F Preliminary Hydrology and Hydraulics Study

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PRELIMINARY
HYDROLOGY & HYDRAULICS STUDY

Maverik Fueling & Convenience Store
Golf Central Parkway & Avenue 45
Indio, CA 92201

Prepared by:
SDC, Inc.
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LongBeach, CA 90802
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Project Owner/Developer:
Maverik, Inc.
185 S State St
Ste 800
Salt Lake City, UT, 84111

December 19th, 2023

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Hydrology & Hydraulics Study
For
Maverik Fueling & Convenience Store
Golf Central Parkway & Avenue 45
Indio, CA 92201

ACKNOWLEDGEMENT AND SIGNATURE PAGE

This Hydrology & Hydraulics Study has been prepared by Mehdi Keshmiri.

Mehdi Keshmiri, P.E./RCE 84833 Date: 03/31/2024

1.0 INTRODUCTION

The purpose of this report is to calculate the pre-development and post-development hydrology conditions for the proposed site located on apn: 611-33-0025. The project is located at the northeast corner of Avenue 45 and Golf Center Parkway. The site will have 2 entrances. It is bound to the east by the Whitewater River and southeast by commercial properties. The proposed development includes a Maverik Fueling & Convenience Store and canopy, parking lot and convenience store. The calculations provided in this report have been created using the Riverside County Flood Control District Manual (2006) as it is standard in the County of Riverside.

Figure 1 – Vicinity Map

2.0 LOCATION

The purpose of this report is to calculate the pre-development and post development hydrology conditions for the proposed site located on apn: 611-33-0025. The project is located at the northeast corner of Avenue 45 and Golf Center Parkway. It is bound to the east by the Whitewater River and southeast by commercial properties.

Figure 2 –Location Map

3.0 METHODOLOGY

This report will compare the storm values using the Riverside County Flood Control District Manual (2006) to determine the increase in the 100 yr.- 24. hr. and 10 yr.- 24 hr storm events from the existing condition. Both design storm events and discharge rates will be studied using Civil Design software's Riverside County Module for node studies and hydrographs.

1. The drainage area was analyzed using Rational Method Analysis per the Riverside County Flood Control District Manual (2006).
2. The drainage subareas are located in Soil Group B according to the Riverside County Flood Control District Manual (2006) .
3. Antecedent Moisture Condition (AMC) of II was assumed for all calculations per the County recommendation within the Hydrology Manual.
4. The runoff index (RI) for Commercial Landscaped areas is 56 (AMCII) and desert areas, ungraded is 82 (AMCII).
5. This site has been analyzed by comparing the 100 year- 24 hr and 10 year- 24 hr storm, pre and post development conditions.
6. The Manning Equation is used to verify pipe capacities based on flow, the slope of pipe, and the pipe material.
7. The Hydrology Map attached to this study is part of this study.

Note: Additional Calculation Assumptions May Have Been Noted Throughout Report

4.0 EXISTING CONDITIONS CALCULATIONS

The project site has have been evaluated using the Rational Method from the Riverside County Flood Control District Manual (2006) to determine the 100 yr. – 24 hr. and 10 yr. 24 hr storm events. Certain tables and figures from the Standards are referenced in this report and have been included in Attachment 1: Standards Excerpts. The existing conditions calculations are provided in Attachment 2 for reference. The hydrology exhibits are provided for reference in the Attachments. A summary of the existing conditions are as follows:

EXISTING CONDITION SUMMARY 10-YEAR – 24 HR STORM EVENT					
DMA	***AREA (ACRES)***	***TIME OF CONC. (TC)***	***INTENSITY (IN/HR)***	***TOTAL DISCHARGE (CFS)***	***VOLUME (Cubic Ft.)***
X-1	3.34	10	2.19	4.73	22,944
Sub-Total:	**3.34**	**10**	**2.19**	**4.73**	**22,944**

EXISTING CONDITION SUMMARY 100-YEAR – 24 HR STORM EVENT					
DMA	***AREA (ACRES)***	***TIME OF CONC. (TC)***	***INTENSITY (IN/HR)***	***TOTAL DISCHARGE (CFS)***	***VOLUME (Cubic Ft.)***
X-1	3.34	10	3.51	10.13	20,834
Sub-Total:	**3.34**	**10**	**3.51**	**10.13**	**20,834**

5.0 PROPOSED CONDITIONS CALCULATIONS

The project site has have been evaluated using the Rational Method from the Riverside County Flood Control District Manual (2006) to determine the 100 yr. – 24 hr. and 10 yr. 24 hr storm events. Certain tables and figures from the Standards are referenced in this report and have been included in Attachment 1: Standards Excerpts. The proposed conditions calculations are provided in Attachment 3 for reference. The hydrology exhibits are provided for reference in the Attachment. A summary of the existing conditions are as follows:

PROPOSED CONDITION SUMMARY 10-YEAR-24 HR STORM EVENT					
DMA	***AREA (ACRES)***	***TIME OF CONC. (TC)***	***INTENSITY (IN/HR)***	***TOTAL DISCHARGE (CFS)***	***VOLUME (Cubic Ft.)***
A-1	3.34	10	2.93	8.44	8602.7
Total:	**3.34**	**10**	**2.93**	**8.44**	**8602.7**

