

FINAL DRAINAGE REPORT – ADDENDUM NO. 1

for

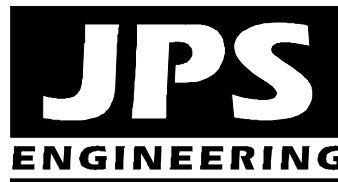
**ARACO ENTERPRISES LLC - BUILDING ADDITION
7470 SOUTHMOOR DRIVE, FOUNTAIN, CO**

Prepared for:

**Araco Enterprises LLC
7470 Southmoor Drive
Fountain, CO 80817**

June 17, 2024

Prepared by:



**19 E. Willamette Ave.
Colorado Springs, CO 80903
(719)-477-9429
www.jpsegr.com**

**JPS Project No. 111705
PPR-1950**

ARACO ENTERPRISES LLC - BUILDING ADDITION
7470 SOUTHMOOR DRIVE, FOUNTAIN, CO
DRAINAGE REPORT STATEMENTS

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 master plan for the drainage basin. I accept responsibility for liability caused by negligent acts, errors or omissions on my part in preparing this report:

John P. Schwab Colorado P.E. No. 29891

2. Developer's Statement:

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

By:

Printed Name: Arturo Acosta
Title: Manager

Date

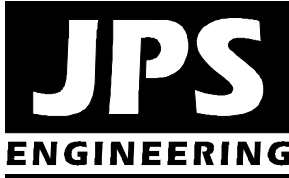
3. El Paso County Statement:

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

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

Date

Conditions:



19 E. Willamette Avenue
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ARACO ENTERPRISES LLC – FINAL DRAINAGE REPORT ADDENDUM NO. 1

I. GENERAL

A. Background

Araco Enterprises LLC is constructing a building addition along with parking and related site improvements on the developed property at 7470 Southmoor Drive in Fountain, Colorado. The project site (El Paso County Assessor’s No. 65244-00-085) is an unplatted 4.2-acre developed parcel described as a tract in the Southeast Quarter of Section 24, Township 15 South, Range 66 West of the 6th P.M. The property is located along the southwest side of Southmoor Drive. The property is zoned M (Industrial).

B. Scope

JPS Engineering prepared the “Final Drainage Report (FDR) for Araco Enterprises LLC – Building Addition” dated June 10, 2022 (approved by El Paso County on 1/5/23; PPR-1950). This report serves as an Addendum to the previously approved FDR. The purpose of this Addendum is to provide updated drainage calculations in support of consolidating the on-site stormwater detention facilities into a single basin at the northwest corner of the property.

II. DEVELOPED DRAINAGE CONDITIONS

The developed drainage basins and projected flows are shown on the attached Figure D1 (Appendix C). The previously depicted Detention Basin A2 (near the southeast corner of the site) has been eliminated, and the proposed Detention Basin A1 at the northwest corner of the site has been enlarged to meet all of the required on-site stormwater detention and water quality requirements.

Appendix A of this Addendum includes updated hydrologic calculations along with updated hydraulic calculations for the proposed Storm Sewer System A2-A1 (24” HDPE and 18” HDPE) conveying the developed drainage from the southerly Basin A2 into Detention Basin A1.

Appendix B includes updated detention pond design calculations, and the revised outlet structure design details are provided on Sh. C3.1.

III. SUMMARY

This Addendum No. 1 to the “Final Drainage Report for Araco Enterprises LLC – Building Addition” provides revised drainage calculations for the consolidation of on-site stormwater detention facilities in Detention Basin A1 at the northwest corner of the property. The proposed detention pond has been designed to provide stormwater detention and water quality to mitigate developed drainage impacts for this site. Proper construction and maintenance of the proposed drainage and erosion control facilities will ensure that this development has no significant adverse drainage impact on downstream or surrounding areas.

APPENDIX A
DRAINAGE CALCULATIONS

ARACO CONCRETE
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS											
5-YEAR C VALUES											
BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A1	1.46	1.293	ASPHALT	0.9	0.167	LANDSCAPED	0.08				0.806
A2	2.30	1.340	BUILDING / ASPHALT	0.9	0.550	GRAVEL	0.59	0.41	LANDSCAPED	0.08	0.665
A1,A2	3.76										0.720
100-YEAR C VALUES											
BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A1	1.46	1.293	ASPHALT	0.96	0.167	LANDSCAPED	0.35				0.890
A2	2.30	1.340	BUILDING / ASPHALT	0.96	0.550	GRAVEL	0.7	0.41	LANDSCAPED	0.35	0.727
A1,A2	3.76										0.790

ARACO CONCRETE
RATIONAL METHOD

HISTORIC FLOWS

BASIN	DESIGN POINT	AREA (AC)	C		Overland Flow			Channel flow					TOTAL Tc ⁽⁴⁾ (MIN)	TOTAL Tc ⁽⁴⁾ (MIN)	INTENSITY ⁽⁵⁾		PEAK FLOW	
			5-YEAR	100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco ⁽¹⁾ (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS ⁽²⁾ VELOCITY (FT/S)	Tt ⁽³⁾ (MIN)			5-YR (IN/HR)	100-YR (IN/HR)	Q5 ⁽⁶⁾ (CFS)	Q100 ⁽⁶⁾ (CFS)
			A	1	3.76	0.113	0.374	300	0.01	31.3	70	15			0.014	1.77	0.7	32.0
B	2	0.44	0.080	0.350	60	0.17	5.7	130	15	0.015	1.84	1.2	6.8	6.8	4.70	7.89	0.17	1.21

