily on the amount of tributary impervious area and can be reduced by implementing development practices that reduce the effective imperviousness, discussed in more detail below.

Future development in the basin shall consider other land planning and engineering design approaches to manage stormwater runoff and water quality. Low Impact Development (LID) is a comprehensive approach with the goal of mimicking the pre-development hydrologic regime. LID emphasizes conservation of natural features and use of engineered, on-site, small-scale hydrologic controls that infiltrate, filter, store, evaporate, and detain runoff close to its source. Portions of the site that aid in reducing the developed conditions discharge should be preserved, which may include mature trees, stream corridors, wetlands, and NRCS Type A/B soils with higher infiltration rates.

Minimizing Directly Connected Impervious Area (MDCIA) includes a variety of runoff reduction strategies based on reducing impervious areas and routing runoff from impervious surfaces over grassy areas to slow runoff and promote infiltration. MDCIA is a technique for reducing runoff peaks and volumes following urbanization. Paved areas can be reduced in extent to the minimum amount practical, and implement methods to route runoff over grassed areas rather than directly into storm sewer. When soils vary over the site, concentrate new impervious areas over NRCS Type C and D soils, while preserving NRCS Type A and B soils for landscape areas and other permeable surfaces. Increasing the number and lengths of flow paths will all reduce the impact of the development.

Volume reduction is a key hydrologic objective, as opposed to peak flow reduction being the only objective. Volume reduction is emphasized not only to reduce pollutant loading and peak flows, but also to move toward hydrologic regimes with flow durations and frequencies closer to the natural hydrologic regime.

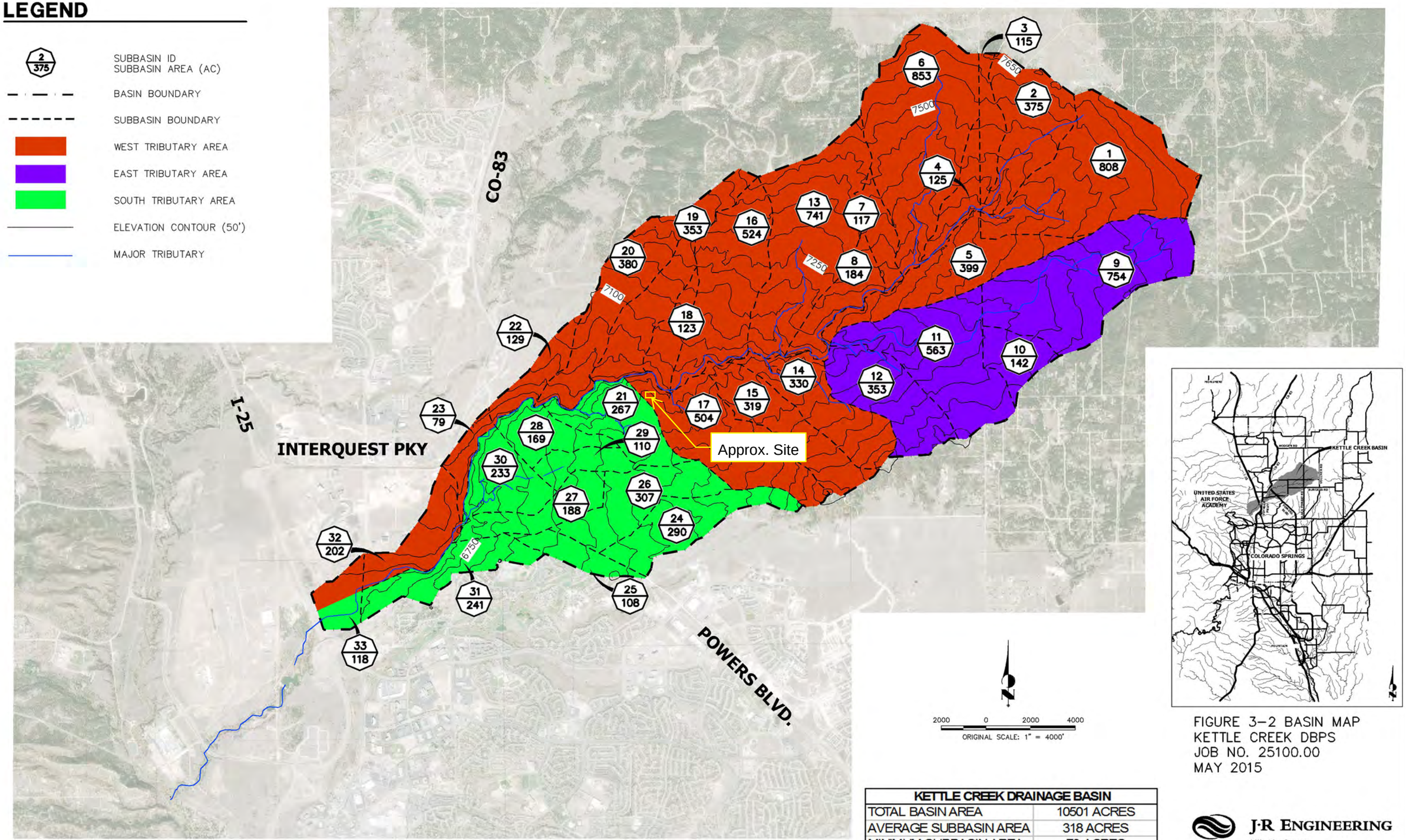
6.4 Limited Channel Stabilization Alternative

Channel improvements may be necessary in the main study reach of Kettle Creek to limit erosion and deposition resulting from high velocities as determined in Section 4. However, grading and grade control structures may not be feasible in Kettle Creek due to the disturbance they would cause with the presence of the Preble's meadow jumping mouse. Conceptual check structure placement is provided for reference, should grade control structures become an option in the future.