PROPOSED CONDITION SUMMARY 100-YEAR-24 HR STORM EVENT					
DMA	***AREA (ACRES)***	***TIME OF CONC. (TC)***	***INTENSITY (IN/HR)***	***TOTAL DISCHARGE (CFS)***	***VOLUME (Cubic Ft.)***
A-1	3.34	10	4.70	14.01	42004
Total:	**3.34**	**10**	**4.70**	**14.01**	**42004**

6.0 FEMA DETERMINATION

In order to access the impacts to existing flood control impacts, FEMA flood mapping was consulted, but the area is not listed and is assumed to be Area X. This means that there is no FEMA flooding risk associated with the project site or its proposed elements. An excerpt from the localized FEMA Flood Insurance Study mapping is provided for reference in Attachment 5.

7.0 CONCLUSION

The project is located at the northeast corner of Avenue 45 and Golf Center Parkway. The site will have 2 entrances. It is bound to the east by the Whitewater River and southeast by commercial properties. The proposed development includes a Maverik Fueling & Convenience Store and canopy, parking lot and convenience store. The site in its existing condition is a vacant, ungraded lot and drains to Golf Center Parkway and Avenue 45 to the west and south. In the proposed condition, the existing drainage pattern will be maintained and the increased flows will drain into the proposed basin in the southwest corner of the site. In flood conditions, the site will overflow through a parkway drain and into Avenue 45. The project site does not increase the discharge rates of the site as the flows are maintained onsite in the proposed basin.

An overall comparison is as follows:

100-YEAR - 24 HR - DESIGN STORM EVENT COMPARISON			
DATA	***EXISTING***	***PROPOSED***	***COMPARISON***
TIME OF CONCENTRATION (TC) MIN.	10	10	***10***
TOTAL DISCHARGE (cfs)	3.51	4.70	***1.19***
AREA (ACRES)	3.34	3.34	***3.34***
VOLUME (CF)	20,834	42,004	***21,170****

10-YEAR - 24 HR - DESIGN STORM EVENT COMPARISON			
DATA	***EXISTING***	***PROPOSED***	***COMPARISON***
TIME OF CONCENTRATION (TC) MIN.	10	10	**10**
TOTAL DISCHARGE (cfs)	4.73	8.44	**3.71**
AREA (ACRES)	3.34	3.34	**x**
VOLUME (CF)	7779	22121	**+14342***

INFILTRATION BASIN DETAILS		
	Basin Bed Area:	***Depth:***
Sand:	3,792 sf	3 ft
Gravel:	3,792 sf	3 ft
Sub Total Volume Stored in Bed Section:		***7,963 cf***
Volume of Basin above ground (CF): (See Basin Report)		***15,650 cf***
Total**:**		**23,613 cf**
10 yr – 24 hr Volume	***14,342 cf ** < 23,613 cf*** √	
100 yr – 24 hr Volume	***21,170 cf* < 23,613 cf*** √	
WQMP Volume (see WQMP Report)		
2 yr – 24hr Volume	***3,937 cf < 23,613 cf*** √ √√	
10 yr – 24hr Volume	***8,602.7 cf < 23,613 cf*** √	

*Note: Porosity values sued: Gravel 0.30, Sand 0.40. *100 yr – 24 hr storm , ** 100 yr - 24 hr storm.*

Riverside County, 3.1 Infiltration Basins (72 Hr Drawdown) Note: Basin stores entire volume as shown above)

$D_1 = [(t) \times (I)] / 12s$

Where I = site infiltration rate (in/hr)
s = safety factor
t = drawdown time (maximum 72 hours)

$A_s = V_{BMP} / d_B$

Where A_s = minimum area required (ft^2)
V_{BMP} = volume of the infiltration basin (ft^3)
d_B= proposed depth not to exceed maximum allowable depth, D_{MAX} (ft)

Infiltration Rate: 1.2 in/hr (Page 20, ECS Southwest, LLP, Project No. 80:1035, 07/07/23.)

Design Volume			
a) Tributary Drainage Area (BMP subarea)	A_{TRIB} =	3.34	acres
b) Enter V_{BMP} determined from Section 4.3 of this Handbook	V_{BMP}=	4,365	ft^3
Maximum Depth			
a) Infiltration rate	I =	1.2	in/hr
b) Factor of Safety (See Table 1, Appendix B: "Infiltration Testing" from this BMP Handbook)	FS =	1.5	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 48\ hrs}{12\ (in/ft) \times FS}$	D_1 =	3.2	ft
d) Enter the depth of freeboard (at least 1 ft)		2	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		50	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		50	ft
g) D_2 is the smaller of:			
Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	38.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	3.2	ft
Basin Geometry			
a) Basin side slopes (no steeper than 4:1)	z =	4	:1
b) Proposed basin depth (excluding freeboard)	d_B =	1	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	4365	ft^2

In addition, the following statements apply to the project site:
Drainage Pattern Alteration Statement: The proposed project does not substantially alter the existing drainage pattern of the site or area.