DEVELOPED FLOWS

BASIN	DESIGN POINT	AREA (AC)	C		Overland Flow			Channel flow					TOTAL Tc ⁽⁴⁾ (MIN)	TOTAL Tc ⁽⁴⁾ (MIN)	INTENSITY ⁽⁵⁾		PEAK FLOW		
			5-YEAR	100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco ⁽¹⁾ (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS ⁽²⁾ VELOCITY (FT/S)	Tt ⁽³⁾ (MIN)			5-YR (IN/HR)	100-YR (IN/HR)	Q5 ⁽⁶⁾ (CFS)	Q100 ⁽⁶⁾ (CFS)	
			DEVELOPED FLOW:																
A1	A1	1.46	0.806	0.890	100	0.01	5.4	200	20	0.015	2.45	1.4	6.7	6.7	4.72	7.93	5.55	10.30	
A2	A2	2.30	0.665	0.727	100	0.03	5.5	500	20	0.01	2.00	4.2	9.7	9.7	4.18	7.01	6.39	11.72	
Tt A2 to DP1								485	20	0.008	1.79	4.5							
A1,A2	1	3.76	0.720	0.790									14.2	14.2	3.60	6.05	9.75	17.96	
DETAINED FLOW:																			
POND A1 DISCHARGE		1	3.76															0.10	1.00
B	2	0.44	0.080	0.350	60	0.17	5.7	130	15	0.015	1.84	1.2	6.8	6.8	4.70	7.89	0.17	1.21	

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5))/(SLOPE^(0.333))

2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)

C = 2.5 FOR HEAVY MEADOW

C = 5 FOR TILLAGE/FIELD

C = 7 FOR SHORT PASTURE AND LAWNS

C = 10 FOR NEARLY BARE GROUND

C = 15 FOR GRASSED WATERWAY

C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES

3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)

4) Tc = Tco + Tt

*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED

5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL

$$I_5 = -1.5 * \ln(Tc) + 7.583$$

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

6) Q = CIA

**ARACO CONCRETE - 7470 SOUTHMOOR DRIVE
STORM INLET SIZING SUMMARY**

INLET	BASIN FLOW			INLET FLOW			INLET CONDITION / TYPE	INLET SIZE	INLET CAPACITY (CFS)
	DP	Q5 FLOW (CFS)	Q100 FLOW (CFS)	INLET FLOW % OF BASIN	Q5 FLOW (CFS)	Q100 FLOW (CFS)			
A2	A2	6.4	11.7	100	6.4	11.7	SUMP TYPE 16	DOUBLE	20.1
A1	A1	5.6	10.3	100	5.6	10.3	SUMP TYPE 16	DOUBLE	16.5

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet A2	Inlet A1
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	6.4	5.6
Major Q_{Known} (cfs)	11.7	10.3

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

Overland Slope (ft/ft)		
Overland Length (ft)		
Channel Slope (ft/ft)		
Channel Length (ft)		

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	6.4	5.6
Major Total Design Peak Flow, Q (cfs)	11.7	10.3
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A

Minor Storm (Calculated) Analysis of Flow Time

C	N/A	N/A
C_s	N/A	N/A
Overland Flow Velocity, V_i	N/A	N/A
Channel Flow Velocity, V_t	N/A	N/A
Overland Flow Time, T_i	N/A	N/A
Channel Travel Time, T_t	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A
Regional T_c	N/A	N/A
Recommended T_c	N/A	N/A
T_c selected by User	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A

Major Storm (Calculated) Analysis of Flow Time

C	N/A	N/A
C_s	N/A	N/A
Overland Flow Velocity, V_i	N/A	N/A
Channel Flow Velocity, V_t	N/A	N/A
Overland Flow Time, T_i	N/A	N/A
Channel Travel Time, T_t	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A
Regional T_c	N/A	N/A
Recommended T_c	N/A	N/A
T_c selected by User	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

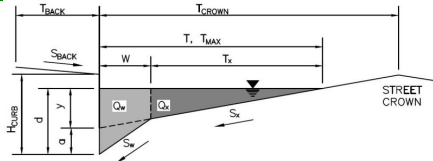
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Araco Enterprises - Inlet A2 (Sump Condition)

Inlet ID:

Inlet A1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 4.0$ ft
 $S_{BACK} = 0.020$ ft/ft
 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$ inches
 $T_{CROWN} = 50.0$ ft
 $W = 2.00$ ft
 $S_x = 0.013$ ft/ft
 $S_w = 0.083$ ft/ft
 $S_D = 0.000$ ft/ft
 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	50.0	50.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

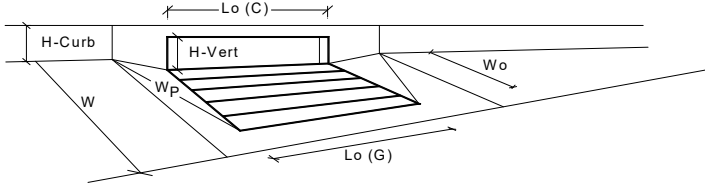
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

$Q_{allow} =$

Minor Storm	Major Storm	
SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)			
Number of Unit Inlets (Grate or Curb Opening)			
Water Depth at Flowline (outside of local depression)			
Grate Information			
Length of a Unit Grate			
Width of a Unit Grate			
Area Opening Ratio for a Grate (typical values 0.15-0.90)			
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)			
Grate Weir Coefficient (typical value 2.15 - 3.60)			
Grate Orifice Coefficient (typical value 0.60 - 0.80)			
Curb Opening Information			
Length of a Unit Curb Opening			
Height of Vertical Curb Opening in Inches			
Height of Curb Orifice Throat in Inches			
Angle of Throat (see USDCM Figure ST-5)			
Side Width for Depression Pan (typically the gutter width of 2 feet)			
Clogging Factor for a Single Curb Opening (typical value 0.10)			
Curb Opening Weir Coefficient (typical value 2.3-3.7)			
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)			
Low Head Performance Reduction (Calculated)			
Depth for Grate Midwidth			
Depth for Curb Opening Weir Equation			
Combination Inlet Performance Reduction Factor for Long Inlets			
Curb Opening Performance Reduction Factor for Long Inlets			
Grated Inlet Performance Reduction Factor for Long Inlets			
Total Inlet Interception Capacity (assumes clogged condition)			
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)			
Type	Denver No. 16 Combination		
a_{local} =	2.00	2.00	inches
No =	2	2	
Ponding Depth =	6.0	9.5	inches
<input checked="" type="checkbox"/> Override Depths			
MINOR MAJOR			
L_o (G) =	3.00	3.00	feet
W_o =	1.73	1.73	feet
A_{ratio} =	0.31	0.31	
C_f (G) =	0.50	0.50	
C_w (G) =	3.60	3.60	
C_o (G) =	0.60	0.60	
MINOR MAJOR			
L_o (C) =	3.00	3.00	feet
H_{vert} =	6.50	6.50	inches
H_{throat} =	5.25	5.25	inches
Theta =	0.00	0.00	degrees
W_p =	2.00	2.00	feet
C_f (C) =	0.10	0.10	
C_w (C) =	3.70	3.70	
C_o (C) =	0.66	0.66	
MINOR MAJOR			
d_{grate} =	0.523	0.813	ft
d_{curb} =	0.33	0.62	ft
RF _{Combination} =	0.71	1.00	
RF _{Curb} =	1.00	1.00	
RF _{Grate} =	0.71	1.00	
MINOR MAJOR			
Q_a =	6.2	16.5	cfs
Q _{PEAK REQUIRED} =	5.6	10.3	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