The locations of these conceptual check structures were determined by areas where mean channel velocities exceeded 5 feet per second for the 100-year event. Future grade between check structures was estimated to stabilize at approximately 0.20 percent. Check structure placement was shown to lower velocities above 5

LEGEND

- SUBBASIN ID / SUBBASIN AREA (AC)
- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- WEST TRIBUTARY AREA
- EAST TRIBUTARY AREA
- SOUTH TRIBUTARY AREA
- ELEVATION CONTOUR (50')
- MAJOR TRIBUTARY



2000 0 2000 4000
ORIGINAL SCALE: 1" = 4000'

FIGURE 3–2 BASIN MAP
KETTLE CREEK DBPS
JOB NO. 25100.00
MAY 2015

KETTLE CREEK DRAINAGE BASIN	
TOTAL BASIN AREA	10501 ACRES
AVERAGE SUBBASIN AREA	318 ACRES
MINIMUM SUBBASIN AREA	79 ACRES
MAXIMUM SUBBASIN AREA	853 ACRES

J·R ENGINEERING
A Westrian Company
Centennial 303–740–9393 • Colorado Springs 719–593–2593
Fort Collins 970–491–9888 • www.jrengineering.com

LEGEND

- SUBBASIN ID
- 100-YEAR 24-HOUR FLOWS (CFS)
- 5-YEAR 24-HOUR FLOWS (CFS)
- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- MAJOR TRIBUTARY
- JUNCTION

CO-83

INTERQUEST PKY

VOYAGER PKY

I-25

POWERS BLVD.

Approx. Site

1	111	402	2	59	217	3	17	60	4	20	75	5	42	150	6	93	332	7	20	71	8	35	113	9	81	287	10	24	87	11	89	332	12	52	184
13	80	285	14	59	207	15	57	201	16	68	241	17	74	264	18	23	80	19	46	157	20	73	244	21	65	207	22	35	107	23	35	109	24	54	166
25	54	159	26	64	199	27	52	157	28	8	120	29	30	92	30	65	200	31	58	241	32	37	147	33	24	93									

J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12	J13	J14	J15	J16	J17	J18	J19	J20	J21	J22	J23	J24	J25	J26										

3000 1500 0 3000

ORIGINAL SCALE: 1" = 3000'

FIGURE 3-12 HYDROLOGY MAP (HISTORIC)
KETTLE CREEK DBPS
JOB NO. 25100.00
MAY 2015

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A Westrian Company

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Fort Collins 970-491-9888 • www.jrengineering.com

LEGEND

- SUBBASIN ID
- 100-YEAR 24-HOUR FLOWS (CFS)
- 5-YEAR 24-HOUR FLOWS (CFS)
- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- MAJOR TRIBUTARY
- JUNCTION

CO-83

INTERQUEST PKY

VOYAGER PKY

I-25

POWERS BLVD.

Approx. Site

1	315	735
2	173	403
3	56	122
4	56	135
5	134	308
6	240	588
7	51	125
8	117	273
9	223	520
10	62	152
11	322	720
12	144	338
13	212	505
14	138	337
15	143	342
16	193	449
17	184	447
18	55	134
19	101	248
20	134	343
21	100	264
22	36	109
23	42	121
24	24	93
28	38	120
29	37	102
30	116	279
31	217	490
32	124	289
33	24	93
S1	109	576

3000 1500 0 3000

ORIGINAL SCALE: 1" = 3000'

FIGURE 3-13 HYDROLOGY MAP (EXISTING)
KETTLE CREEK DBPS
JOB NO. 25100.00
MAY 2015

NOTE

1. SUBBASIN 24-27 DATA IS REPLACED WITH DATA FROM THE KETTLE CREEK DRAINAGE BASIN OLD RANCH ROAD TRIBUTARY MASTER DEVELOPMENT DRAINAGE PLAN AND LABELED AS SOURCE-1 (S1).

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LEGEND

- SUBBASIN ID
- 100–YEAR 24–HOUR FLOWS (CFS)
- 5–YEAR 24–HOUR FLOWS (CFS)
- BASIN BOUNDARY
- SUBBASIN BOUNDARY
- MAJOR TRIBUTARY
- JUNCTION

CO-83

INTERQUEST PKY

VOYAGER PKY

I-25

POWERS BLVD.

Approx. Site

1	315	735	
2	173	403	
3	56	122	
4	56	135	J1
5	134	308	
6	240	588	
7	51	125	J2
8	117	273	J4
9	223	520	J5
10	62	152	J7
11	322	720	
12	144	338	
13	212	505	J3
14	138	337	J8
15	143	342	J6
16	193	449	J9
17	184	447	J10
18	55	134	J11
19	111	262	J12
20	206	448	J13
21	114	284	J14
22	112	219	J15
23	44	124	J16
24	24	93	J17
25			J18
26			J19
27			J20
28	123	241	J23
29	111	207	J24
30	158	340	J25
31	290	606	J26
32	274	500	S1
33	24	93	
S1	109	576	

3000 1500 0 3000

ORIGINAL SCALE: 1" = 3000'

FIGURE 3–14 HYDROLOGY MAP (FUTURE)
KETTLE CREEK DBPS
JOB NO. 25100.00
MAY 2015

NOTE

1. SUBBASIN 24–27 DATA IS REPLACED WITH DATA FROM THE KETTLE CREEK DRAINAGE BASIN OLD RANCH ROAD TRIBUTARY MASTER DEVELOPMENT DRAINAGE PLAN AND LABELED AS SOURCE–1 (S1).

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EXISTING CONDITIONS
MODEL RESULTS
(5-YEAR)

5-Year, 2-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Subbasin-1	1.263	286	0.51
Subbasin-2	0.586	160	0.52
Subbasin-3	0.180	56	0.65
Junction-1	2.029	492	0.52
Reach-1	2.029	490	0.52
Subbasin-4	0.195	50	0.45
Junction-2	2.224	536	0.52
Reach-2	2.224	536	0.52
Subbasin-5	0.625	119	0.56
Junction-3	2.849	644	0.53
Reach-3	2.849	644	0.53
Subbasin-6	1.333	203	0.43
Junction-4	4.182	846	0.5
Reach-4	4.182	846	0.5
Subbasin-7	0.183	45	0.44
Junction-5	4.365	865	0.49
Reach-5	4.365	862	0.49
Subbasin-8	0.288	104	0.52
Junction-6	4.653	885	0.49
Reach-6	4.653	883	0.49
Subbasin-9	1.177	195	0.51
Subbasin-10	0.222	55	0.43
Junction-7	1.399	217	0.49
Reach-7	1.399	217	0.49
Subbasin-11	0.880	302	0.61
Junction-8	2.279	437	0.54
Reach-8	2.279	434	0.54
Subbasin-12	0.552	127	0.5
Junction-9	2.831	546	0.53
Reach-9	2.831	545	0.53
Junction-10	7.484	1,305	0.51
Reach-10	7.484	1,305	0.51
Subbasin-13	1.156	183	0.47
Subbasin-14	0.516	122	0.44
Junction-11	9.156	1,437	0.5
Reach-11	9.156	1,435	0.5
Subbasin-15	0.498	127	0.47
Junction-12	9.654	1,445	0.5
Reach-12	9.654	1,442	0.5
Subbasin-16	0.819	175	0.51
Subbasin-17	0.788	164	0.44
Junction-13	11.261	1,475	0.49

