

# DRAINAGE LETTER

## 7280 N. NEVADA LANE

AN UNPLATTED PARCEL IN THE NW1/4 NE1/4, SECTION 8, T. 13 S., R. 65 W. 6<sup>TH</sup> P.M.  
EL PASO COUNTY, COLORADO

PCD File: PPR2411

November 3, 2023

Revised  
May 17, 2024

prepared for  
GREENER PASTURES LLC  
Jeff Weisburg  
4450 Mark Dabling Blvd  
Colorado Springs, CO 80907

Oliver E. Watts, Consulting Engineer, Inc.  
Colorado Springs, Colorado

**OLIVER E. WATTS, PE-LS**  
OLIVER E. WATTS, CONSULTING ENGINEER, INC.  
CIVIL ENGINEERING AND SURVEYING  
614 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907  
(719) 593-0173  
fax (719) 265-9660  
[olliewatts@aol.com](mailto:olliewatts@aol.com)  
**Celebrating over 45 years in business**

May 17, 2024

El Paso County Planning and Community Development  
2880 International Circle  
Colorado Springs, CO 80910

ATTN: *Joshua Palmer, P.E.*

SUBJECT: Drainage Letter, 7280 N. Nevada Lane

Transmitted herewith for your review and approval is the drainage letter for 7280 N. Nevada Lane, to accompany the zone change submittal on subject property. It has been revised in accordance with your comments of April 18, 2024.

**There will be no construction involved and no change in the runoff** as a result of this zone change request. This letter reflects current conditions as well as historic conditions (Post 3/10/28). Please contact our office if we may provide any further information.

Oliver E. Watts, Consulting Engineer, Inc.

BY: \_\_\_\_\_  
Oliver E. Watts, President

Encl:

Drainage Letter 2 pages  
Computations 3 pages  
MHFD Detention, 5 pages  
Soils Map and Interpretation Sheet  
Backup Information, 4 pages  
FEMA Flood Panel 08041C0529 G, December 7, 2018  
Sand Creek Drainage Basin (1977) Sheet 44  
Offsite Drainage Map  
Drainage Plan Dwg 23-5924-04

**1. ENGINEER'S STATEMENT:**

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

Oliver E. Watts, Consulting Engineer, Inc.

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Oliver E. Watts      Colo. PE-LS No. 9853

**2. OWNERS / DEVELOPER'S STATEMENT:**

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

Greener Pastures, LLC

By: \_\_\_\_\_  
Jeff Weisburg  
4450 Mark Dabling Blvd  
Colorado Springs, CO 80907  
(719) 291-0291

**3. EL PASO COUNTY:**

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

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

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Date

Conditions:

#### 4. LOCATION AND DESCRIPTION:

7280 N. Nevada Lane is located south of Woodmen Road, East of Black Forest Road and West of Sand Creek, as shown on the enclosed vicinity map. It occupies 4.984 acres in the Sand Creek Drainage basin in part of the Northwest quarter of the Northeast Quarter of Section 8, Township 13 South, Range 65 West of the 6<sup>th</sup> P.M. in El Paso County. The Assessor's Parcel No. is 5308000074. It is an unplatted parcel for which a zone change is being processed, which is the reason for this drainage letter. The site is bounded on the South by California Drive, on the East by Nevada Lane, on the West by Omaha Lane, and on the North by unplatted property.

#### 5. FLOOD PLAIN STATEMENT:

This subdivision is not within the limits of a designated flood plain or flood hazard area, as identified on FEMA panel no. 08041C0533 G, dated December 7, 2018, a copy of which is enclosed for reference.

#### 6. CRITERIA AND METHOD:

All computations are based on the rational method described in Volume 1 and 2, revised October 31, 2023 of the City – County drainage criteria and the El Paso County "Engineering Criteria Manual, revised December 13, 2016. Computations are enclosed, along with pertinent criteria backup information. All soils in the area are of the Blakeland Complex, hydrologic group "A", and a soils map and interpretation sheet are enclosed.

#### 7. DESCRIPTION OF RUNOFF:

##### A. Historic:

Historically (pre 2008) this area was in a range land condition. As shown on the offsite area to the North (basins O-1 and O-2) would discharge into the property and combine with basins A-C in historic conditions to develop a total of 1.3 cfs \ 9.6 cfs. The outfall would be California Drive along the South boundary. This runoff is not concentrated but is distributed over the length of the street adjacent to the development. The low area of the site is the Southwest corner.

##### B. Developed:

As shown on the enclosed offsite drainage map, 1.89 acres of the adjacent northerly lot will drain into subject property. No other inflows exist. The routing across the property is delineated on the enclosed drainage plan. Basin D in the southeast corner is isolated from the remainder of the parcel by a dike and area grading and the 0.63 office parcel drains 0.1 cfs / 0.3 cfs (5-year / 100- year runoffs) in concentrated form into California Drive. This portion of the area is historic and considered exempt. The remainder of the property is graded around a number of shop buildings to drain into California Drive over the westerly 360 feet of the South boundary with no specific outfall structure, totaling 3.8 cfs/12.2 cfs.

Since the total area of disturbance of the site exceeds one acre a full spectrum detention pond is required and is placed in the Southwest corner of the site. Storage computations are enclosed. A temporary swale is provided to concentrate the otherwise sheet flow into the pond, and the pond discharges into California Drive near Utah Lane, where energy dissipation is provided. As shown on the hydrograph in the detention computations the 100-year outflow from the pond will be 4.4 cfs, compared with the historic undeveloped runoff of 9.6 cfs.

The streets in this area are unpaved or lightly graveled and further routing may be seen in a southerly direction, primarily on Wyoming Lane, some 3800 feet to the Sand Creek channel. No specific routing has been addressed in the Sand Creek study. Sheet 44 of the study is enclosed for reference.

A concentrated flow into the pond directly is discouraged due to erosion.

What form of dissipation is provided at the discharge points? Please show and label it on the drainage map.

**8. FEES:** This site is unplatted and no construction is proposed in subject zone change request. Drainage fees are not applicable until the site is subdivided.

**9. Cost Estimate:**

Item No.	Description	Quantity	Unit Cost	Cost
1	Drainage Swale	240 LF	\$ 3.00	\$ 720.00
2	18" PVC	35 LF	76.00	2660.00
3	Concrete Downdrain	96 LF	70.00	6720.00
4	Detention Pond Grading	315 CY	8.00	2520.00
Subtotal Construction Cost				\$ 12620.00
Engineering		10%		1262.00
Total Estimated Cost				\$13882.00

**10. Summary:**

The owner of the 4.984 acre site is required to provide a drainage report as part of his zone change request. Since the area disturbed exceeds one acre, he is required to mitigate the increase. Of the total area, 0.63 acres is historic and considered exempt. The remaining 4.35 acres will be drained to a full spectrum detention pond that will store and release into California Drive near Utah Lane at the Southwest corner of the site. The historic runoff for the project area, including the inflows from adjacent properties north of the site, is 9.6 cfs (100-year storm). The resulting computed release from the proposed pond is 4.4 cfs, which is more than appropriate.

Review C1: Please include a summary section. Will this proposed project have adversely impact adjacent properties or stormwater runoff. if not, please state.

Review C2: Unresolved.

Review C1: Please discuss grading erosion, water quality, and water detention within this project. Note that if/when the site disturbs >1ac of soil, a stormwater quality treatment facility (PBMP) will be needed for the runoff from the non-excluded areas. Exclusions can be found in our PBMP Applicability Form and ECM Appendix I.7

Review C2: Unresolved. Although this project disturbed more than 1 acre, since it has already been built out, GEC is not needed, but construction drawings for the detention pond and outlet structures are required

## **11. References.**

1. City – County drainage criteria, Volumes 1 and 2, revised October 31, 2023.
2. El Paso County “Engineering Criteria Manual, revised December 13, 2016.
3. Sand Creek Drainage Basin Planning Study, revised March, 1996.