Housing in a 100-Year Flood Hazard Statement: The project is not in a FEMA mapped flood hazard area per the appropriate FEMA mapping and as such, no hazards exist at this time.

Flooding Statement: The majority of the project is mapped FEMA area and is considered to be Zone X with no flooding on-site per FEMA plate 06065C2252H dated 3/6/2018.

Offsite Flows: The proposed project does not take on direct offsite flows. The project site takes on nuisance flows from the west that are captured by a V-gutter and conveyed to a parkway drain to the south and into Barbour Ave. The majority of the flows continue their historic drainage patterh to the south east and drain into the existing basin.

11.0 REFERENCES

The following references were utilized in the creation of this hydrology report:

1. Riverside County Flood Control District Manual (2006).

2. Civilcadd/civildesign Engineering Software, 1989-2014 (c) , Version 9.0.

3. Preliminary Grading Plans (See attached plans).

APPENDIX A

REFERENCE MATERIALS

VICINITY MAP

NOT TO SCALE

N

SITE ADDRESS

GOLF CENTRAL PARKWAY &
AVENUE 45
INDIO, CA 92201
CONSULTANT PROJECT
NUMBER: MAV. 36890
APN: 611-33-0025

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

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RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

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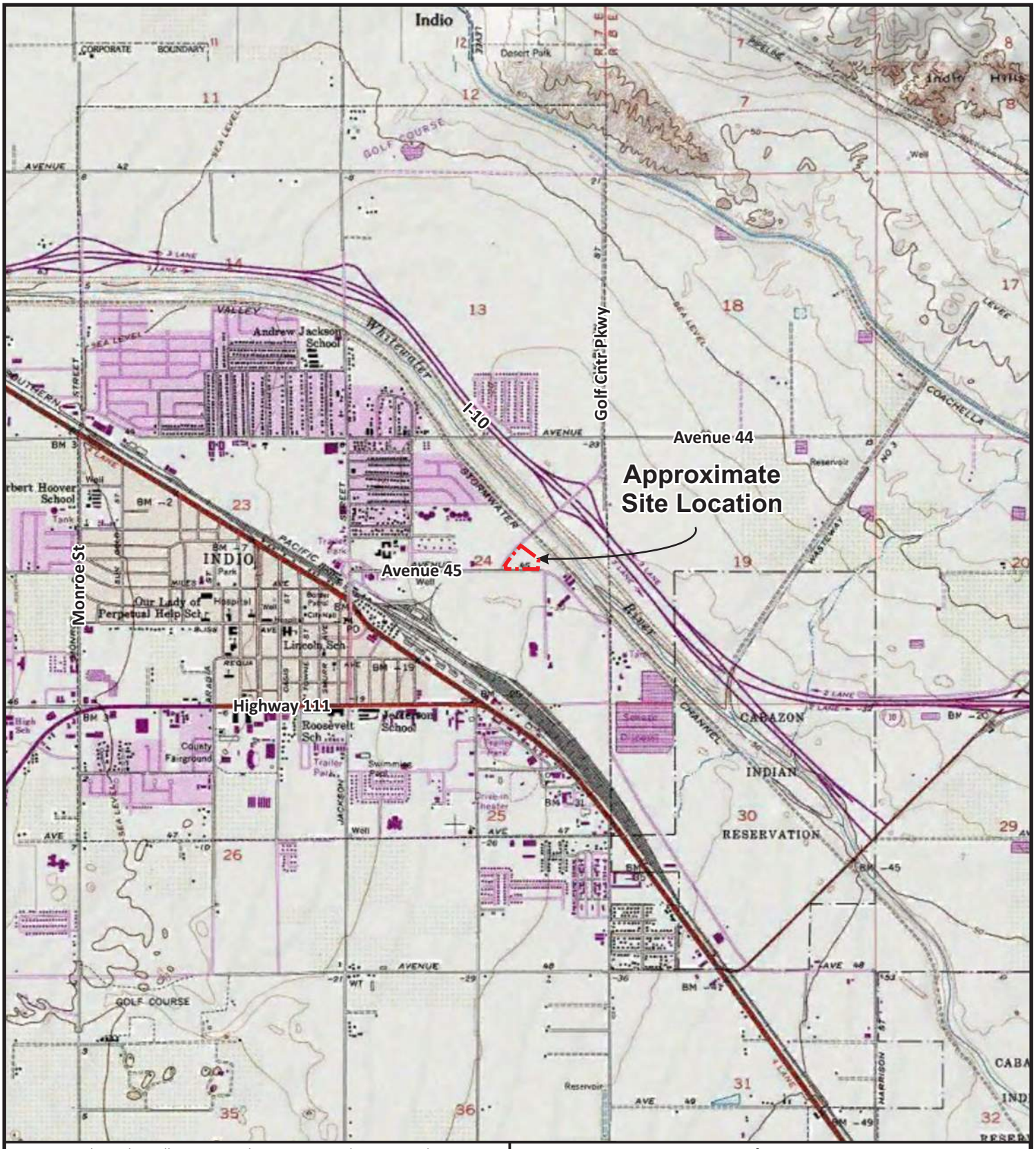
IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6



Source: Google Earth satellite image with USGS topographic map overlay.