5-Year, 2-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Reach-13	11.261	1,473	0.49
Subbasin-18	0.192	50	0.44
Junction-14	11.453	1,473	0.49
Reach-14	11.453	1,473	0.49
Subbasin-19	0.552	86	0.44
Junction-15	12.005	1,488	0.49
Reach-15	12.005	1,485	0.49
Subbasin-20	0.594	113	0.38
Junction-16	12.599	1,487	0.49
Reach-16	12.599	1,487	0.49
Subbasin-21	0.417	82	0.33
Junction-17	13.016	1,487	0.48
Reach-17	13.016	1,486	0.48
Subbasin-22	0.200	24	0.21
Junction-18	13.216	1,486	0.48
Reach-18	13.216	1,484	0.48
Subbasin-23	0.123	30	0.25
Junction-19	13.339	1,484	0.47
Reach-19	13.339	1,482	0.47
Subbasin-24	0.453	81	0.45
Subbasin-25	0.169	206	1.12
Subbasin-26	0.480	111	0.51
Junction-21	1.102	250	0.58
Reach-21	1.102	245	0.58
Subbasin-27	0.294	139	0.75
Junction-22	1.396	346	0.61
Reach-22	1.396	344	0.61
Subbasin-28	0.264	25	0.19
Subbasin-29	0.172	28	0.27
Junction-20	0.436	50	0.22
Reach-20	0.436	50	0.22
Subbasin-30	0.364	107	0.47
Junction-23	15.535	1,484	0.48
Reach-23	15.535	1,482	0.48
Subbasin-31	0.377	219	0.55
Subbasin-32	0.316	137	0.5
Junction-24	16.228	1,482	0.48
Reach-24	16.228	1,481	0.48
Subbasin-33	0.184	13	0.1
Junction-25	16.412	1481.1	0.48
Reach-25	16.412	1481.1	0.48
Junction-26	16.412	1481.1	0.48

5-Year, 24-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Subbasin-1	1.263	315	1.06
Subbasin-2	0.586	173	1.06
Subbasin-3	0.180	56	1.27
Junction-1	2.029	527	1.08
Reach-1	2.029	526	1.08
Subbasin-4	0.195	56	0.97
Junction-2	2.224	572	1.07
Reach-2	2.224	568	1.07
Subbasin-5	0.625	134	1.14
Junction-3	2.849	689	1.08
Reach-3	2.849	689	1.08
Subbasin-6	1.333	240	0.94
Junction-4	4.182	928	1.04
Reach-4	4.182	917	1.04
Subbasin-7	0.183	51	0.97
Junction-5	4.365	940	1.03
Reach-5	4.365	929	1.03
Subbasin-8	0.288	117	1.1
Junction-6	4.653	959	1.04
Reach-6	4.653	944	1.04
Subbasin-9	1.177	223	1.05
Subbasin-10	0.222	62	0.93
Junction-7	1.399	252	1.03
Reach-7	1.399	250	1.03
Subbasin-11	0.880	322	1.23
Junction-8	2.279	484	1.11
Reach-8	2.279	484	1.11
Subbasin-12	0.552	144	1.06
Junction-9	2.831	609	1.1
Reach-9	2.831	594	1.1
Junction-10	7.484	1,444	1.06
Reach-10	7.484	1,428	1.06
Subbasin-13	1.156	212	1
Subbasin-14	0.516	138	0.95
Junction-11	9.156	1,605	1.05
Reach-11	9.156	1,604	1.05
Subbasin-15	0.498	143	1
Junction-12	9.654	1,636	1.05
Reach-12	9.654	1,634	1.05

5-Year, 24-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Subbasin-16	0.819	193	1.06
Subbasin-17	0.788	184	0.95
Junction-13	11.261	1,730	1.04
Reach-13	11.261	1,705	1.04
Subbasin-18	0.192	55	0.95
Junction-14	11.453	1,711	1.04
Reach-14	11.453	1,710	1.04
Subbasin-19	0.552	101	0.95
Junction-15	12.005	1,745	1.03
Reach-15	12.005	1,741	1.03
Subbasin-20	0.594	134	0.86
Junction-16	12.599	1,760	1.03
Reach-16	12.599	1,741	1.03
Subbasin-21	0.417	100	0.79
Junction-17	13.016	1,752	1.02
Reach-17	13.016	1,752	1.02
Subbasin-22	0.200	36	0.59
Junction-18	13.216	1,756	1.01
Reach-18	13.216	1,746	1.01
Subbasin-23	0.123	42	0.66
Junction-19	13.339	1,748	1.01
Reach-19	13.339	1,747	1.01
Source-1	1.396	109	0.58
Subbasin-28	0.264	38	0.57
Subbasin-29	0.172	37	0.7
Junction-20	0.436	75	0.62
Reach-20	0.436	70	0.62
Subbasin-30	0.364	116	1
Junction-23	15.535	1,764	0.96
Reach-23	15.535	1,751	0.96
Subbasin-31	0.377	217	1.05
Subbasin-32	0.316	124	1.01
Junction-24	16.228	1,766	0.96
Reach-24	16.228	1,754	0.96
Subbasin-33	0.184	24	0.37
Junction-25	16.412	1,756	0.96
Reach-25	16.412	1,750	0.96
Junction-26	16.412	1,750	0.96

NOTE:

1. SOURCE-1 IS THE 24 HOUR FLOW DATA FOR SUBBASINS 24-27, JUNCTION 22, AND REACHES 21-22. SUBBASINS 24-27 DATA HAS BEEN REPLACED WITH KETTLE CREEK DRAINAGE BASIN OLD RANCH ROAD TRIBUTARY MASTER DEVELOPMENT PLAN FLOW DATA (JR ENG. 2001).