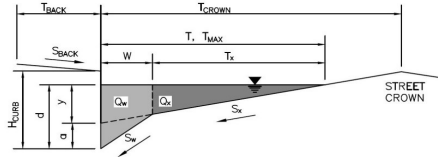
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Araco Enterprises - Inlet A2 (Sump Condition)

Inlet ID:

Inlet A2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

T_{BACK} = 4.0 ft
 S_{BACK} = 0.020 ft/ft
 n_{BACK} = 0.020

Height of Curb at Gutter Flow Line
 Distance from Curb Face to Street Crown
 Gutter Width
 Street Transverse Slope
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)
 Street Longitudinal Slope - Enter 0 for sump condition
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

H_{CURB} = 6.00 inches
 T_{CROWN} = 50.0 ft
 W = 2.00 ft
 S_x = 0.037 ft/ft
 S_w = 0.083 ft/ft
 S_o = 0.000 ft/ft
 n_{STREET} = 0.016

Max. Allowable Spread for Minor & Major Storm
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
J _{MAX}	50.0	50.0	ft
d _{MAX}	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

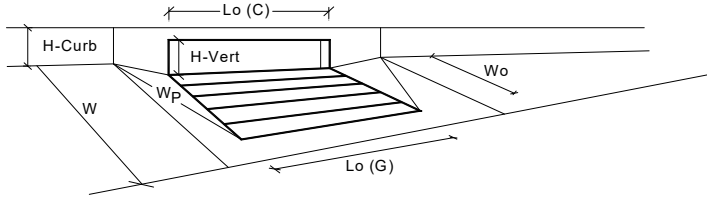
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

Q_{allow} =

Minor Storm	Major Storm	
SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)			
Number of Unit Inlets (Grate or Curb Opening)	2	2	inches
Water Depth at Flowline (outside of local depression)			
Grate Information	MINOR		MAJOR
Length of a Unit Grate	3.00	3.00	feet
Width of a Unit Grate	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	0.60	0.60	
Curb Opening Information	MINOR		MAJOR
Length of a Unit Curb Opening	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.66	0.66	
Low Head Performance Reduction (Calculated)	MINOR		MAJOR
Depth for Grate Midwidth	0.523	1.023	ft
Depth for Curb Opening Weir Equation	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.71	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	0.71	1.00	
Total Inlet Interception Capacity (assumes clogged condition)	MINOR		MAJOR
WARNING: Inlet Capacity less than Q Peak for Minor Storm	6.2	20.1	cfs
Q PEAK REQUIRED	6.4	11.7	cfs

**ARACO CONCRETE - 7470 SOUTHMOOR DRIVE
STORM SEWER SIZING SUMMARY**

PIPE FLOW				PIPE CAPACITY		
PIPE	BASINS	Q5 FLOW (CFS)	Q100 FLOW (CFS)	PIPE SIZE (IN)	MIN. PIPE SLOPE	FULL PIPE CAPACITY (CFS)
A2	A2	6.4	11.7	24	0.5%	16.0
A1	A1	5.6	10.3	18	1.0%	10.5

ASSUMPTIONS:

1. STORM DRAIN PIPE ASSUMED TO BE RCP OR HDPE

Hydraulic Analysis Report

Project Data

Project Title: Project - Araco
Designer: JPS
Project Date: Wednesday, October 23, 2019
Project Units: U.S. Customary Units
Notes:

Channel Analysis: SD-A2

Notes:

Input Parameters

Channel Type: Circular
Pipe Diameter: 2.0000 ft
Longitudinal Slope: 0.0050 ft/ft
Manning's n: 0.0130
Depth: 2.0000 ft

Result Parameters

Flow: 15.9965 cfs
Area of Flow: 3.1416 ft²
Wetted Perimeter: 6.2832 ft
Hydraulic Radius: 0.5000 ft
Average Velocity: 5.0918 ft/s
Top Width: 0.0000 ft
Froude Number: 0.0000
Critical Depth: 1.4414 ft
Critical Velocity: 6.5991 ft/s
Critical Slope: 0.0066 ft/ft
Critical Top Width: 1.79 ft
Calculated Max Shear Stress: 0.6240 lb/ft²
Calculated Avg Shear Stress: 0.1560 lb/ft²

Channel Analysis: SD-A1

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0130

Depth: 1.5000 ft

Result Parameters

Flow: 10.5043 cfs

Area of Flow: 1.7671 ft²

Wetted Perimeter: 4.7124 ft

Hydraulic Radius: 0.3750 ft

Average Velocity: 5.9442 ft/s

Top Width: 0.0000 ft

Froude Number: 0.0000

Critical Depth: 1.2451 ft

Critical Velocity: 6.6989 ft/s

Critical Slope: 0.0098 ft/ft

Critical Top Width: 1.13 ft

Calculated Max Shear Stress: 0.9360 lb/ft²

Calculated Avg Shear Stress: 0.2340 lb/ft²

APPENDIX B

STORMWATER DETENTION CALCULATIONS

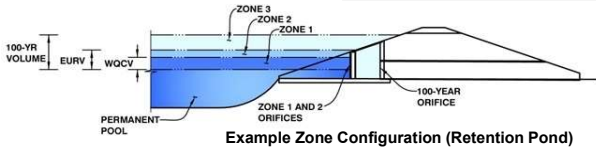
ARACO CONCRETE
COMPOSITE RUNOFF COEFFICIENTS