LEGEND

Approximate Site Location

Approximate Scale: 1" = 1/2 Mile

0 1/2 Mile 1 Mile

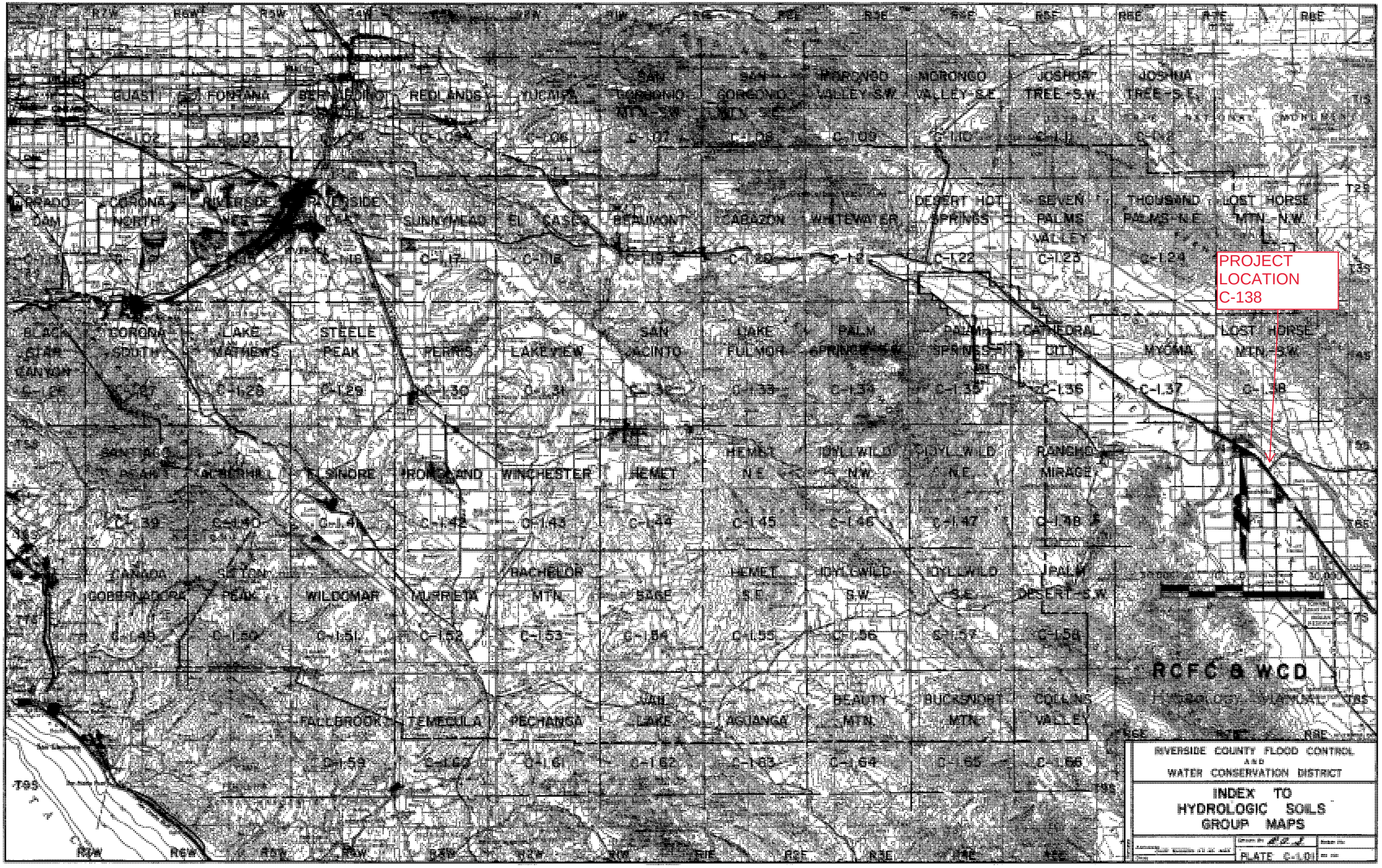
N

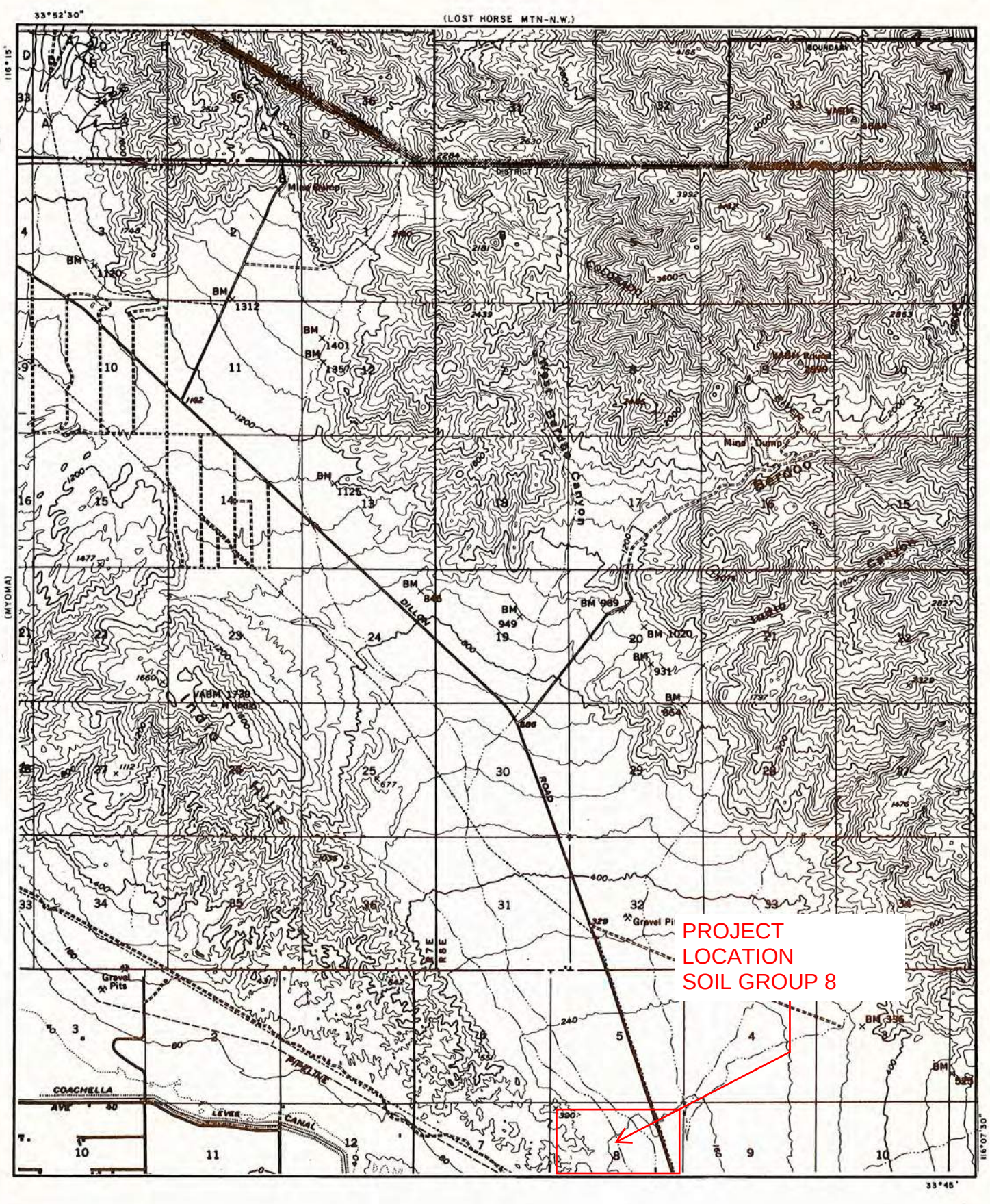
Plate 1
Site Location Map

Proposed Indio Maverik Store
Indio Center Drive & Avenue 45
Indio, Riverside County, California

Earth Systems

7/3/2023 | File No.: 306043-001


PROJECT LOCATION C-138
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
INDEX TO HYDROLOGIC SOILS GROUP MAPS
PLATE C-1.01
RCFC & WCD