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EXISTING CONDITIONS
MODEL RESULTS
(100-YEAR)

100-Year, 2-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Subbasin-1	1.263	634	1.12
Subbasin-2	0.586	355	1.13
Subbasin-3	0.180	115	1.33
Junction-1	2.029	1,082	1.14
Reach-1	2.029	1,080	1.14
Subbasin-4	0.195	117	1.03
Junction-2	2.224	1,184	1.13
Reach-2	2.224	1,184	1.13
Subbasin-5	0.625	262	1.21
Junction-3	2.849	1,423	1.15
Reach-3	2.849	1,423	1.15
Subbasin-6	1.333	474	0.99
Junction-4	4.182	1,895	1.10
Reach-4	4.182	1,894	1.10
Subbasin-7	0.183	106	1.03
Junction-5	4.365	1,938	1.10
Reach-5	4.365	1,931	1.10
Subbasin-8	0.288	242	1.17
Junction-6	4.653	1,980	1.10
Reach-6	4.653	1,977	1.10
Subbasin-9	1.177	433	1.11
Subbasin-10	0.222	132	0.99
Junction-7	1.399	483	1.09
Reach-7	1.399	483	1.09
Subbasin-11	0.880	657	1.30
Junction-8	2.279	959	1.17
Reach-8	2.279	953	1.17
Subbasin-12	0.552	291	1.12
Junction-9	2.831	1,208	1.16
Reach-9	2.831	1,205	1.16
Junction-10	7.484	2,905	1.12
Reach-10	7.484	2,903	1.12
Subbasin-13	1.156	418	1.06
Subbasin-14	0.516	285	1.01
Junction-11	9.156	3,198	1.11
Reach-11	9.156	3,195	1.11
Subbasin-15	0.498	293	1.06
Junction-12	9.654	3,218	1.11
Reach-12	9.654	3,213	1.11
Subbasin-16	0.819	387	1.12
Subbasin-17	0.788	382	1.01
Junction-13	11.261	3,283	1.10

100-Year, 2-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Reach-13	11.261	3,280	1.10
Subbasin-18	0.192	118	1.01
Junction-14	11.453	3,281	1.10
Reach-14	11.453	3,279	1.10
Subbasin-19	0.552	201	1.00
Junction-15	12.005	3,314	1.09
Reach-15	12.005	3,309	1.09
Subbasin-20	0.594	279	0.91
Junction-16	12.599	3,313	1.09
Reach-16	12.599	3,312	1.09
Subbasin-21	0.417	217	0.84
Junction-17	13.016	3,312	1.08
Reach-17	13.016	3,308	1.08
Subbasin-22	0.200	81	0.64
Junction-18	13.216	3,308	1.07
Reach-18	13.216	3,305	1.07
Subbasin-23	0.123	93	0.71
Junction-19	13.339	3,305	1.07
Reach-19	13.339	3,302	1.07
Subbasin-24	0.453	188	1.03
Subbasin-25	0.169	374	2.01
Subbasin-26	0.480	247	1.12
Junction-21	1.102	463	1.22
Reach-21	1.102	463	1.22
Subbasin-27	0.294	279	1.49
Junction-22	1.396	689	1.28
Reach-22	1.396	687	1.28
Subbasin-28	0.264	83	0.62
Subbasin-29	0.172	80	0.75
Junction-20	0.436	157	0.67
Reach-20	0.436	156	0.67
Subbasin-30	0.364	250	1.06
Junction-23	15.535	3,305	1.08
Reach-23	15.535	3,298	1.08
Subbasin-31	0.377	458	1.11
Subbasin-32	0.316	298	1.06
Junction-24	16.228	3,298	1.08
Reach-24	16.228	3,297	1.08
Subbasin-33	0.184	57	0.41
Junction-25	16.412	3297.4	1.07
Reach-25	16.412	3297.4	1.07
Junction-26	16.412	3297.4	1.07

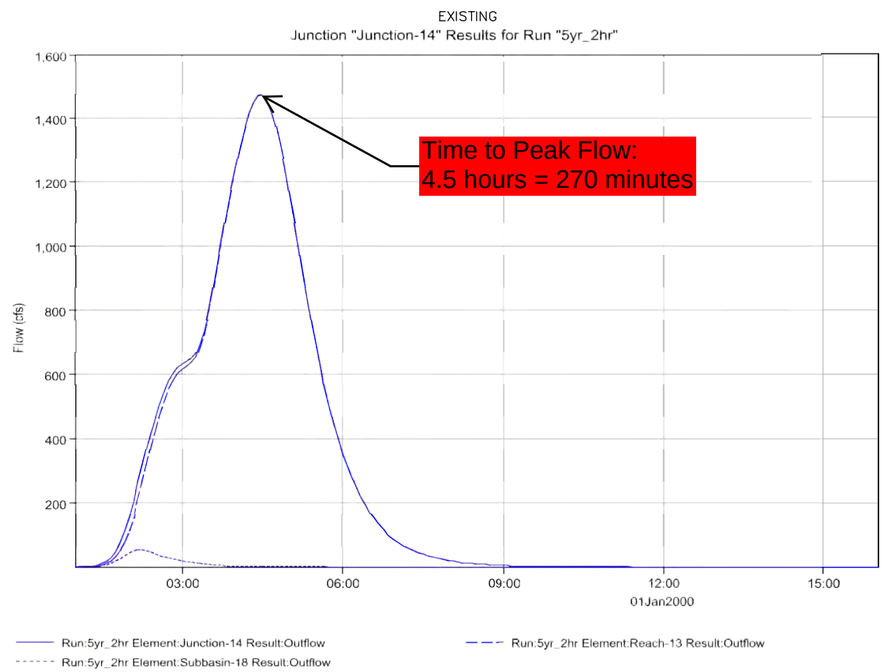
100-Year, 24-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Subbasin-1	1.263	735	2.36
Subbasin-2	0.586	403	2.37
Subbasin-3	0.180	122	2.67
Junction-1	2.029	1,217	2.39
Reach-1	2.029	1,216	2.39
Subbasin-4	0.195	135	2.22
Junction-2	2.224	1,325	2.38
Reach-2	2.224	1,322	2.38
Subbasin-5	0.625	308	2.52
Junction-3	2.849	1,602	2.41
Reach-3	2.849	1,602	2.41
Subbasin-6	1.333	588	2.18
Junction-4	4.182	2,190	2.34
Reach-4	4.182	2,153	2.34
Subbasin-7	0.183	125	2.24
Junction-5	4.365	2,208	2.33
Reach-5	4.365	2,186	2.33
Subbasin-8	0.288	273.3	2.48
Junction-6	4.653	2253.3	2.34
Reach-6	4.653	2,213	2.34
Subbasin-9	1.177	520	2.35
Subbasin-10	0.222	152	2.17
Junction-7	1.399	593	2.32
Reach-7	1.399	588	2.32
Subbasin-11	0.880	720	2.66
Junction-8	2.279	1,114	2.45
Reach-8	2.279	1,112	2.45
Subbasin-12	0.552	338	2.39
Junction-9	2.831	1,403	2.44
Reach-9	2.831	1,368	2.44
Junction-10	7.484	3,375	2.38
Reach-10	7.484	3,329	2.38
Subbasin-13	1.156	505	2.28
Subbasin-14	0.516	337	2.20
Junction-11	9.156	3,761	2.36
Reach-11	9.156	3,756	2.36
Subbasin-15	0.498	342	2.28
Junction-12	9.654	3,828	2.35
Reach-12	9.654	3,823	2.35