IMPERVIOUS AREAS - EXISTING CONDITIONS											
BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
A	3.76	0.15	BUILDING / PAVEMENT	100	3.61	MEADOW	0				3.989
IMPERVIOUS AREAS - DEVELOPED CONDITIONS											
BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
A1	1.46	1.293	ASPHALT	100	0.167	LANDSCAPED	0				88.562
A2	2.30	1.340	BUILDING / ASPHALT	100	0.550	NATIVE GRAVEL	40	0.41	LANDSCAPE	0	67.826
A1,A2	3.76										75.878

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: ARACO CONCRETE
Basin ID: A1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.14	0.096	Orifice Plate
Zone 2 (EURV)	5.57	0.275	Orifice Plate
Zone 3 (100-year)	7.31	0.163	Weir&Pipe (Restrict)
Total (all zones)		0.534	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	5.57	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	14.60	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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

	Row 1 (required)	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)	0.00	1.86	3.71					
Orifice Area (sq. inches)	0.75	0.75	0.75					
	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)

	Not Selected	
Invert of Vertical Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	
Vertical Orifice Area =	N/A	ft ²
Vertical Orifice Centroid =	N/A	feet

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

	Zone 3 Weir	
Overflow Weir Front Edge Height, Ho =	6.40	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	feet
Overflow Weir Grate Slope =	0.00	H:V
Horiz. Length of Weir Sides =	2.50	feet
Overflow Grate Type =	Type C Grate	N/A
Debris Clogging % =	50%	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	
Height of Grate Upper Edge, H ₁ =	6.40	ft
Overflow Weir Slope Length =	2.50	feet
Grate Open Area / 100-yr Orifice Area =	89.98	N/A
Overflow Grate Open Area w/o Debris =	6.96	ft ²
Overflow Grate Open Area w/ Debris =	3.48	ft ²

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

	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	0.10	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	inches
Restrictor Plate Height Above Pipe Invert =	1.60	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	
Outlet Orifice Area =	0.08	ft ²
Outlet Orifice Centroid =	0.08	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.61	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	3.00	feet
Spillway End Slopes =	0.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	1.00	feet
Stage at Top of Freeboard =	9.50	feet
Basin Area at Top of Freeboard =	0.11	acres
Basin Volume at Top of Freeboard =	0.76	acre-ft