LEGEND

SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

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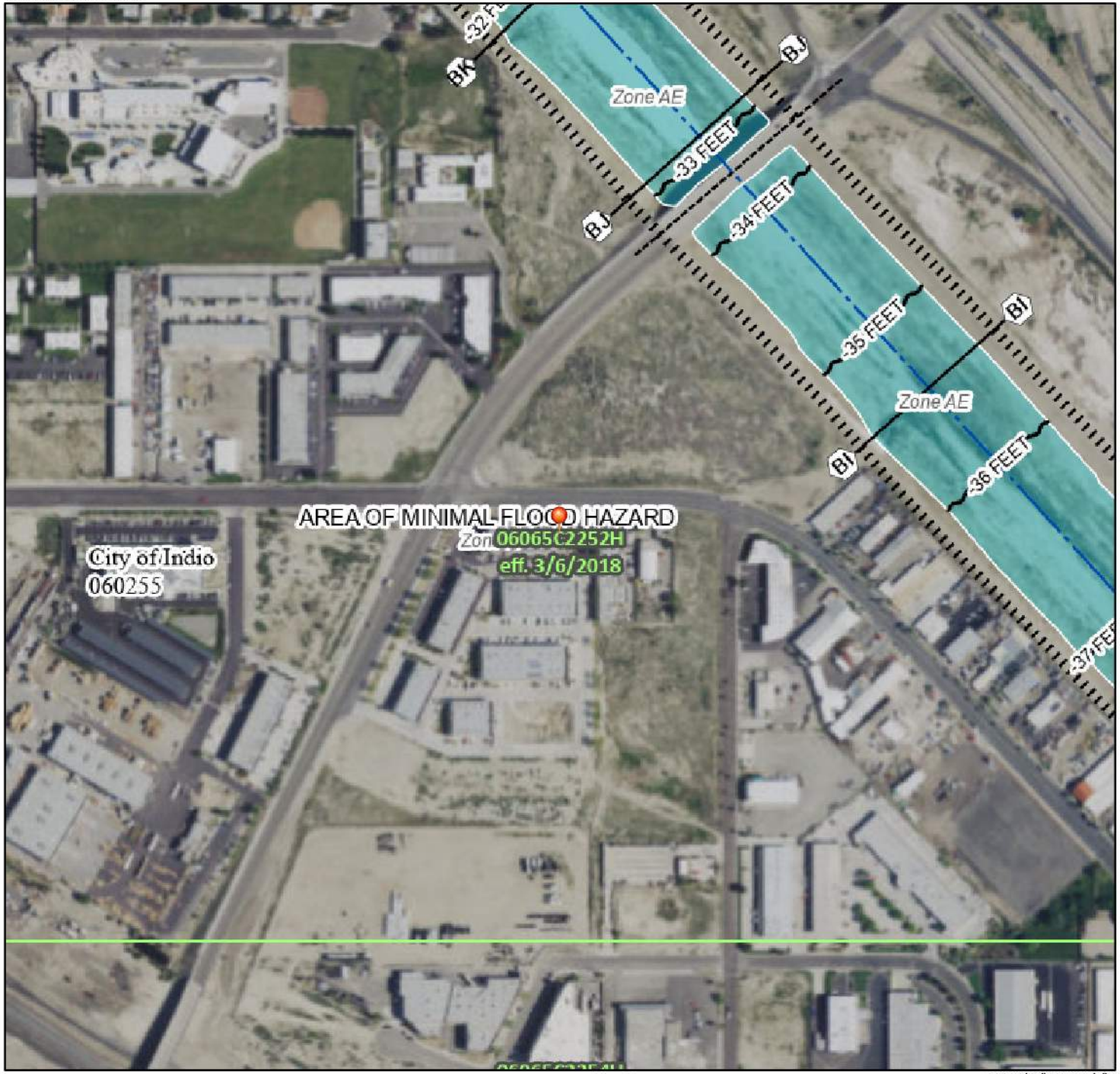
HYDROLOGIC SOILS GROUP MAP FOR LOST HORSE MTN.—S.W.

PLATE C-1.38

National Flood Hazard Layer FIRMette

FEMA

116°12'37"W 33°43'34"N



116°11'59"W 33°43'4"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/19/2023 at 1:58 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.

WQMP EXHIBIT A.2
REGIONAL WATERS MAP

GOLF CENTRAL PARKWAY & AVENUE 45
INDIO, CA 92201
APN: 611-33-0025

LEGEND
- DRAINAGE FLOW DIRECTION
- FLOW PATH
- PROJECT LOCATION

NOT TO SCALE

Know what's below. Call before you dig.

DATE OF PREPARATION: 12/19/23

MAV·RIK
185 S. STATE STREET
SALT LAKE CITY, UT 84111

MARK	DESCRIPTION	DATE

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:

243 E. 3rd Street
Long Beach, CA 90802
1333 W. McDermott Dr., Suite 200
Allen, TX 75013
Firm # F-21415

DATE: 10/10/2023

SDC
SITE DESIGN COLLABORATIVE
JOB NO.: 2023092O.0

MAVERIK STORE #:
GOLF CENTRAL PKWY & AVE. 45
INDIO, CA 92201

REGIONAL WATERS MAP

SHEET NO.
C-601

APPENDIX B

HYDROLOGY CALCULATIONS-EXISTING

APPENDIX C

HYDROLOGY CALCULATIONS-PROPOSED

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

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RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

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Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6

NOAA Atlas 14, Volume 6, Version 2
Location name: Indio, California, USA*
Latitude: 33.7228°, Longitude: -116.2046°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