100-Year, 24-Hour Storm			
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Volume (in)
Subbasin-16	0.819	449	2.37
Subbasin-17	0.788	447	2.20
Junction-13	11.261	4,038	2.34
Reach-13	11.261	3,975	2.34
Subbasin-18	0.192	134.1	2.2
Junction-14	11.453	3,992	2.34
Reach-14	11.453	3,987	2.34
Subbasin-19	0.552	248	2.19
Junction-15	12.005	4,069	2.33
Reach-15	12.005	4,058	2.33
Subbasin-20	0.594	343	2.06
Junction-16	12.599	4,103	2.32
Reach-16	12.599	4,064	2.32
Subbasin-21	0.417	264	1.96
Junction-17	13.016	4,091	2.31
Reach-17	13.016	4,081	2.31
Subbasin-22	0.200	109	1.66
Junction-18	13.216	4,091	2.30
Reach-18	13.216	4,080	2.30
Subbasin-23	0.123	121	1.75
Junction-19	13.339	4,086	2.29
Reach-19	13.339	4,081	2.29
Source-1	1.396	576	1.58
Subbasin-28	0.264	120	1.63
Subbasin-29	0.172	102	1.83
Junction-20	0.436	222	1.71
Reach-20	0.436	207	1.71
Subbasin-30	0.364	279	2.28
Junction-23	15.535	4,121	2.21
Reach-23	15.535	4,081	2.21
Subbasin-31	0.377	490	2.26
Subbasin-32	0.316	289	2.22
Junction-24	16.228	4,114	2.22
Reach-24	16.228	4,096	2.22
Subbasin-33	0.184	93	1.21
Junction-25	16.412	4,102	2.20
Reach-25	16.412	4,084	2.20
Junction-26	16.412	4,084	2.20

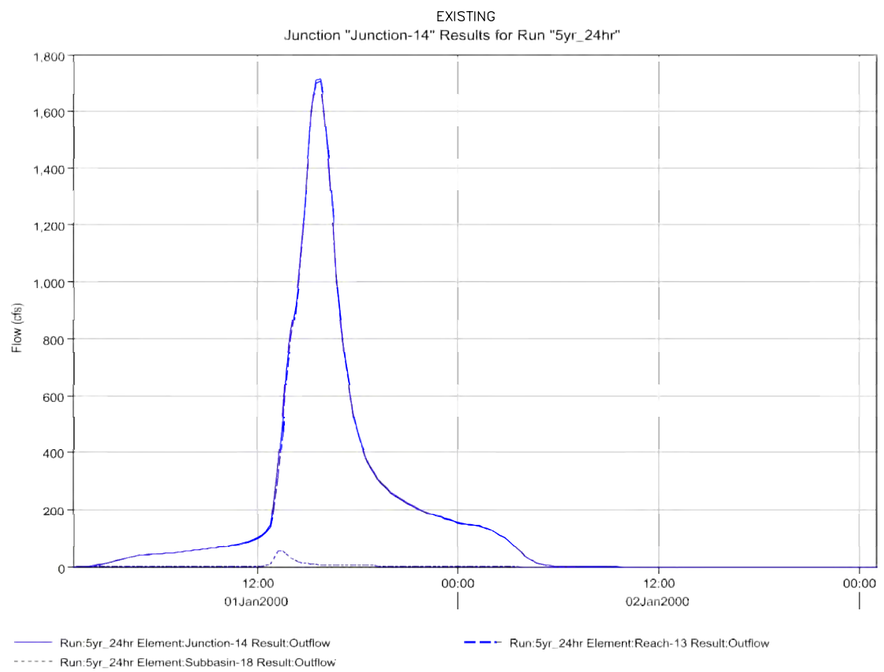
NOTE:

1. SOURCE-1 IS THE 24 HOUR FLOW DATA FOR SUBBASINS 24-27, JUNCTION 22, AND REACHES 21-22. SUBBASINS 24-27 DATA HAS BEEN REPLACED WITH KETTLE CREEK DRAINAGE BASIN OLD RANCH ROAD TRIBUTARY MASTER DEVELOPMENT PLAN FLOW DATA (JR ENG. 2001).

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5–YR
2–HR



5–YR
24–HR

JUNCTION 14
HOWELLS ROAD (APPROXIMATE)