MAJOR BASIN	SUB BASIN	AREA 1"=30'		BASIN		T <sub>c</sub> MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW		RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-								5-ry qp -CFS-	100-yr qp -CFS-		
SAND CREEK	O-1	5.93	0.49	100	7.5	7.8			A	BARE	0.30	0.50	C=7		5	100
		1.25	0.10	+254	14.5	+1.8				R/L	0.08	0.35	C=10	V=2.4		
DEVELOPED	O-2	TOTAL	0.59			9.6	4.2	7.0		MIX	0.265	0.475	0.65	2.0	5	100
		4.62	0.38	100	8	8.7				BARE	0.30	0.50	C=7			
		11.15	0.962	+314	22	+2.0				R/L	0.08	0.35	C=10	V=2.6		
		TOTAL	1.30			10.7	4.3	6.8		MIX	0.144	0.39	0.80	3.5	5	100
	A	COGO	0.018	100	6.5	8.7			A	ROOF	0.73	0.81				
			0.010	+180	11	+2.4				CONC	0.89	0.96	C=5	V=1.24		
			0.700							R/L	0.08	0.35				
			0.680							BARE	0.30	0.50				
		TOTAL	1.41			11.1	4.0	6.7		MIX	0.200	0.422				
	O-1 +A			+280	17.5	+2.7							C=7	V=1.7		
	DP1	TOTAL	2.00			12.3	3.0	6.4		MIX	0.218	0.438	1.3	5.6	5	100
	B	COGO	0.227	100	2.5	9.7			A	ROOF	0.73	0.81				
			0.028	+290	6.5	+4.6				CONC.	0.90	0.96	C=7	V=1.05		
			1.285			14.3	3.6	6.0		BARE	0.30	0.50				
		TOTAL	1.54							MIX	0.374	0.554	2.1	5.1	5	100
	DP2		2.84	+390	9	+8.6							C=7	V=0.76		
	B+O2					19.2	3.2	5.3	A	MOX	0.318	0.588	2.8	8.5	5	100

**HYDROLOGICAL COMPUTATION – BASIC DATA**

PROJ: 7280 N. NEVADA LANE      BY: O.E. WATTS  
RATIONAL METHOD                      DATE: 11-3-23

**OLIVER E. WATTS, CONSULTING ENGINEER, INC.**  
614 ELKTON DRIVE COLORADO SPRINGS, CO 80907

MAJOR BASIN	SUB BASIN	AREA		BASIN		T <sub>c</sub> MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW		RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-								5-ry qp -CFS-	100-yr qp -CFS-		
SAND CREEK DEVELOPED	C	COGO	0.068	100	2	12.7			A	BARE	0.30	0.50			5	100
			0.035	+100	2	+1.9				CONC	0.90	0.96	C=5	V=0.87		
			0.043							ROOF	0.73	0.81				
			1.264							R/L	0.08	0.35				
		TOTAL	1.41			14.6	3.4	6.0		MIX	0.130	0.386	0.6	3.5	5	100
01+O2+A-C	DP3			+200	5	+4.2							C=5	V=0.79		
		TOTAL	4.95			18.5	3.2	5.4			0.242	0.459	3.8	12.2	5	100
	D	COGO	0.033	100	3	13.1			A	ROOF	0.73	0.81				
			0.017	+155	4	+3.2				CONC	0.90	0.96	C=5	V=0.80		
			0.096							A.C.	0.90	0.96				
			0.058							L/S	0.08	0.35				
			0.426							BARE	0.30	0.50				
		TOTAL	0.63			16.3	3.4	5.7		MIX	0.052	0.074	0.1	0.3	5	100

**HYDROLOGICAL COMPUTATION – BASIC DATA**  
 PROJ: 7280 N NEVADA LN BY: O.E. WATTS  
 RATIONAL METHOD DATE: 11-3-23

**OLIVER E. WATTS, CONSULTING ENGINEER, INC.**  
 614 ELKTON DRIVE COLORADO SPRINGS, CO 80907

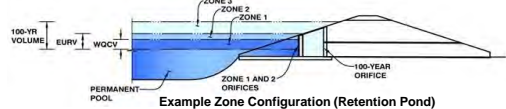


MAJOR BASIN	SUB BASIN	AREA		BASIN		T <sub>c</sub> MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW		RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-		5-ry qp -CFS-	100-yr qp -CFS-			5	100				
													V=	C=	+	+
SAND CREEK	01+02	COGO	0.72	300	24	16.0			A	R/L	0.08	0.35			5	100
		V=1.33	C=7	+580	21	+7.2										
HISTORIC			+498			23.2	2.9	4.8								
	TOTAL		5.70	880	45								1.3	9.6	5	100
FOR TOTAL IMPERVIOUS %																
	01	0.59							A		0.265	0.475				
	O2	1.30									0.144	0.39				
	A	1.41									0.200	0.422				
	B	1.54									0.374	0.554				
	C	1.41									0.130	0.386				
	D	0.63									0.052	0.074				
	TOTAL	6.88	880	45	+5.11%						0.200	0.411	=13%	IMP		
<b>HYDROLOGICAL COMPUTATION – BASIC DATA</b>																
PROJ: 7280 N NEVADA LN						BY: O.E. WATTS						<b>OLIVER E. WATTS, CONSULTING ENGINEER, INC.</b> 614 ELKTON DRIVE COLORADO SPRINGS, CO 80907				
RATIONAL METHOD						DATE: MAY 7, 2024										
PAGE 3 0 3																

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

**Project: 7280 N NEVADA AVE**  
**Basin ID: 5-17-24 EDP POND 20-5924 7280 NEVADA LANE**



**Watershed Information**

Selected BMP Type	<b>SF</b>
Watershed Area	6.88 acres
Watershed Length	880 ft
Watershed Length to Centroid	440 ft
Watershed Slope	0.051 ft/ft
Watershed Imperviousness	13.00% percent
Percentage Hydrologic Soil Group A	100.0% percent
Percentage Hydrologic Soil Group B	0.0% percent
Percentage Hydrologic Soil Groups C/D	0.0% percent
Target WOCV Drain Time	12.0 hours
Location for 1-hr Rainfall Depths	User Input

*After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.*

Water Quality Capture Volume (WOCV)	0.032 acre-feet
Excess Urban Runoff Volume (EURV)	0.098 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.)	0.039 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.)	0.060 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.)	0.080 acre-feet
25-yr Runoff Volume (P1 = 2 in.)	0.176 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.)	0.271 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.)	0.402 acre-feet
500-yr Runoff Volume (P1 = 3.41 in.)	0.834 acre-feet
Approximate 2-yr Detention Volume	0.043 acre-feet
Approximate 5-yr Detention Volume	0.058 acre-feet
Approximate 10-yr Detention Volume	0.076 acre-feet
Approximate 25-yr Detention Volume	0.101 acre-feet
Approximate 50-yr Detention Volume	0.130 acre-feet
Approximate 100-yr Detention Volume	0.194 acre-feet

**Optional User Overrides**

0.032	acre-feet
0.098	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.41	inches