Routed Hydrograph Results

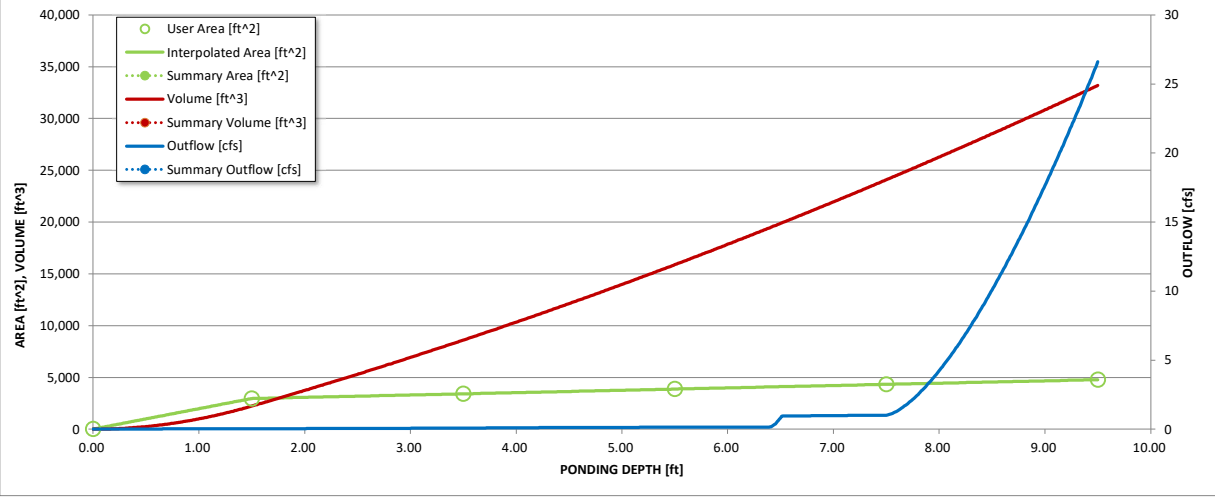
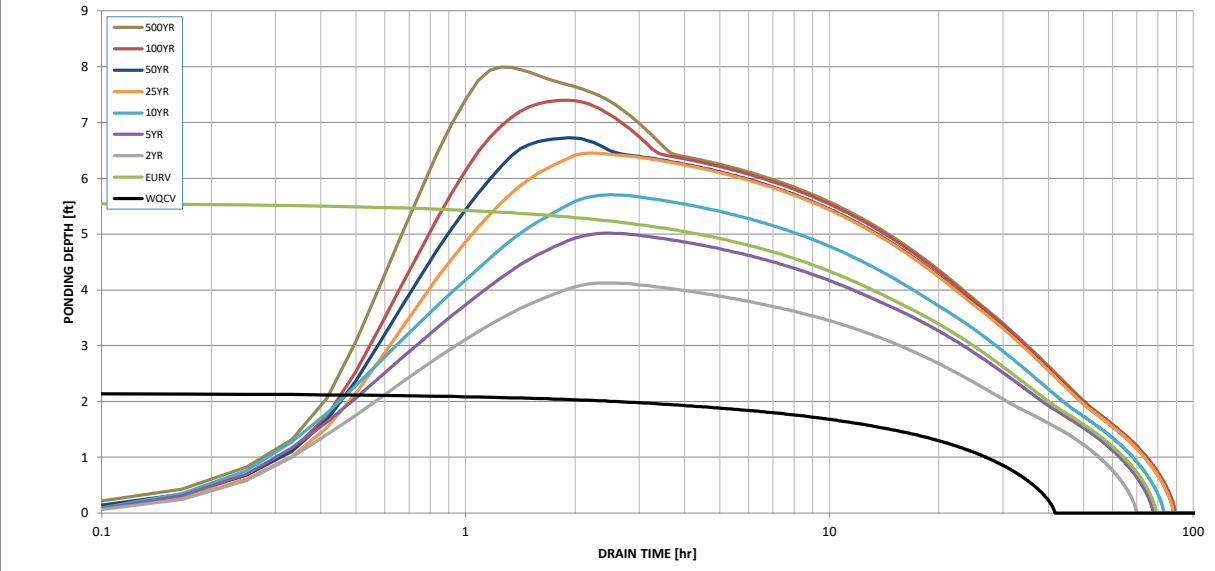
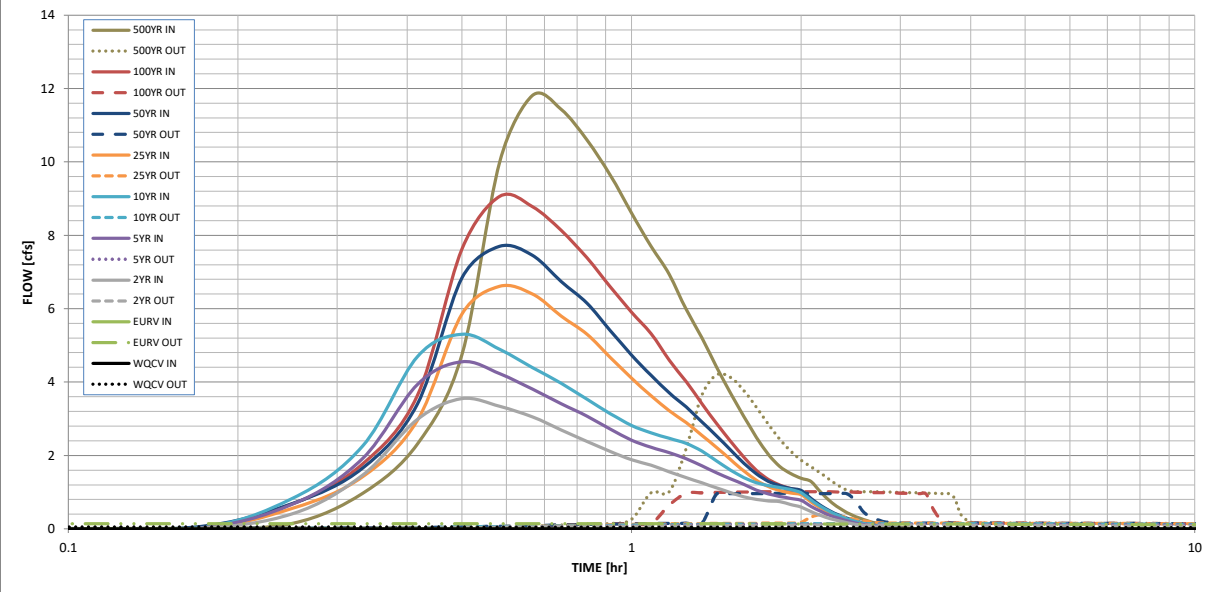
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =			1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	0.264	0.343	0.406	0.483	0.557	0.645	0.838
CUHP Runoff Volume (acre-ft) =	0.096	0.370	0.264	0.343	0.406	0.483	0.557	0.645	0.838
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.0	0.1	0.5	0.9	1.5	2.8
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.1	0.4	1.0	1.0	4.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	N/A	3.6	2.9	0.8	1.0	0.7	1.5
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.12	0.25	0.41	0.76
Peak Inflow Q (cfs) =	N/A	N/A	3.5	4.6	5.3	6.6	7.7	9.1	11.8
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.1	0.4	1.0	1.0	4.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.6	2.9	0.8	1.0	0.7	1.5
Structure Controlling Flow	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.1	0.1
Max Velocity through Grate 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) =	39	71	63	70	74	78	77	76	74
Time to Drain 99% of Inflow Volume (hours) =	40	75	67	74	79	84	83	83	82
Maximum Ponding Depth (ft) =	2.15	5.56	4.12	5.02	5.70	6.45	6.72	7.40	8.00
Area at Maximum Ponding Depth (acres) =	0.07	0.09	0.08	0.09	0.09	0.09	0.10	0.10	0.10
Maximum Volume Stored (acre-ft) =	0.096	0.370	0.247	0.322	0.383	0.452	0.477	0.542	0.602

Note that while the indicated ratios of Peak Outflow to Predevelopment Q appear higher than the recommended range for the 5-year and 10-year storms, the actual Peak Outflows are negligible (0.1 cfs) for these design storms.