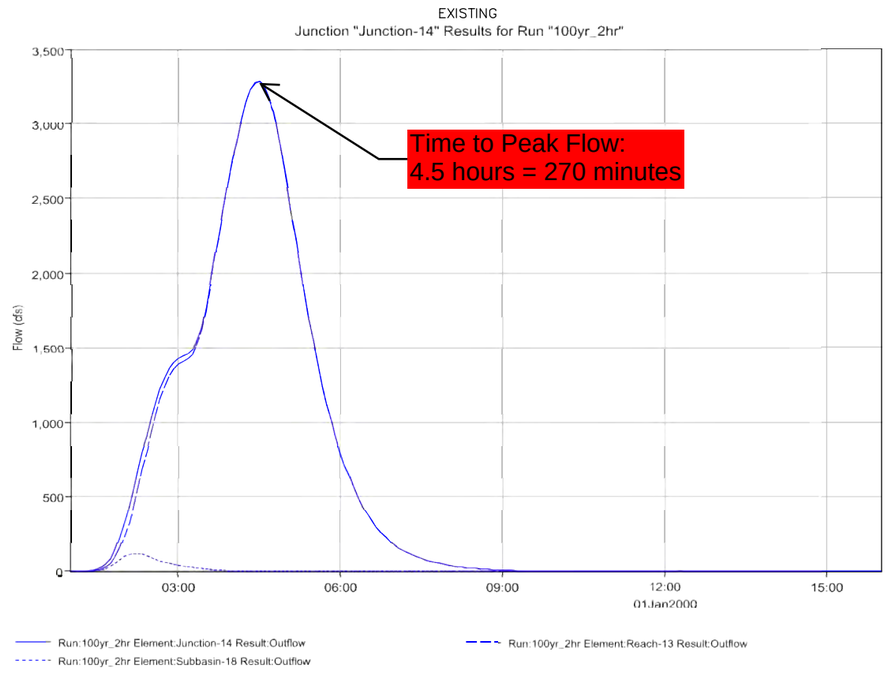
EXISTING CONDITIONS HYDROGRAPHS
AT SELECT LOCATIONS
5-YEAR

APPENDIX B – HYDROLOGIC
RESULTS – EXISTING
HYDROGRAPHS 5–YR J–14
KETTLE CREEK DBPS
JOB NO. 25100.00
MAY 2015
B–51

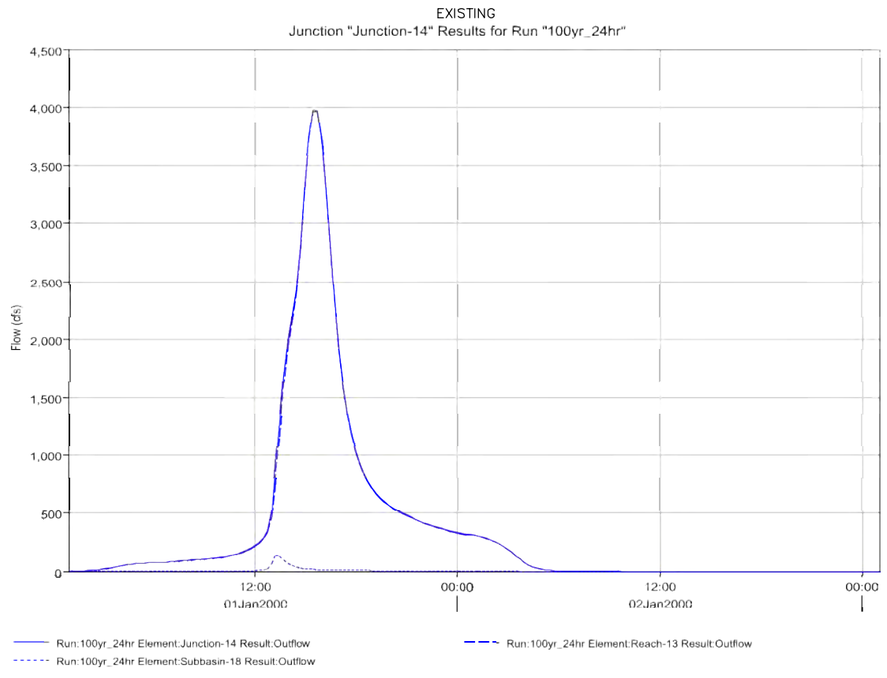
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JUNCTION 18
POWERS BLVD BRIDGE

JUNCTION 24
HWY 83 BRIDGE



100–YR
2–HR



100–YR
24–HR

JUNCTION 14
HOWELLS ROAD (APPROXIMATE)

EXISTING CONDITIONS HYDROGRAPHS
AT SELECT LOCATIONS
100-YEAR

APPENDIX B– HYDROLOGIC RESULTS– EXISTING HYDROGRAPHS 100–YR J–14
KETTLE CREEK DBPS
JOB NO. 25100.00
MAY 2015
B–63

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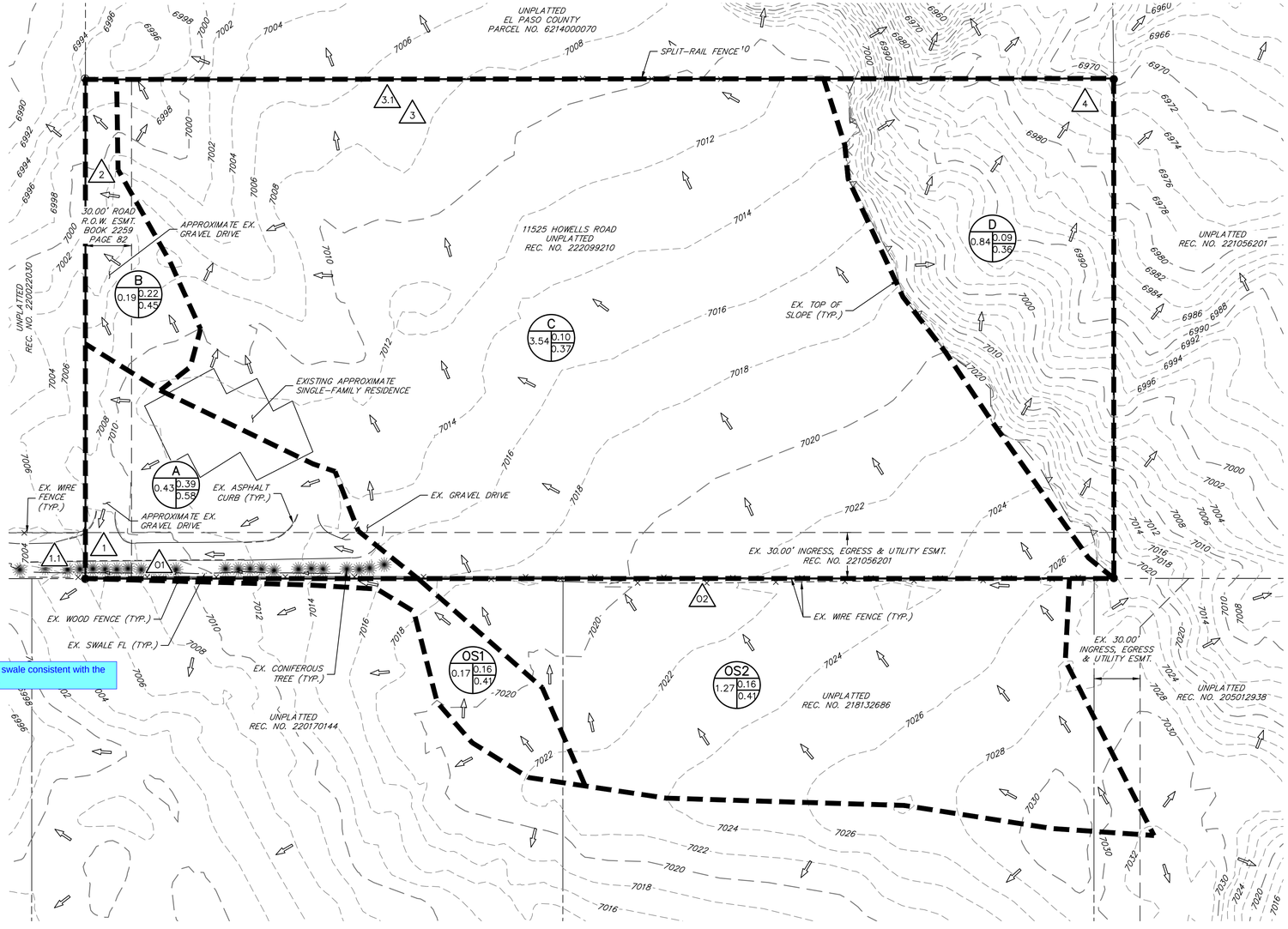
Appendix E