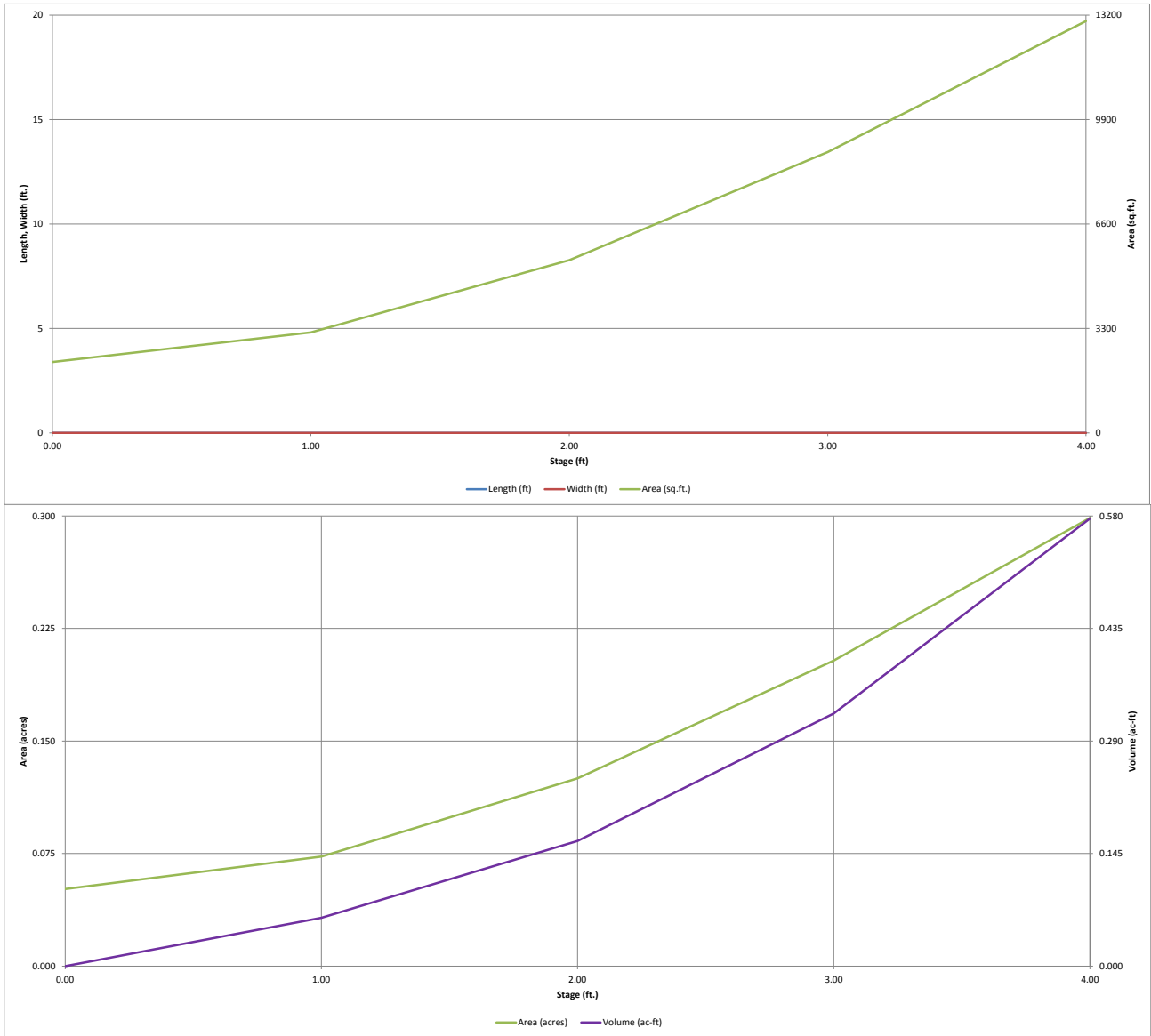
**Define Zones and Basin Geometry**

Select Zone 1 Storage Volume (Required)		acre-feet
Select Zone 2 Storage Volume (Optional)		acre-feet
Select Zone 3 Storage Volume (Optional)		acre-feet
Total Detention Basin Volume		acre-feet
Initial Surge Volume (ISV)	N/A	ft <sup>3</sup>
Initial Surge Depth (ISD)	N/A	ft
Total Available Detention Depth (H <sub>total</sub> )	user	ft
Depth of Trickle Channel (H <sub>TC</sub> )	N/A	ft
Slope of Trickle Channel (S <sub>TC</sub> )	N/A	ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> )	user	H:V
Basin Length-to-Width Ratio (R <sub>LW</sub> )	user	
Initial Surge Area (A <sub>ISV</sub> )	user	ft <sup>2</sup>
Surcharge Volume Length (L <sub>ISV</sub> )	user	ft
Surcharge Volume Width (W <sub>ISV</sub> )	user	ft
Depth of Basin Floor (H <sub>FLOOR</sub> )	user	ft
Length of Basin Floor (L <sub>FLOOR</sub> )	user	ft
Width of Basin Floor (W <sub>FLOOR</sub> )	user	ft
Area of Basin Floor (A <sub>FLOOR</sub> )	user	ft <sup>2</sup>
Volume of Basin Floor (V <sub>FLOOR</sub> )	user	ft <sup>3</sup>
Depth of Main Basin (H <sub>MAIN</sub> )	user	ft
Length of Main Basin (L <sub>MAIN</sub> )	user	ft
Width of Main Basin (W <sub>MAIN</sub> )	user	ft
Area of Main Basin (A <sub>MAIN</sub> )	user	ft <sup>2</sup>
Volume of Main Basin (V <sub>MAIN</sub> )	user	ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> )	user	acre-feet

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
<b>Media Surface</b>	--	0.00	--	--	--	2,234	0.051		
	--	1.00	--	--	--	3,175	0.073	2,704	0.062
	--	2.00	--	--	--	5,454	0.125	7,019	0.161
	--	3.00	--	--	--	8,874	0.204	14,183	0.326
	--	4.00	--	--	--	13,013	0.299	25,126	0.577
	--	--	--	--	--	--	--		

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

*MHFD-Detention, Version 4.04 (February 2021)*

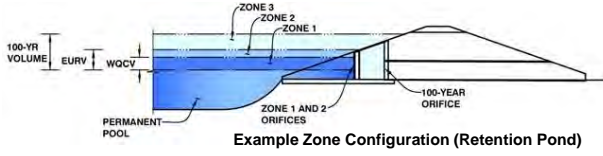


I cannot review these pond calcs without pond details. Please provide construction details for pond.

## DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*

**Project:** 7280 N NEVADA AVE  
**Basin ID:** 5-17-24 EDP POND 20-5924 7280 NEVADA LANE



**Example Zone Configuration (Retention Pond)**

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1	#N/A		
Zone 2			
Zone 3			
Total (all zones)			

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

Underdrain Orifice Invert Depth = 0.50 ft (distance below the filtration media surface)  
 Underdrain Orifice Diameter = 0.88 inches

Underdrain Orifice Area = 0.0 ft<sup>2</sup>  
 Underdrain Orifice Centroid = 0.04 feet

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

Invert of Lowest Orifice = 0.17 ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate = 4.00 ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing = 4.00 inches  
 Orifice Plate: Orifice Area per Row = 12.57 inches

WQ Orifice Area per Row = 8.729E-02 ft<sup>2</sup>  
 Elliptical Half-Width = N/A feet  
 Elliptical Slot Centroid = N/A feet  
 Elliptical Slot Area = N/A ft<sup>2</sup>

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

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.17	0.67	1.17					
Orifice Area (sq. inches)	6.28	6.29	6.28					
	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Vertical Orifice = 12.00 ft (relative to basin bottom at Stage = 0 ft)  
 Vertical Orifice Diameter = 12.00 inches

Vertical Orifice Area = Not Selected ft<sup>2</sup>  
 Vertical Orifice Centroid = 0.50 feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H<sub>o</sub> = 1.50 ft (relative to basin bottom at Stage = 0 ft)  
 Overflow Weir Front Edge Length = 2.00 feet  
 Overflow Weir Gate Slope = 0.00 H:V  
 Horiz. Length of Weir Sides = 2.00 feet  
 Overflow Gate Type = Type C Gate  
 Debris Clogging % = 0%

Height of Gate Upper Edge, H<sub>u</sub> = 1.50 feet  
 Overflow Weir Slope Length = 2.00 feet  
 Gate Open Area / 100-yr Orifice Area = 3.54  
 Overflow Gate Open Area w/o Debris = 2.78 ft<sup>2</sup>  
 Overflow Gate Open Area w/ Debris = 2.78 ft<sup>2</sup>

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

Depth to Invert of Outlet Pipe = 1.50 ft (distance below basin bottom at Stage = 0 ft)  
 Circular Orifice Diameter = 12.00 inches

Outlet Orifice Area = 0.79 ft<sup>2</sup>  
 Outlet Orifice Centroid = 0.50 feet  
 Half-Central Angle of Restrictor Plate on Pipe = N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 3.08 ft (relative to basin bottom at Stage = 0 ft)  
 Spillway Crest Length = 5.00 feet  
 Spillway End Slopes = 4.00 H:V  
 Freeboard above Max Water Surface = 0.50 feet

Spillway Design Flow Depth = 0.69 feet  
 Stage at Top of Freeboard = 4.27 feet  
 Basin Area at Top of Freeboard = 0.30 acres  
 Basin Volume at Top of Freeboard = 0.58 acre-ft