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	0.05	0.00	0.15
	0:15:00	0.00	0.00	0.00	0.41	0.67	0.83	0.56	0.69	0.68	0.97
	0:20:00	0.00	0.00	0.00	1.47	1.92	2.26	1.42	1.66	1.78	2.31
	0:25:00	0.00	0.00	0.00	2.99	3.94	4.69	2.95	3.40	3.63	4.74
	0:30:00	0.00	0.00	0.00	3.55	4.55	5.30	5.85	6.84	7.62	10.00
	0:35:00	0.00	0.00	0.00	3.34	4.23	4.89	6.61	7.70	9.06	11.81
	0:40:00	0.00	0.00	0.00	3.05	3.81	4.40	6.40	7.45	8.78	11.43
	0:45:00	0.00	0.00	0.00	2.70	3.41	3.96	5.80	6.74	8.13	10.60
	0:50:00	0.00	0.00	0.00	2.38	3.07	3.53	5.30	6.15	7.39	9.64
	0:55:00	0.00	0.00	0.00	2.11	2.72	3.14	4.67	5.41	6.60	8.61
	1:00:00	0.00	0.00	0.00	1.88	2.42	2.82	4.11	4.74	5.91	7.70
	1:05:00	0.00	0.00	0.00	1.73	2.22	2.62	3.63	4.18	5.32	6.94
	1:10:00	0.00	0.00	0.00	1.56	2.08	2.47	3.22	3.70	4.60	5.98
	1:15:00	0.00	0.00	0.00	1.40	1.91	2.33	2.89	3.32	4.02	5.21
	1:20:00	0.00	0.00	0.00	1.26	1.72	2.12	2.54	2.91	3.41	4.40
	1:25:00	0.00	0.00	0.00	1.12	1.53	1.85	2.22	2.53	2.87	3.69
	1:30:00	0.00	0.00	0.00	0.99	1.36	1.60	1.88	2.14	2.39	3.06
	1:35:00	0.00	0.00	0.00	0.88	1.22	1.40	1.58	1.79	1.96	2.50
	1:40:00	0.00	0.00	0.00	0.80	1.06	1.26	1.32	1.50	1.59	2.03
	1:45:00	0.00	0.00	0.00	0.76	0.95	1.18	1.15	1.30	1.35	1.70
	1:50:00	0.00	0.00	0.00	0.74	0.89	1.13	1.04	1.18	1.20	1.51
	1:55:00	0.00	0.00	0.00	0.66	0.83	1.07	0.98	1.10	1.10	1.38
	2:00:00	0.00	0.00	0.00	0.59	0.78	0.99	0.93	1.05	1.03	1.29
	2:05:00	0.00	0.00	0.00	0.47	0.61	0.78	0.74	0.83	0.80	1.00
	2:10:00	0.00	0.00	0.00	0.37	0.48	0.61	0.57	0.64	0.61	0.76
	2:15:00	0.00	0.00	0.00	0.28	0.37	0.47	0.44	0.49	0.46	0.58
	2:20:00	0.00	0.00	0.00	0.22	0.28	0.36	0.34	0.38	0.35	0.44
	2:25:00	0.00	0.00	0.00	0.17	0.22	0.27	0.26	0.29	0.27	0.33
	2:30:00	0.00	0.00	0.00	0.13	0.16	0.20	0.19	0.21	0.20	0.25
	2:35:00	0.00	0.00	0.00	0.09	0.12	0.15	0.14	0.16	0.15	0.19
	2:40:00	0.00	0.00	0.00	0.07	0.09	0.11	0.11	0.12	0.12	0.14
	2:45:00	0.00	0.00	0.00	0.05	0.06	0.08	0.08	0.09	0.08	0.11
	2:50:00	0.00	0.00	0.00	0.03	0.04	0.06	0.05	0.06	0.06	0.07
	2:55:00	0.00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.05
	3:00:00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:05:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	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	0.00
	3:35:00	0.00	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	0.00
	3:45:00	0.00	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	0.00
	3:55:00	0.00	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	0.00	
4:05:00	0.00	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	0.00	
4:15:00	0.00	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	0.00	
4:25:00	0.00	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	0.00	
4:35:00	0.00	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	0.00	
4:45:00	0.00	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	0.00	
4:55:00	0.00	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	0.00	
5:05:00	0.00	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	0.00	
5:15:00	0.00	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	0.00	
5:25:00	0.00	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	0.00	
5:35:00	0.00	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	0.00	
5:45:00	0.00	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	0.00	
5:55:00	0.00	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	0.00	

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: JPS
Company: JPS
Date: June 4, 2024
Project: ARACO CONCRETE
Location: BASIN EDB-A1

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, I_a</p> <p>B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) Predominant Watershed NRCS Soil Group</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$ </p>	<p>$I_a =$ <u>76.0</u> %</p> <p>$i =$ <u>0.760</u></p> <p>Area = <u>3.760</u> ac</p> <p>$d_6 =$ _____ in</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> Choose One <input type="radio"/> Water Quality Capture Volume (WQCV) <input checked="" type="radio"/> Excess Urban Runoff Volume (EURV) </div> <p>$V_{DESIGN} =$ <u>0.096</u> ac-ft</p> <p>$V_{DESIGN\ OTHER} =$ _____ ac-ft</p> <p>$V_{DESIGN\ USER} =$ _____ ac-ft</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> Choose One <input checked="" type="radio"/> A <input type="radio"/> B <input type="radio"/> C / D </div> <p>EURV = <u>0.370</u> ac-ft</p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <u>4.0</u> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <u>0.00</u> ft / ft DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p><u>Concrete Forebay</u></p> <hr/> <hr/> <hr/>

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

Designer: JPS
Company: JPS
Date: June 4, 2024
Project: ARACO CONCRETE
Location: BASIN EDB-A1

<p>5. Forebay</p> <p>A) Minimum Forebay Volume ($V_{FMIN} =$ <u>2%</u> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth ($D_F =$ <u>18</u> inch maximum)</p> <p>D) Forebay Discharge</p> <p style="margin-left: 40px;">i) Undetained 100-year Peak Discharge</p> <p style="margin-left: 40px;">ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p>$V_{FMIN} =$ <u>0.002</u> ac-ft</p> <p>$V_F =$ <u>0.002</u> ac-ft</p> <p>$D_F =$ <u>15.0</u> in</p> <p>$Q_{100} =$ <u>17.96</u> cfs</p> <p>$Q_F =$ <u>0.36</u> cfs</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Choose One</p> <p><input type="radio"/> Berm With Pipe</p> <p><input checked="" type="radio"/> Wall with Rect. Notch</p> <p><input type="radio"/> Wall with V-Notch Weir</p> </div> <p align="right" style="color: blue; font-size: small;">(flow too small for berm w/ pipe)</p> <p>Calculated $D_p =$ <u> </u> in</p> <p>Calculated $W_N =$ <u>3.9</u> in</p>
<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Choose One</p> <p><input checked="" type="radio"/> Concrete</p> <p><input type="radio"/> Soft Bottom</p> </div> <p>$S =$ <u>0.0050</u> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-foot minimum)</p> <p>B) Surface Area of Micropool (10 ft² minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>$D_M =$ <u>2.5</u> ft</p> <p>$A_M =$ <u>10</u> sq ft</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Choose One</p> <p><input checked="" type="radio"/> Orifice Plate</p> <p><input type="radio"/> Other (Describe):</p> </div> <p>_____</p> <p>_____</p> <p>$D_{orifice} =$ <u>0.75</u> inches</p> <p>$A_{ot} =$ <u>2.25</u> square inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 4

Designer: JPS
Company: JPS
Date: June 4, 2024
Project: ARACO CONCRETE
Location: BASIN EDB-A1

<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>$D_{IS} = 6$ in</p> <p>$V_{IS} =$ <input style="width: 50px;" type="text"/> cu ft</p> <p>$V_s = 5.0$ cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$</p> <p>B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)</p> <p align="center">Other (Y/N): <input style="width: 50px;" type="text"/> N</p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H_{TR})</p> <p>G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)</p>	<p>$A_t = 81$ square inches</p> <p><i>S.S. Well Screen with 60% Open Area</i></p> <hr/> <hr/> <p>User Ratio =</p> <p>$A_{total} = 134$ sq. in.</p> <p>$H = 5.57$ feet</p> <p>$H_{TR} = 94.84$ inches</p> <p>$W_{opening} = 12.0$ inches</p>