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	**0.065** (0.054-0.079)	**0.101** (0.084-0.122)	**0.153** (0.127-0.186)	**0.200** (0.165-0.245)	**0.271** (0.216-0.344)	**0.333** (0.260-0.432)	**0.402** (0.306-0.535)	**0.481** (0.356-0.658)	**0.603** (0.427-0.861)	**0.713** (0.488-1.05)
10-min	**0.093** (0.078-0.113)	**0.144** (0.120-0.175)	**0.219** (0.182-0.267)	**0.287** (0.236-0.352)	**0.389** (0.310-0.494)	**0.477** (0.372-0.619)	**0.577** (0.438-0.766)	**0.690** (0.510-0.944)	**0.865** (0.612-1.23)	**1.02** (0.699-1.51)
15-min	**0.112** (0.094-0.136)	**0.175** (0.145-0.212)	**0.265** (0.220-0.323)	**0.347** (0.286-0.425)	**0.471** (0.375-0.597)	**0.577** (0.450-0.749)	**0.697** (0.530-0.927)	**0.834** (0.616-1.14)	**1.05** (0.741-1.49)	**1.24** (0.845-1.83)
30-min	**0.163** (0.136-0.198)	**0.254** (0.211-0.308)	**0.386** (0.320-0.469)	**0.504** (0.415-0.618)	**0.684** (0.545-0.868)	**0.839** (0.654-1.09)	**1.01** (0.770-1.35)	**1.21** (0.896-1.66)	**1.52** (1.08-2.17)	**1.80** (1.23-2.66)
60-min	**0.229** (0.191-0.277)	**0.355** (0.296-0.431)	**0.540** (0.448-0.657)	**0.706** (0.581-0.866)	**0.958** (0.762-1.22)	**1.18** (0.916-1.52)	**1.42** (1.08-1.89)	**1.70** (1.25-2.32)	**2.13** (1.51-3.04)	**2.52** (1.72-3.72)
2-hr	**0.317** (0.264-0.384)	**0.470** (0.391-0.570)	**0.697** (0.579-0.848)	**0.905** (0.745-1.11)	**1.22** (0.975-1.55)	**1.50** (1.17-1.95)	**1.82** (1.38-2.42)	**2.18** (1.61-2.98)	**2.74** (1.94-3.90)	**3.23** (2.21-4.77)
3-hr	**0.381** (0.318-0.462)	**0.556** (0.463-0.675)	**0.819** (0.680-0.996)	**1.06** (0.873-1.30)	**1.44** (1.14-1.82)	**1.76** (1.38-2.29)	**2.14** (1.62-2.84)	**2.57** (1.90-3.51)	**3.23** (2.29-4.61)	**3.82** (2.61-5.65)
6-hr	**0.502** (0.419-0.608)	**0.727** (0.606-0.882)	**1.07** (0.885-1.30)	**1.38** (1.13-1.69)	**1.86** (1.48-2.36)	**2.29** (1.78-2.97)	**2.78** (2.11-3.69)	**3.34** (2.47-4.57)	**4.22** (2.99-6.02)	**5.00** (3.42-7.39)
12-hr	**0.607** (0.506-0.735)	**0.900** (0.749-1.09)	**1.34** (1.11-1.62)	**1.73** (1.42-2.12)	**2.34** (1.86-2.97)	**2.87** (2.24-3.72)	**3.48** (2.64-4.62)	**4.16** (3.08-5.70)	**5.22** (3.70-7.45)	**6.16** (4.21-9.10)
24-hr	**0.760** (0.672-0.876)	**1.16** (1.02-1.34)	**1.74** (1.54-2.02)	**2.27** (1.98-2.64)	**3.06** (2.59-3.69)	**3.74** (3.11-4.60)	**4.50** (3.65-5.66)	**5.36** (4.23-6.93)	**6.66** (5.05-8.96)	**7.79** (5.72-10.8)
2-day	**0.880** (0.779-1.01)	**1.36** (1.20-1.57)	**2.05** (1.81-2.38)	**2.67** (2.34-3.11)	**3.59** (3.04-4.32)	**4.37** (3.63-5.37)	**5.23** (4.24-6.58)	**6.19** (4.89-8.00)	**7.62** (5.78-10.3)	**8.84** (6.49-12.3)
3-day	**0.940** (0.832-1.08)	**1.46** (1.29-1.68)	**2.21** (1.95-2.56)	**2.87** (2.51-3.35)	**3.85** (3.26-4.64)	**4.68** (3.89-5.75)	**5.59** (4.54-7.03)	**6.60** (5.22-8.54)	**8.11** (6.15-10.9)	**9.39** (6.89-13.1)
4-day	**0.989** (0.875-1.14)	**1.54** (1.36-1.77)	**2.32** (2.05-2.69)	**3.02** (2.64-3.52)	**4.05** (3.43-4.88)	**4.91** (4.08-6.04)	**5.86** (4.76-7.37)	**6.92** (5.46-8.94)	**8.48** (6.43-11.4)	**9.80** (7.19-13.6)
7-day	**1.05** (0.927-1.21)	**1.62** (1.44-1.87)	**2.45** (2.16-2.83)	**3.18** (2.78-3.70)	**4.25** (3.60-5.12)	**5.15** (4.28-6.33)	**6.13** (4.97-7.71)	**7.22** (5.70-9.32)	**8.82** (6.69-11.9)	**10.2** (7.46-14.1)
10-day	**1.08** (0.958-1.25)	**1.68** (1.48-1.94)	**2.53** (2.23-2.92)	**3.27** (2.86-3.82)	**4.38** (3.71-5.27)	**5.30** (4.40-6.52)	**6.31** (5.12-7.93)	**7.42** (5.86-9.58)	**9.05** (6.87-12.2)	**10.4** (7.65-14.5)
20-day	**1.15** (1.02-1.33)	**1.80** (1.59-2.08)	**2.73** (2.40-3.16)	**3.54** (3.10-4.13)	**4.75** (4.02-5.72)	**5.75** (4.77-7.06)	**6.83** (5.54-8.59)	**8.02** (6.34-10.4)	**9.76** (7.40-13.1)	**11.2** (8.23-15.6)
30-day	**1.19** (1.06-1.37)	**1.90** (1.68-2.19)	**2.91** (2.57-3.37)	**3.80** (3.33-4.44)	**5.12** (4.34-6.17)	**6.22** (5.16-7.64)	**7.39** (6.00-9.30)	**8.68** (6.85-11.2)	**10.5** (8.00-14.2)	**12.1** (8.86-16.8)
45-day	**1.29** (1.14-1.49)	**2.09** (1.84-2.41)	**3.23** (2.85-3.74)	**4.24** (3.71-4.95)	**5.74** (4.86-6.91)	**6.98** (5.79-8.57)	**8.31** (6.74-10.4)	**9.75** (7.70-12.6)	**11.8** (8.98-15.9)	**13.5** (9.94-18.8)
60-day	**1.36** (1.20-1.57)	**2.22** (1.97-2.57)	**3.48** (3.07-4.03)	**4.59** (4.01-5.35)	**6.22** (5.27-7.49)	**7.58** (6.30-9.31)	**9.04** (7.34-11.4)	**10.6** (8.38-13.7)	**12.9** (9.78-17.3)	**14.7** (10.8-20.5)