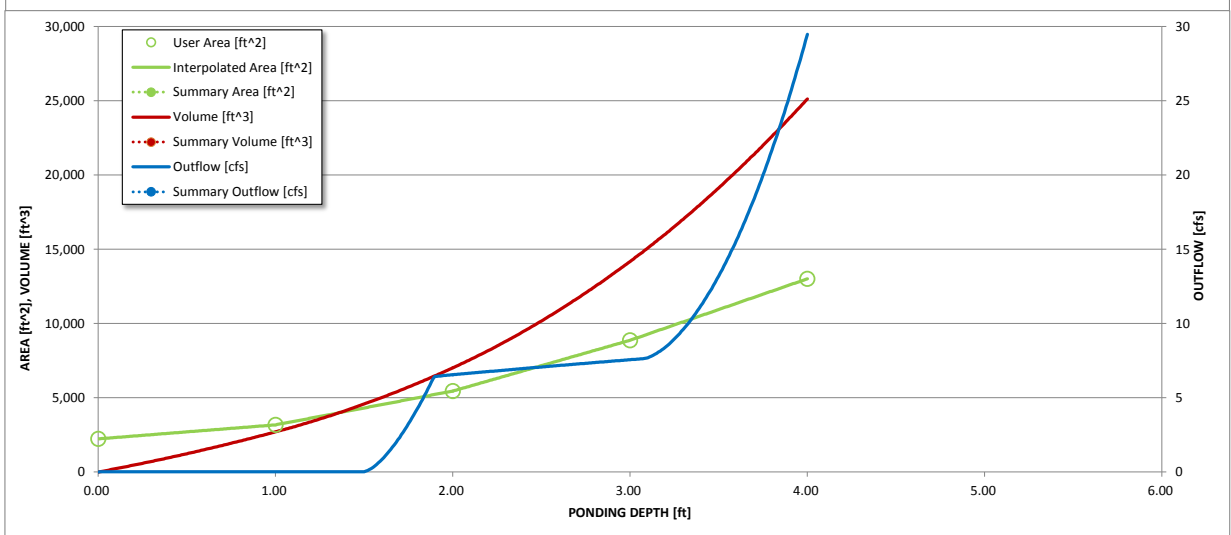
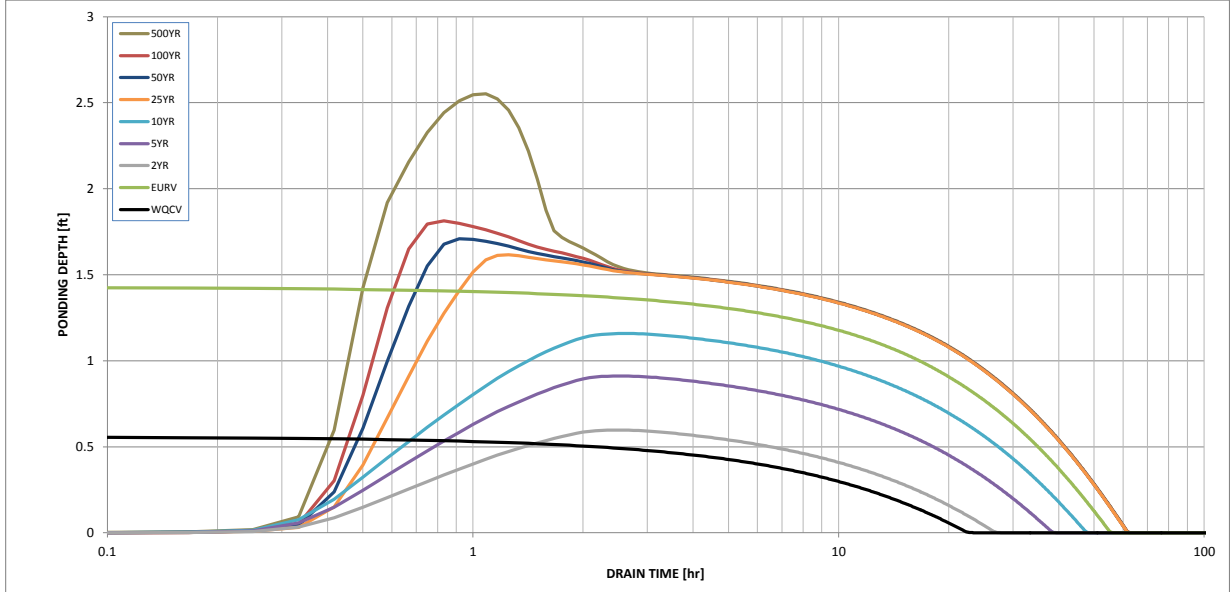
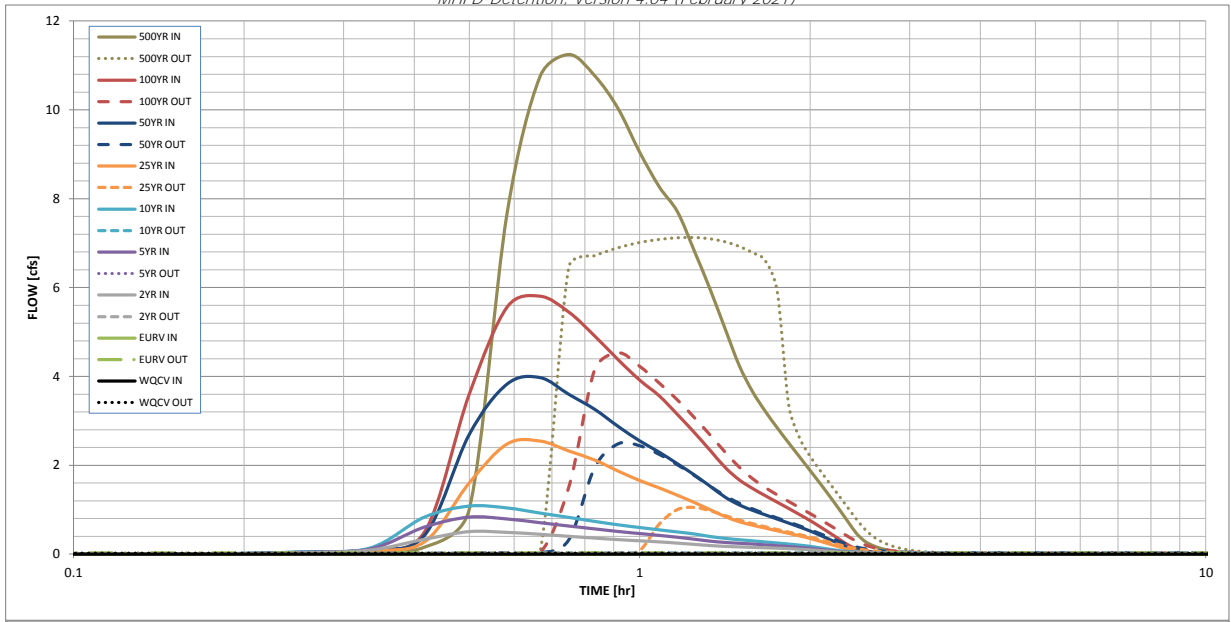
### Routed Hydrograph Results

*The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)*

	WOCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.41
One-Hour Rainfall Depth (in)	0.032	0.098	0.039	0.060	0.080	0.176	0.271	0.402	0.834
CUHP Runoff Volume (acre-ft)	N/A	N/A	0.039	0.060	0.080	0.176	0.271	0.402	0.834
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.1	0.1	0.2	1.4	2.8	4.6	9.9
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A		2.5					
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.01	0.36	0.02	0.20	0.41	0.67	1.44
Peak Inflow Q (cfs)	N/A	N/A	0.5	0.8	1.1	2.5	4.0	5.8	11.2
Peak Outflow Q (cfs)	0.0	0.0	0.0	0.0	0.0	1.0	2.5	4.5	7.1
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.0	0.2	0.7	0.9	1.0	0.7
Structure Controlling Flow	Filtration Media	Filtration Media	Filtration Media	Filtration Media	Filtration Media	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Gate 1 (fps)	N/A	N/A	N/A	N/A	N/A	0.4	0.9	1.6	2.5
Max Velocity through Gate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	22	53	26	37	46	57	55	52	44
Time to Drain 99% of Inflow Volume (hours)	22	55	27	38	47	60	60	59	55
Maximum Ponding Depth (ft)	0.56	1.43	0.60	0.91	1.16	1.62	1.71	1.81	2.55
Area at Maximum Ponding Depth (acres)	0.06	0.10	0.06	0.07	0.08	0.10	0.11	0.12	0.17
Maximum Volume Stored (acre-ft)	0.032	0.098	0.034	0.056	0.074	0.116	0.126	0.138	0.242

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.04 (February 2021)*



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

## Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0:15:00	0.00	0.00	0.02	0.04	0.05	0.03	0.04	0.04	0.06
	0:20:00	0.00	0.00	0.09	0.11	0.13	0.08	0.10	0.11	0.15
	0:25:00	0.00	0.00	0.33	0.61	0.83	0.28	0.41	0.50	1.00
	0:30:00	0.00	0.00	0.50	0.83	1.08	1.60	2.69	3.60	7.66
	0:35:00	0.00	0.00	0.49	0.79	1.04	2.48	3.83	5.56	10.74
	0:40:00	0.00	0.00	0.44	0.71	0.93	2.54	3.98	5.81	11.25
	0:45:00	0.00	0.00	0.40	0.63	0.83	2.32	3.60	5.45	10.77
	0:50:00	0.00	0.00	0.36	0.57	0.74	2.12	3.26	4.91	10.03
	0:55:00	0.00	0.00	0.32	0.51	0.66	1.87	2.87	4.38	9.05
	1:00:00	0.00	0.00	0.30	0.46	0.60	1.66	2.55	3.92	8.27
	1:05:00	0.00	0.00	0.27	0.42	0.55	1.49	2.29	3.56	7.71
	1:10:00	0.00	0.00	0.24	0.38	0.50	1.32	2.03	3.14	6.82
	1:15:00	0.00	0.00	0.22	0.34	0.46	1.16	1.78	2.74	5.95
	1:20:00	0.00	0.00	0.19	0.29	0.40	1.00	1.52	2.33	5.07
	1:25:00	0.00	0.00	0.17	0.26	0.35	0.85	1.28	1.95	4.24
	1:30:00	0.00	0.00	0.16	0.25	0.33	0.73	1.11	1.67	3.66
	1:35:00	0.00	0.00	0.15	0.23	0.30	0.65	0.98	1.48	3.22
	1:40:00	0.00	0.00	0.14	0.21	0.27	0.59	0.88	1.32	2.84
	1:45:00	0.00	0.00	0.13	0.19	0.25	0.53	0.79	1.17	2.51
	1:50:00	0.00	0.00	0.12	0.17	0.23	0.47	0.70	1.03	2.19
	1:55:00	0.00	0.00	0.11	0.15	0.20	0.41	0.61	0.89	1.88
	2:00:00	0.00	0.00	0.09	0.13	0.18	0.36	0.52	0.76	1.59
	2:05:00	0.00	0.00	0.08	0.11	0.14	0.29	0.42	0.62	1.30
	2:10:00	0.00	0.00	0.06	0.08	0.11	0.23	0.33	0.48	1.02
	2:15:00	0.00	0.00	0.05	0.06	0.08	0.17	0.23	0.34	0.73
	2:20:00	0.00	0.00	0.03	0.04	0.06	0.11	0.15	0.21	0.46
	2:25:00	0.00	0.00	0.03	0.04	0.05	0.07	0.09	0.12	0.29
	2:30:00	0.00	0.00	0.02	0.03	0.04	0.05	0.06	0.08	0.19
	2:35:00	0.00	0.00	0.02	0.02	0.03	0.03	0.04	0.05	0.13
	2:40:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.04	0.09
	2:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.03	0.06
	2:50:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.04
	2:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:05:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:15:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