Design Procedure Form: Extended Detention Basin (EDB)

Designer: JPS
Company: JPS
Date: June 4, 2024
Project: ARACO CONCRETE
Location: BASIN EDB-A1

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Buried Riprap Spillway</p> <hr/> <hr/> <hr/>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p>Periodic inspection and maintenance by property owner as required</p> <p>Ramp provided for skid-loader access to pond bottom</p> <hr/> <hr/> <hr/> <hr/>
<p>Notes:</p> <hr/> <hr/> <hr/>	

Hydraulic Analysis Report

Project Data

Project Title: Project - Araco – Detention Pond Trickle Channel

Designer: JPS

Project Date: Wednesday, June 5, 2024

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Channel Analysis - Trickle Channel

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 12.0000 ft/ft

Side Slope 2 (Z2): 12.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0130

Flow: 0.1800 cfs = **1% of 100-Yr Peak Inflow (DP1)**

Result Parameters

Depth: 0.1125 ft OK

Area of Flow: 0.1520 ft²

Wetted Perimeter: 2.7105 ft

Hydraulic Radius: 0.0561 ft

Average Velocity: 1.1842 ft/s

Top Width: 2.7011 ft OK

Froude Number: 0.8797

Critical Depth: 0.1069 ft

Critical Velocity: 1.3120 ft/s

Critical Slope: 0.0066 ft/ft

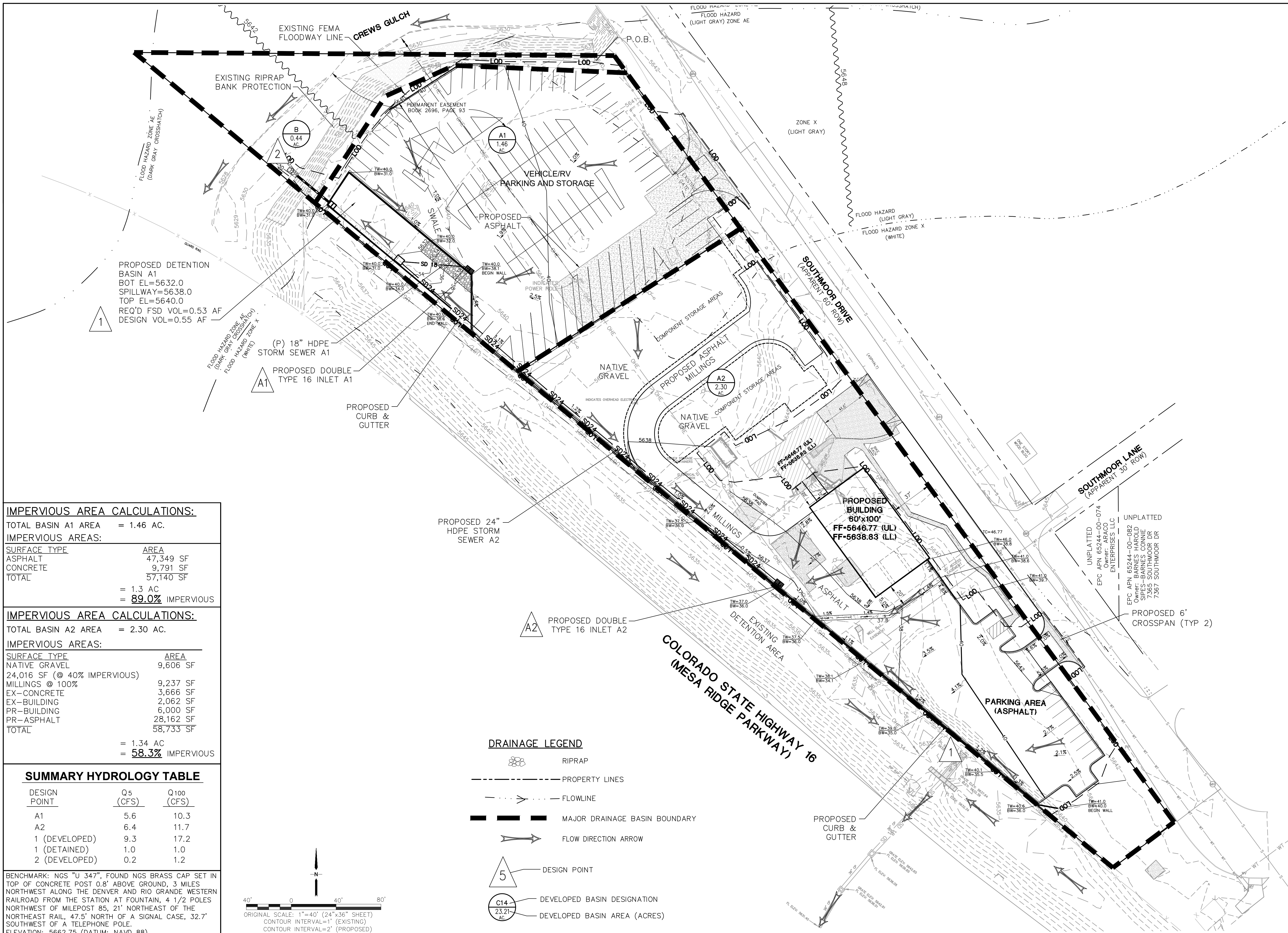
Critical Top Width: 2.57 ft

Calculated Max Shear Stress: 0.0351 lb/ft²

Calculated Avg Shear Stress: 0.0175 lb/ft²

APPENDIX C

FIGURES



IMPERVIOUS AREA CALCULATIONS:
 TOTAL BASIN A1 AREA = 1.46 AC.
 IMPERVIOUS AREAS:

SURFACE TYPE	AREA
ASPHALT	47,349 SF
CONCRETE	9,791 SF
TOTAL	57,140 SF

= 1.3 AC
 = **89.0%** IMPERVIOUS

IMPERVIOUS AREA CALCULATIONS:
 TOTAL BASIN A2 AREA = 2.30 AC.
 IMPERVIOUS AREAS:

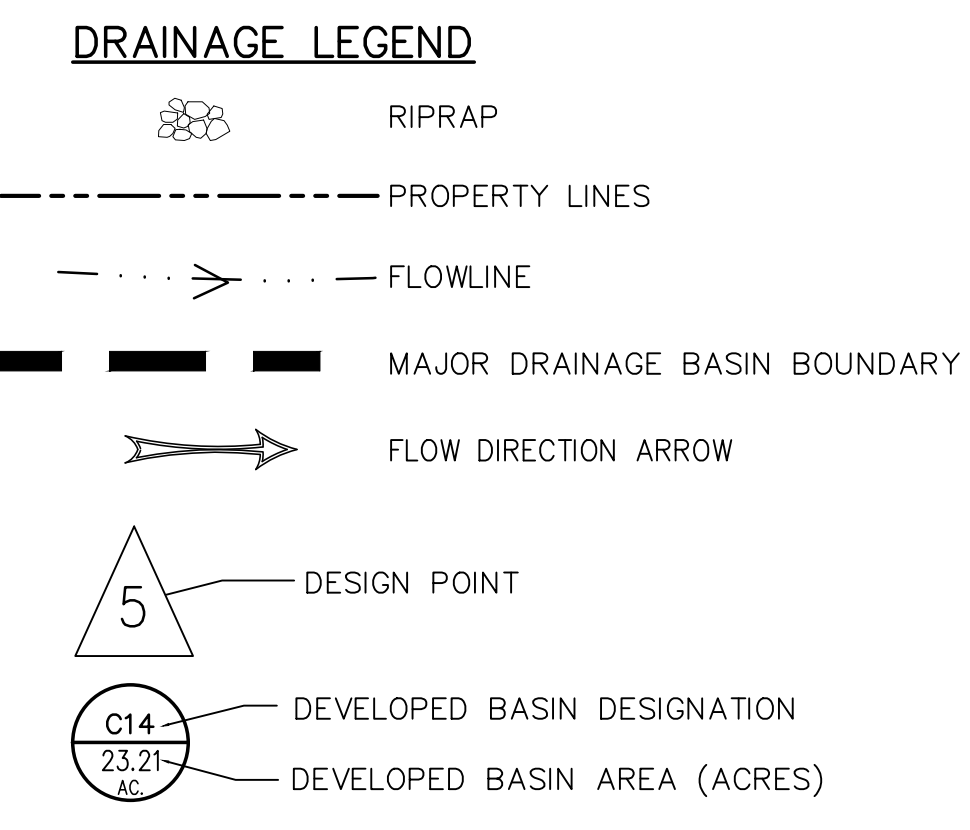
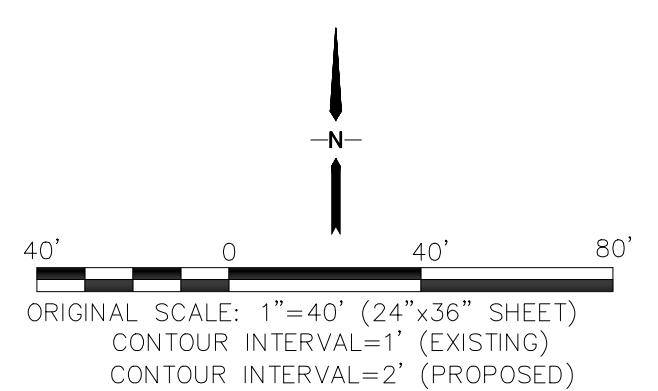
SURFACE TYPE	AREA
NATIVE GRAVEL	9,606 SF
24,016 SF (@ 40% IMPERVIOUS)	
MILLINGS @ 100%	9,237 SF
EX-CONCRETE	3,666 SF
EX-BUILDING	2,062 SF
PR-BUILDING	6,000 SF
PR-ASPHALT	28,162 SF
TOTAL	58,733 SF

= 1.34 AC
 = **58.3%** IMPERVIOUS

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
A1	5.6	10.3
A2	6.4	11.7
1 (DEVELOPED)	9.3	17.2
1 (DETAINED)	1.0	1.0
2 (DEVELOPED)	0.2	1.2

BENCHMARK: NGS "U 347", FOUND NGS BRASS CAP SET IN TOP OF CONCRETE POST 0.8' ABOVE GROUND, 3 MILES NORTHWEST ALONG THE DENVER AND RIO GRANDE WESTERN RAILROAD FROM THE STATION AT FOUNTAIN, 4 1/2 POLES NORTHWEST OF MILEPOST 85, 21' NORTHEAST OF THE NORTHEAST RAIL, 47.5' NORTH OF A SIGNAL CASE, 32.7' SOUTHWEST OF A TELEPHONE POLE.
 ELEVATION: 5662.75 (DATUM: NAVD 88)



PROPOSED DETENTION BASIN A1
 BOT EL=5632.0
 SPILLWAY=5638.0
 TOP EL=5640.0
 REQ'D FSD VOL=0.53 AF
 DESIGN VOL=0.55 AF

PROPOSED DETENTION BASIN A2
 BOT EL=5632.0
 SPILLWAY=5638.0
 TOP EL=5640.0
 REQ'D FSD VOL=0.53 AF
 DESIGN VOL=0.55 AF

ARACO CONCRETE
 7470 SOUTHMOOR DR., COLORADO SPRINGS, COLORADO 80915

DEVELOPED DRAINAGE PLAN

JPS ENGINEERING

19 E. Willamette Ave.
 Colorado Springs, CO 80903
 PH: 719-477-9429
 FAX: 719-471-0766
 www.jpsegr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
 1-800-922-1987
 CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MEMBER UTILITIES.

NO.	REVISION	BY	DATE

HORZ. SCALE: 1"=40'
 VERT. SCALE: N/A
 SURVEYED: LDC
 CREATED: 6/21/19
 PROJECT NO: 111705
 SHEET:

DRAWN: BJJ
 DESIGNED: JPS
 CHECKED: JPS
 LAST MODIFIED: 06/13/24
 MODIFIED BY: PV

D1