Drainage Maps

WELSH SUBDIVISION

EL PASO COUNTY, COLORADO

EXISTING DRAINAGE MAP



Please label swale consistent with the calculations.

LAYER LINETYPE LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
CENTERLINE		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
CURB & GUTTER		
FEMA FLOODPLAIN	100YR	100YR
SUB-BASIN DRAINAGE AREA		

BASIN TAG — BASIN ID (#) / AREA [AC] (#.#) — C_5 (#) / C_{100} (#)

1 — DESIGN POINT DESIGNATION

FLOW DIRECTION (EXISTING) ⇨ FLOW DIRECTION (PROPOSED) ➡

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	0.43	41%	0.39	0.58	6.4	0.8	2.0
B	0.19	23%	0.22	0.45	8.0	0.2	0.7
C	3.54	3%	0.10	0.37	14.0	1.3	7.9
D	0.84	2%	0.09	0.36	10.0	0.3	2.1
OS1	0.17	10%	0.16	0.41	12.3	0.1	0.4
OS2	1.27	10%	0.16	0.41	12.8	0.8	3.3

DESIGN POINT

DP	Q_5 Total	Q_{100} Total
O1	0.1	0.4
1	0.8	2.0
1.1	0.8	2.1
2	0.2	0.7
O2	0.8	3.3
3	1.3	7.9
3.1	2.0	11.1
4	0.3	2.1

N

40 20 0 40 80

ORIGINAL SCALE: 1" = 40'

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

811 Know what's **below.** **Call** before you dig.

EXISTING DRAINAGE MAP
WELSH SUBDIVISION
JOB NO. 25341.00
09/28/2026
SHEET 1 OF 1

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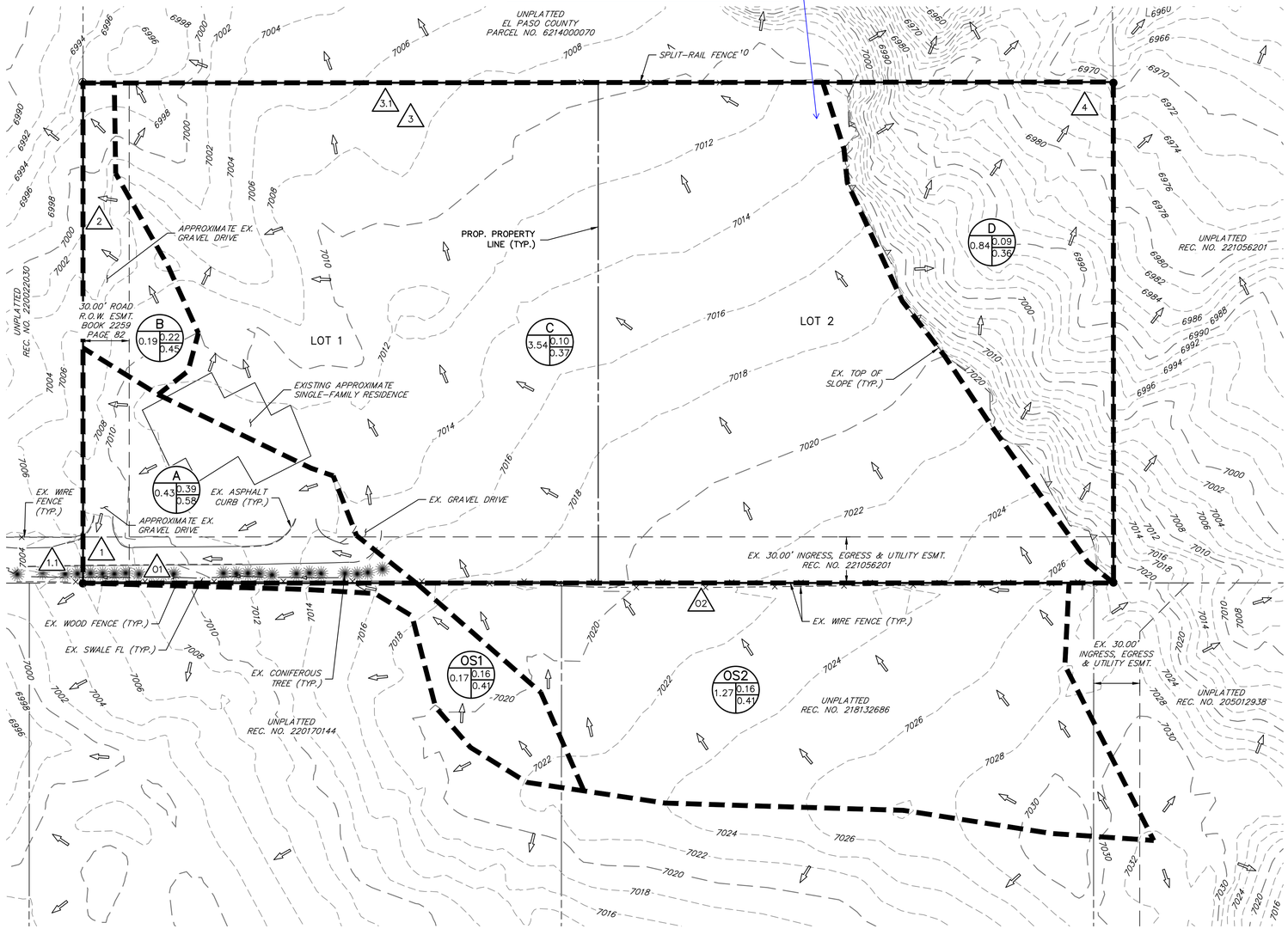
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WELSH SUBDIVISION

EL PASO COUNTY, COLORADO

PROPOSED DRAINAGE MAP

Please work with the geotechnical engineer and depict where the no-build easements should be located and if any additional setback is needed from the top of the slope to maintain slope stability and prevent erosion. Please address in narrative as well. This no build area must be reflected on the final plat drawing.