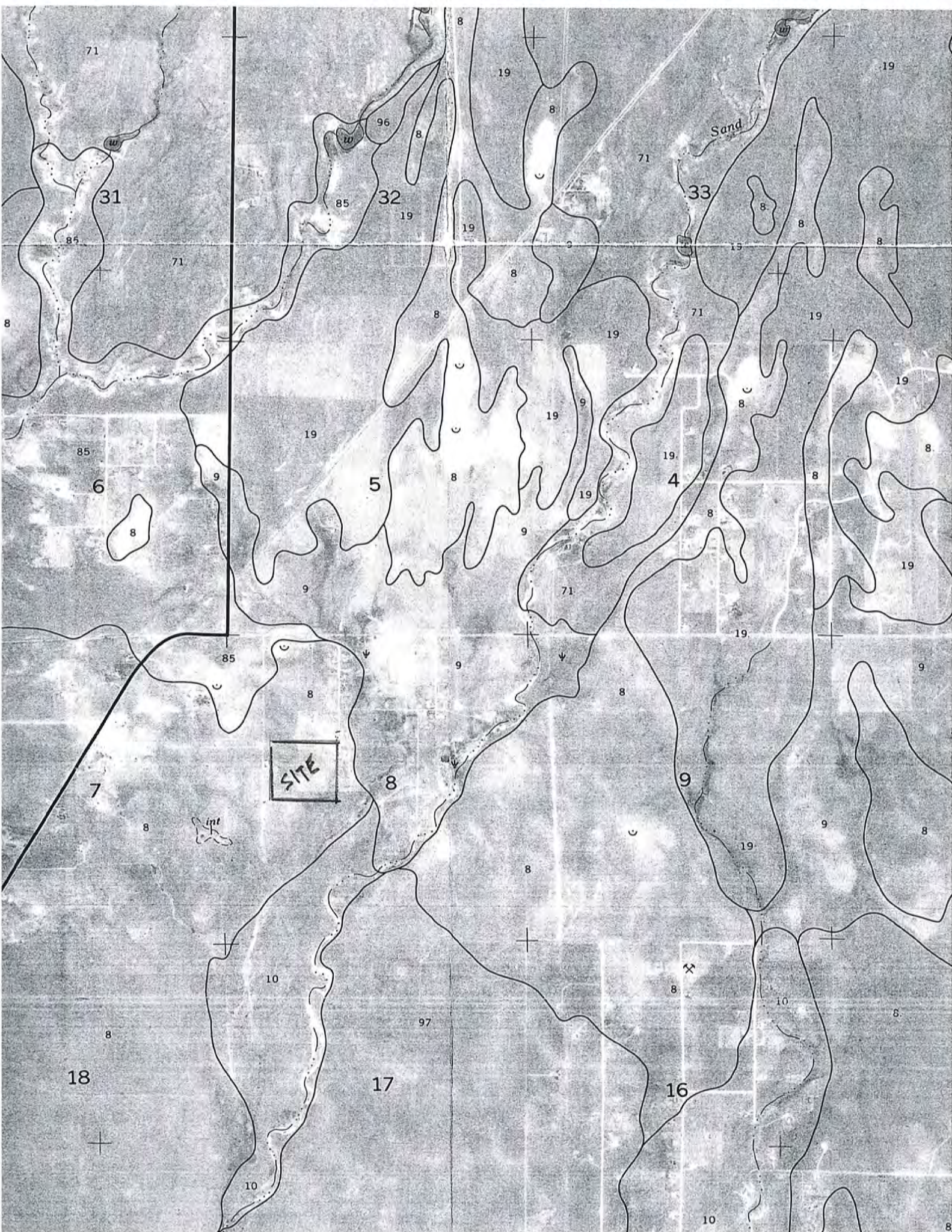
EL PASO COUNTY AREA, COLORADO

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth In	Hardness	
Alamosa: 1-----	C	Frequent-----	Brief-----	May-Jun	>60	---	High.
Ascalon: 2, 3-----	B	None-----	---	---	>60	---	Moderate.
Badland: 4-----	D	---	---	---	---	---	---
Bijou: 5, 6, 7-----	B	None-----	---	---	>60	---	Low.
Blakeland: 8-----	A	None-----	---	---	>60	---	Low.
19: Blakeland part-	A	None-----	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part-----	D	Common-----	Very brief----	Mar-Aug	>60	---	High.
Blendon: 10-----	B	None-----	---	---	>60	---	Moderate.
Bresser: 11, 12, 13-----	B	None-----	---	---	>60	---	Low.
Brussett: 14, 15-----	B	None-----	---	---	>60	---	Moderate.
Chaseville: 16, 17-----	A	None-----	---	---	>60	---	Low.
118: Chaseville part	A	None-----	---	---	>60	---	Low.
Midway part---	D	None-----	---	---	10-20	Rippable	Moderate.
Columbine: 19-----	A	None to rare	---	---	>60	---	Low.
Connerton: 120: Connerton part-	B	None-----	---	---	>60	---	High.
Rock outcrop part-----	D	---	---	---	---	---	---
Cruerton: 21-----	B	None-----	---	---	>60	---	Moderate.
Cushman: 22, 23-----	C	None-----	---	---	20-40	Rippable	Moderate.
124: Cushman part---	C	None-----	---	---	20-40	Rippable	Moderate.
Kutch part---	C	None-----	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26-----	B	None-----	---	---	>60	---	Moderate.
127: Elbeth part---	B	None-----	---	---	>60	---	Moderate.

See footnote at end of table.





**Table 6-6. Runoff Coefficients for Rational Method**  
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
<b>Business</b>													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
<b>Residential</b>													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
<b>Industrial</b>													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
<b>Parks and Cemeteries</b>													
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
<b>Undeveloped Areas</b>													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
<b>Streets</b>													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
<b>Drive and Walks</b>													
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
<b>Roofs</b>													
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
<b>Lawns</b>													
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

### 3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration ( $t_c$ ) consists of an initial time or overland flow time ( $t_i$ ) plus the travel time ( $t_r$ ) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time ( $t_i$ ) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion ( $t_r$ ) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$t_c = t_i + t_t \quad (\text{Eq. 6-7})$$

Where:

$t_c$  = time of concentration (min)

$t_i$  = overland (initial) flow time (min)

$t_t$  = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

### 3.2.1 Overland (Initial) Flow Time

The overland flow time,  $t_i$ , may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L}}{S^{0.33}} \quad (\text{Eq. 6-8})$$

Where:

$t_i$  = overland (initial) flow time (min)

$C_s$  = runoff coefficient for 5-year frequency (see Table 6-6)

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

$S$  = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

### 3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time,  $t_t$ , which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time,  $t_t$ , can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad (\text{Eq. 6-9})$$

Where:

$V$  = velocity (ft/s)

$C_v$  = conveyance coefficient (from Table 6-7)

$S_w$  = watercourse slope (ft/ft)

**Table 6-7. Conveyance Coefficient,  $C_v$** 

Type of Land Surface	$C_v$
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

\*For buried riprap, select  $C_v$  value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration ( $t_c$ ) is then the sum of the overland flow time ( $t_o$ ) and the travel time ( $t_t$ ) per Equation 6-7.

### 3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \quad (\text{Eq. 6-10})$$

Where:

$t_c$  = maximum time of concentration at the first design point in an urban watershed (min)

$L$  = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional “calibration” of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

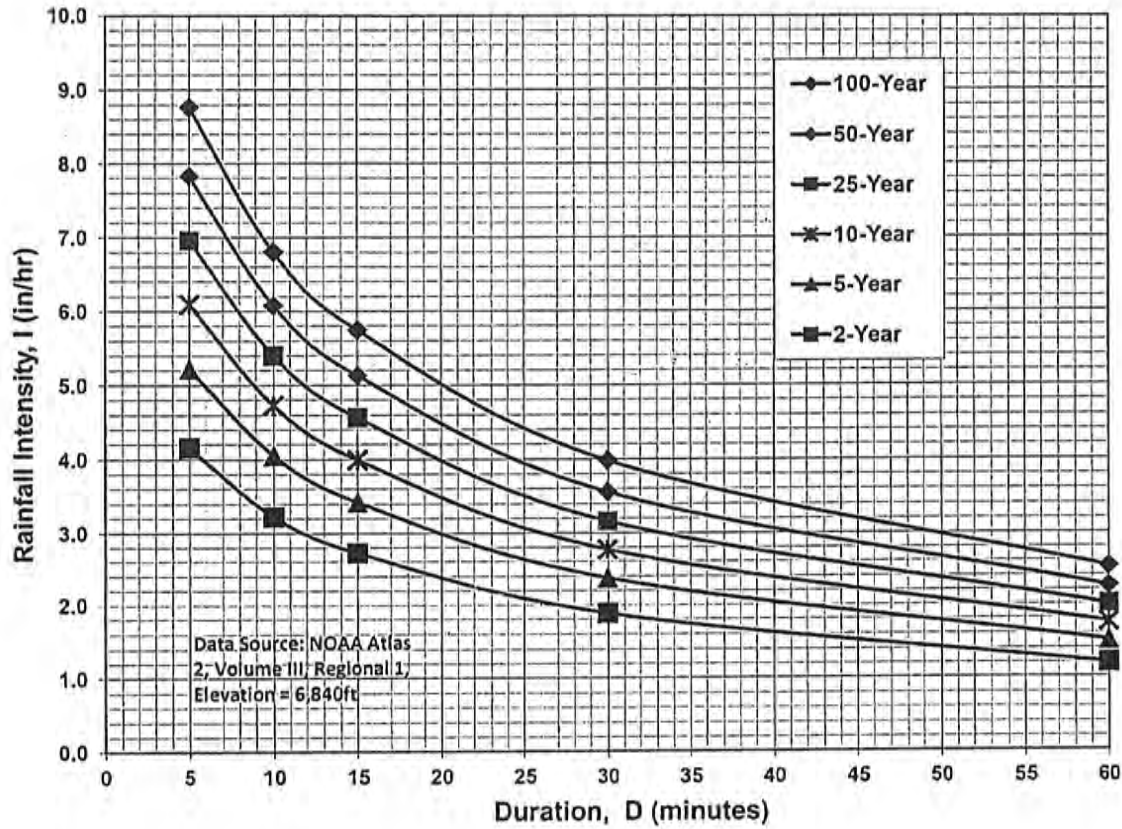
### 3.2.4 Minimum Time of Concentration

If the calculations result in a  $t_c$  of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum  $t_c$  for urbanized areas is 5 minutes.

### 3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



**IDF Equations**

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_5 = -1.50 \ln(D) + 7.583$$

$$I_2 = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

# National Flood Hazard Layer FIRMette



104°41'38"W 38°56'29"N

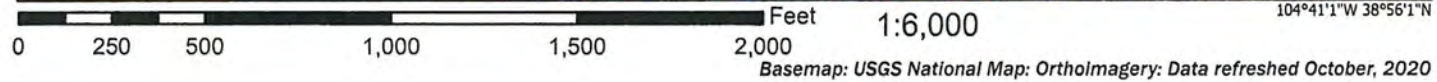


OLIVER E. WATTS  
CONSULTING ENGINEER, INC.  
COLORADO SPRINGS

## Legend

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

- |                             |  |   |
|-----------------------------|--|---|
| SPECIAL FLOOD HAZARD AREAS  |  | Without Base Flood Elevation (BFE)<br>Zone A, V, A99  |
|                             |  | With BFE or Depth Zone AE, AO, AH, VE, AR   |
|                             |  | Regulatory Floodway   |
| OTHER AREAS OF FLOOD HAZARD |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X |
|                             |  | Future Conditions 1% Annual Chance Flood Hazard Zone X  |
|                             |  | Area with Reduced Flood Risk due to Levee. See Notes. Zone X  |
|                             |  | Area with Flood Risk due to Levee Zone D  |
| OTHER AREAS                 |  | NO SCREEN Area of Minimal Flood Hazard Zone X   |
|                             |  | Effective LOMRs   |
| GENERAL STRUCTURES          |  | Area of Undetermined Flood Hazard Zone D  |
|                             |  | Channel, Culvert, or Storm Sewer  |
| OTHER FEATURES              |  | Levee, Dike, or Floodwall   |
|                             |  | Cross Sections with 1% Annual Chance Water Surface Elevation  |
| MAP PANELS                  |  | 20.2  |
|                             |  | 17.5  |
|                             |  | Coastal Transect  |
| OTHER FEATURES              |  | Base Flood Elevation Line (BFE)   |
|                             |  | Limit of Study  |
|                             |  | Jurisdiction Boundary   |
| OTHER FEATURES              |  | Coastal Transect Baseline   |
|                             |  | Profile Baseline  |
|                             |  | Hydrographic Feature  |
| MAP PANELS                  |  | Digital Data Available  |
|                             |  | No Digital Data Available   |
|                             |  | Unmapped  |
- The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/30/2023 at 4:55 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

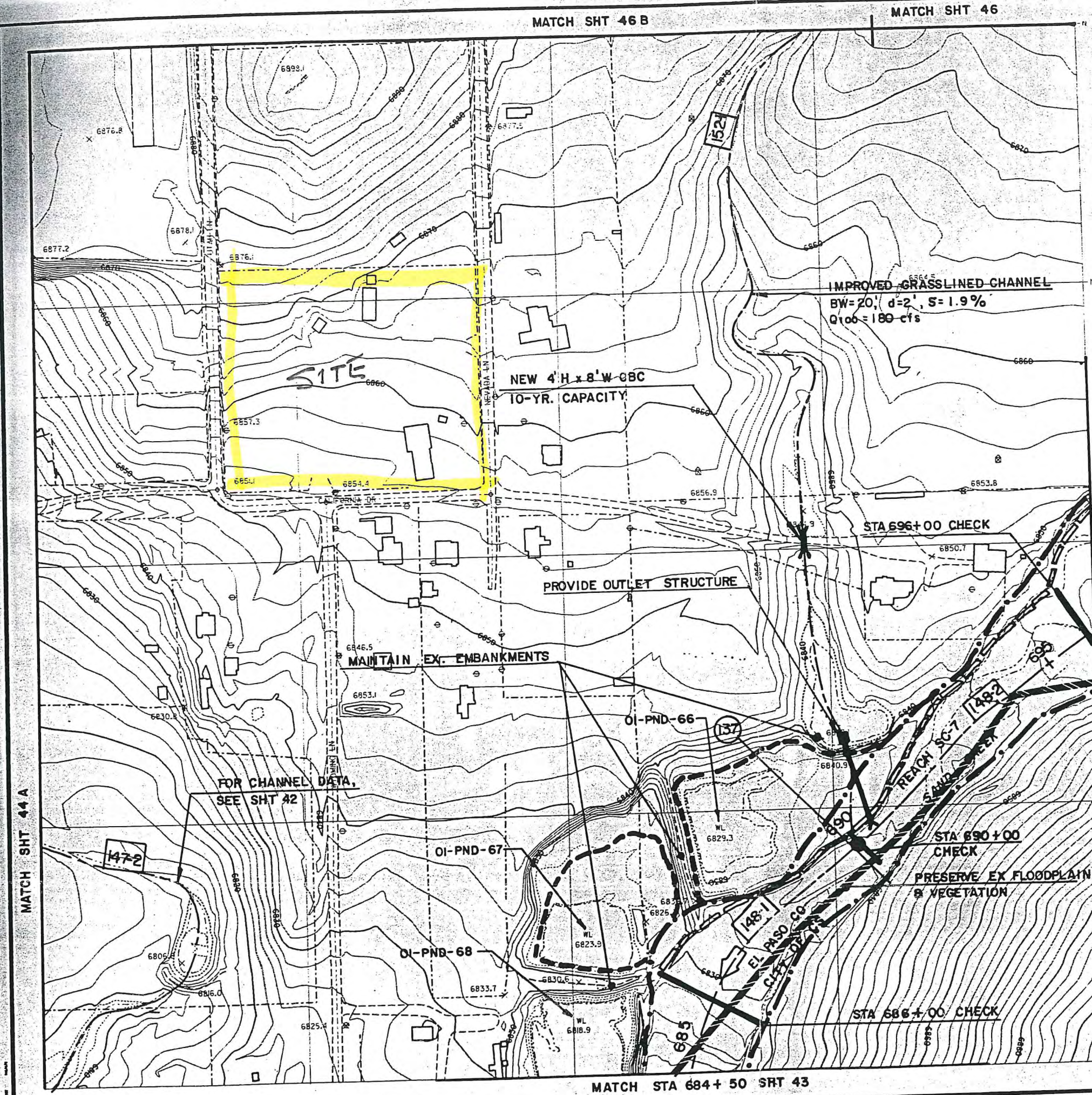
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory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

THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.