LAYER LINETYPE LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
CENTERLINE		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
CURB & GUTTER		
FEMA FLOODPLAIN	100YR	100YR
SUB-BASIN DRAINAGE AREA		

BASIN TAG — BASIN ID / AREA [AC] — C_5 / C_{100}

1 — DESIGN POINT DESIGNATION

FLOW DIRECTION (EXISTING) ⇨ FLOW DIRECTION (PROPOSED) ➡

BASIN SUMMARY TABLE

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DESIGN POINT

DP	Q_5 Total	Q_{100} Total
O1	0.1	0.4
1	0.8	2.0
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2	0.2	0.7
O2	0.8	3.3
3	1.3	7.9
3.1	2.0	11.1
4	0.3	2.1

PBMP Summary Table

Basins	Tributary Area (area)	PBMP
A-C	4.16	Excluded*
D	0.84	Excluded**

*Excluded based on large lot single family sites per ECM App. I.7.B.5
**Excluded based on land disturbance to undeveloped land that will remain undeveloped per ECM App. I.7.B.7

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

811 Know what's below. Call before you dig.

40 20 0 40 80
ORIGINAL SCALE: 1" = 40'

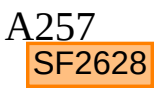
PROPOSED DRAINAGE MAP
WELSH SUBDIVISION
JOB NO. 25341.00
09/28/2026
SHEET 1 OF 1

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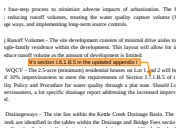
Drainage Report comments.pdf Markup Summary

EPC Stormwater- Zachary (5)



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SF2628



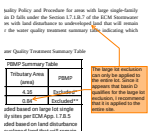
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It's section I.6.1.B.5 in the updated appendix I



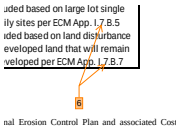
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Basin D falls under the Section I.7.1.B.7 of the ECM Stormwater
Quality Policy and Procedure for sites with land disturbance to undeveloped land that will remain undeveloped.



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Page Label: 9
Author: EPC Stormwater- Zachary
Date: 11/3/2026 8:17:03 AM
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The large lot exclusion can only be applied to the entire lot. Since it appears that basin D qualifies for the large lot exclusion, I recommend that it is applied to the entire site.



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Page Label: 9
Author: EPC Stormwater- Zachary
Date: 11/3/2026 7:15:19 AM
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6

Joseph Sandstrom (19)



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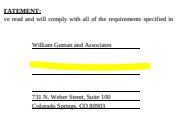


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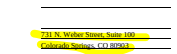


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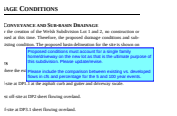
Developer, not applicant.



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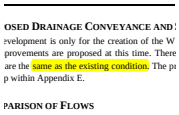
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Author: Joseph Sandstrom
Date: 11/9/2026 9:34:31 PM
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Proposed conditions must account for a single family home/driveway on the new lot as that is the ultimate purpose of this subdivision. Please update/revise.

Please include the comparison between existing vs. developed flows in cfs and percentage for the 5 and 100 year events.



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Date: 11/9/2026 4:54:54 PM
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same as the existing condition

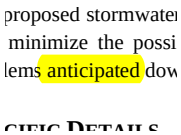
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Author: Joseph Sandstrom
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no difference



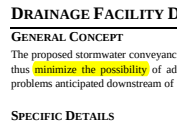
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The drainage report must clearly state that there will be no adverse impacts to downstream properties.



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Date: 11/9/2026 4:56:06 PM
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anticipated



Subject: Highlight
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Author: Joseph Sandstrom
Date: 11/9/2026 4:56:09 PM
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minimize the possibility



Subject: Highlight
Page Label: 8
Author: Joseph Sandstrom
Date: 11/9/2026 4:56:40 PM
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therefore,
no downstream stabilization will be required with this project.



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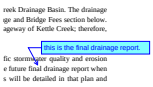
Please see DCM 1.4.2. DEVELOPERS IN AND ALONG A DRAINAGEWAY ARE REQUIRED TO IMPLEMENT THE PROPER MEASURES TO MAINTAIN OR CREATE STABLE CHARACTERISTICS OF THE DRAINAGEWAY. THE PRINCIPAL OBJECTIVE IS TO LIMIT EXCESSIVE EROSION IN AND ALONG THE CHANNEL.

The soils report section 6.8 indicates accelerated erosion along the NE corner of the property. Analyze the stability of the slope/channel and provide recommendations mitigate the accelerated erosion regardless of whether the flows will be increased in this area by this subdivision. Please revise narrative as needed.



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future final drainage report when construction occurs.



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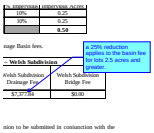
this is the final drainage report.



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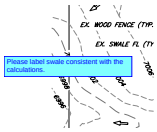
The site does not affect the discharge directly into the open drainageway of Kettle Creek; therefore,

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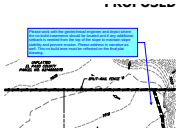
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a 25% reduction applies to the basin fee for lots 2.5 acres and greater.



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Date: 11/9/2026 5:09:30 PM
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Please label swale consistent with the calculations.



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Date: 11/9/2026 9:38:12 PM
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Please work with the geotechnical engineer and depict where the no-build easements should be located and if any additional setback is needed from the top of the slope to maintain slope stability and prevent erosion. Please address in narrative as well. This no build area must be reflected on the final plat drawing.