CHANNEL IMPROVEMENTS		
SEGMENT NO.	BOTTOM WIDTH (FT)	CHANNEL TYPE
148-1	N/A	SELECTIVE RIPRAP LININGS AND GRADE CONTROL
148-2		

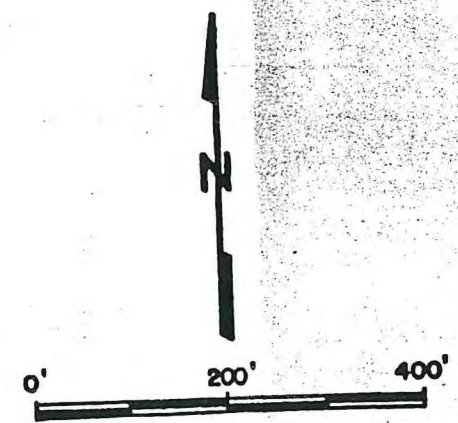
FOR PROFILE SEE SHEET P-12

Kiowa Engineering Corporation  
418 W. Bijou Street  
Colorado Springs, Colorado



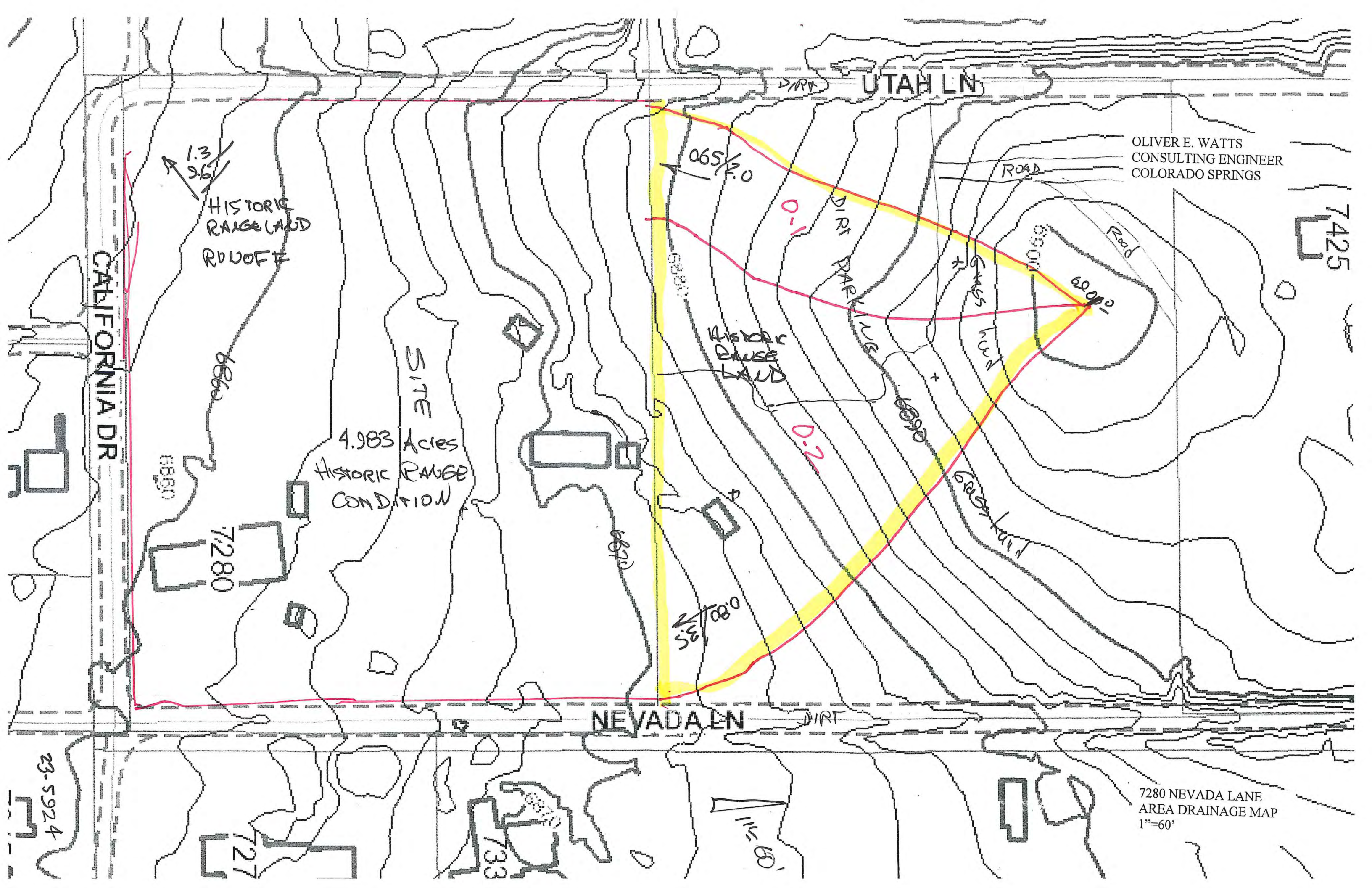
OLIVER E. WATTS  
CONSULTING ENGINEER, INC.  
COLORADO SPRINGS

7280 NEVADA LANE  
SAND CREEK DRAINAGE MAP  
1"=200'



SAND CREEK DRAINAGE  
BASIN PLANNING STUDY  
PRELIMINARY DESIGN PLANS

Project No.	90-0
Date	9-92
Design	RHW
Drawn	EAK
Checked	RHW
Reviewed	



OLIVER E. WATTS  
CONSULTING ENGINEER  
COLORADO SPRINGS

7425

CALIFORNIA DR

UTAH LN

NEVADA LN

SITE  
4.983 Acres  
Historic RAUGELUND  
CONDITION

HISTORIC  
RAUGELUND  
ROOF

HISTORIC  
RAUGELUND  
LAND

7280 NEVADA LANE  
AREA DRAINAGE MAP  
1"=60'

23-5924

727

733

735

7280

6860

6850

6870

6890

6850

6900

6900

0.65/2.0

0.1

0.2

0.8/3.5

1.3/9.6

ROAD

ROAD

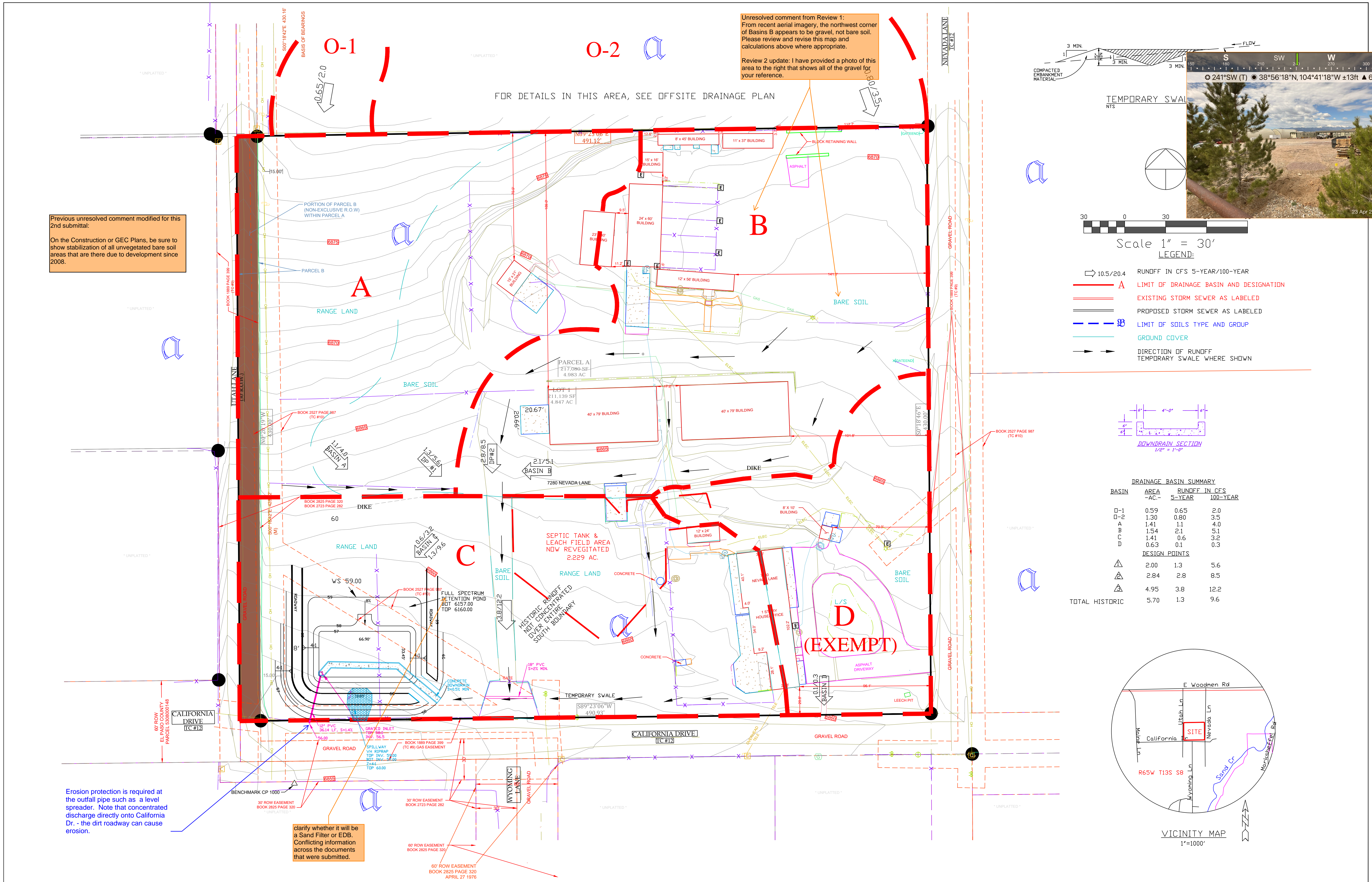
DIRT

DIRT

DIRT  
PARK  
LANE

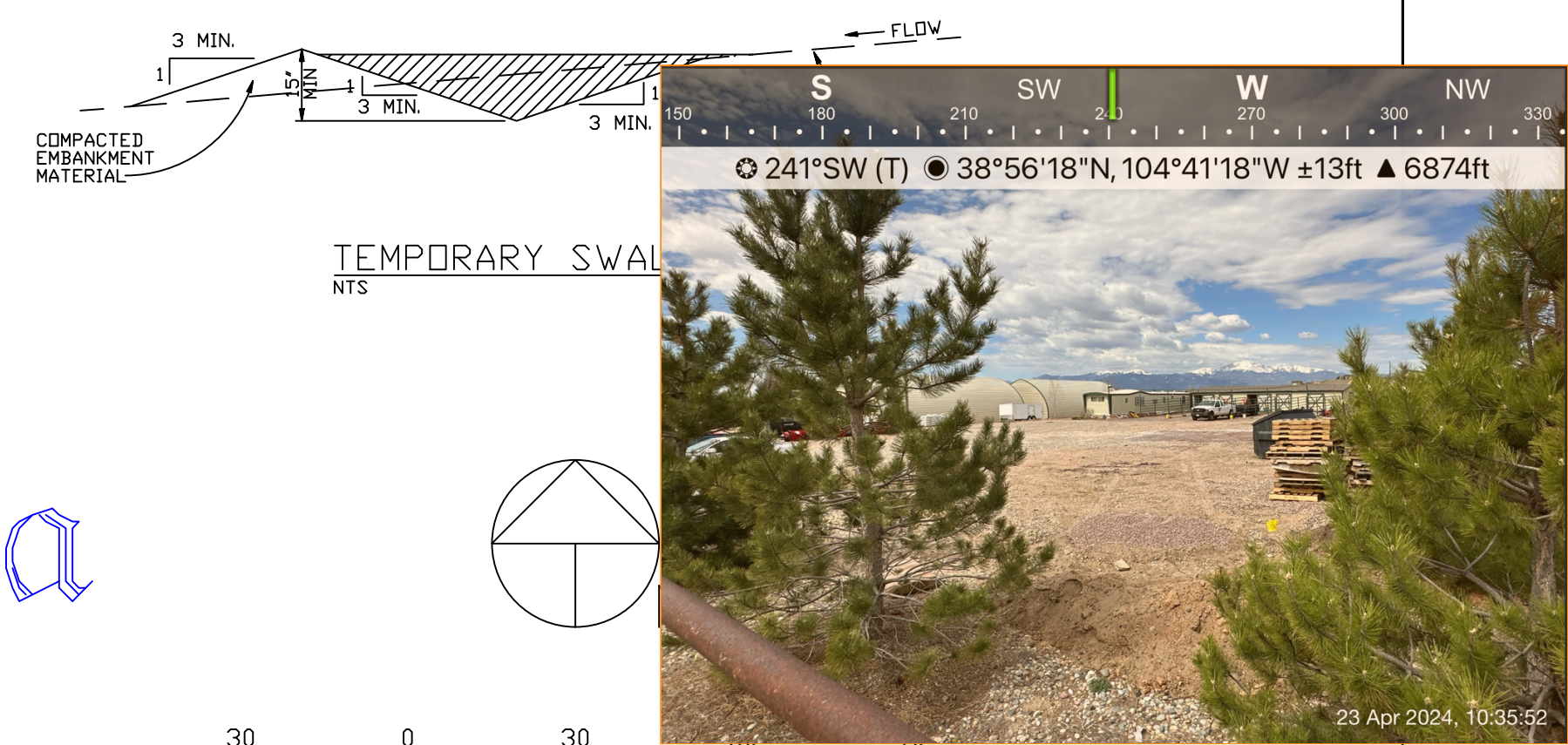
Grass  
Lund

Grass  
Lund

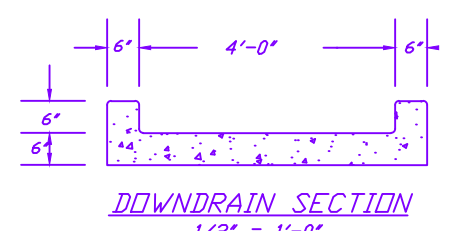


Unresolved comment from Review 1:  
 From recent aerial imagery, the northwest corner of Basins B appears to be gravel, not bare soil. Please review and revise this map and calculations above where appropriate.

Review 2 update: I have provided a photo of this area to the right that shows all of the gravel for your reference.

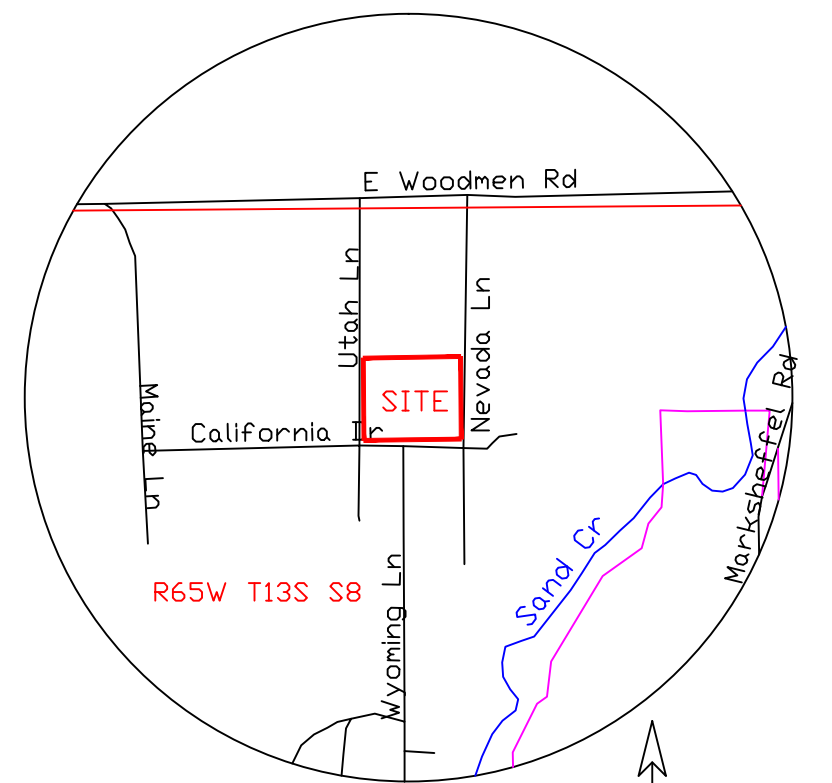


- Scale 1" = 30'
- LEGEND:
- 10.5/20.4 RUNOFF IN CFS 5-YEAR/100-YEAR
  - A LIMIT OF DRAINAGE BASIN AND DESIGNATION
  - EXISTING STORM SEWER AS LABELED
  - PROPOSED STORM SEWER AS LABELED
  - B LIMIT OF SOILS TYPE AND GROUP
  - GROUND COVER
  - DIRECTION OF RUNOFF
  - TEMPORARY SWALE WHERE SHOWN



DRAINAGE BASIN SUMMARY

BASIN	AREA -AC-	RUNOFF IN CFS 5-YEAR	100-YEAR
D-1	0.59	0.65	2.0
D-2	1.30	0.80	3.5
A	1.41	1.1	4.0
B	1.54	2.1	5.1
C	1.41	0.6	3.2
D	0.63	0.1	0.3
DESIGN POINTS			
	2.00	1.3	5.6
	2.84	2.8	8.5
	4.95	3.8	12.2
TOTAL HISTORIC	5.70	1.3	9.6



Previous unresolved comment modified for this 2nd submittal.  
 On the Construction or GEC Plans, be sure to show stabilization of all unvegetated bare soil areas that are there due to development since 2008.

FOR DETAILS IN THIS AREA, SEE OFFSITE DRAINAGE PLAN

clarify whether it will be a Sand Filter or EDB. Conflicting information across the documents that were submitted.

Erosion protection is required at the outfall pipe such as a level spreader. Note that concentrated discharge directly onto California Dr. - the dirt roadway can cause erosion.