[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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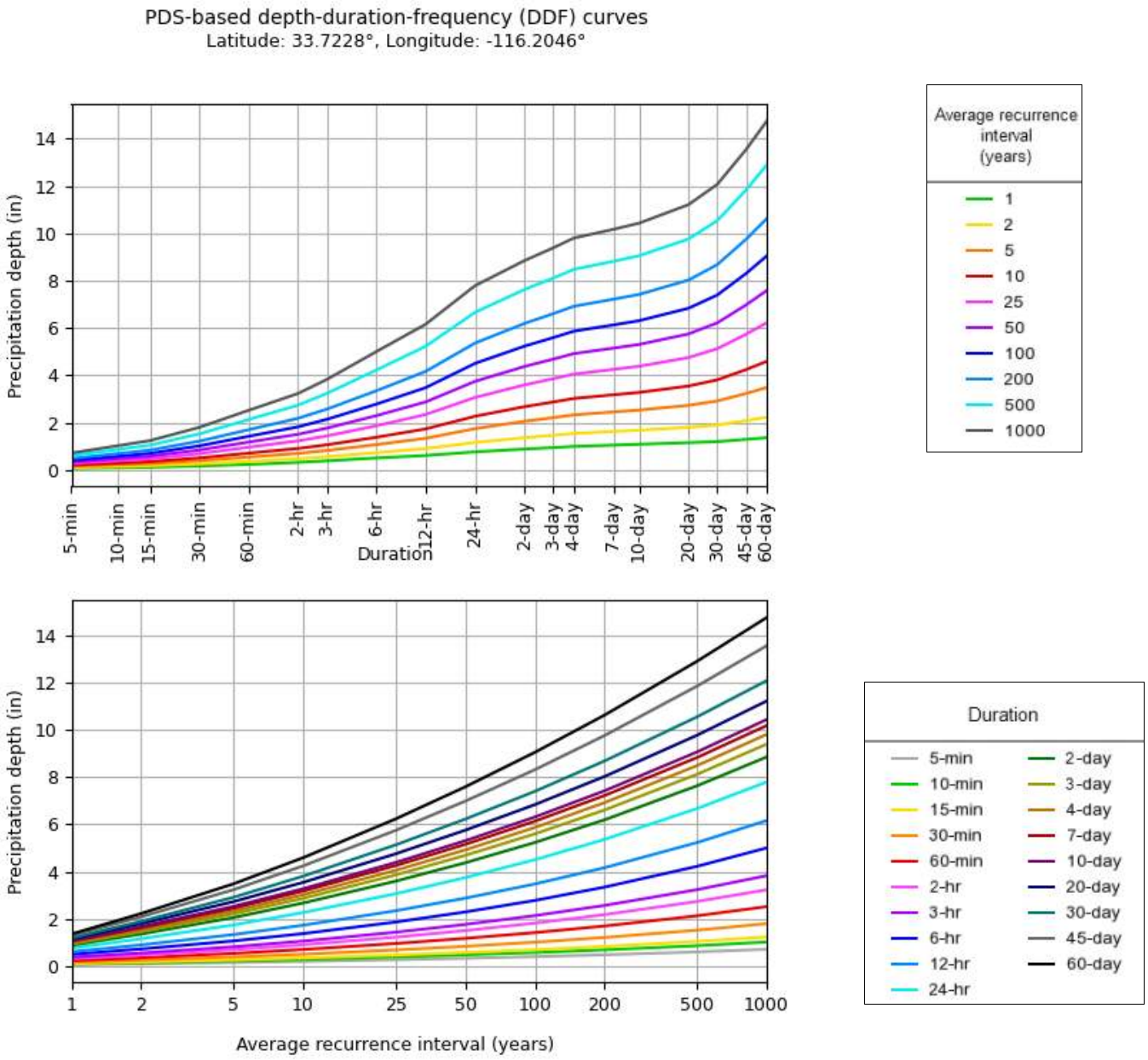
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Dec 19 19:54:06 2023

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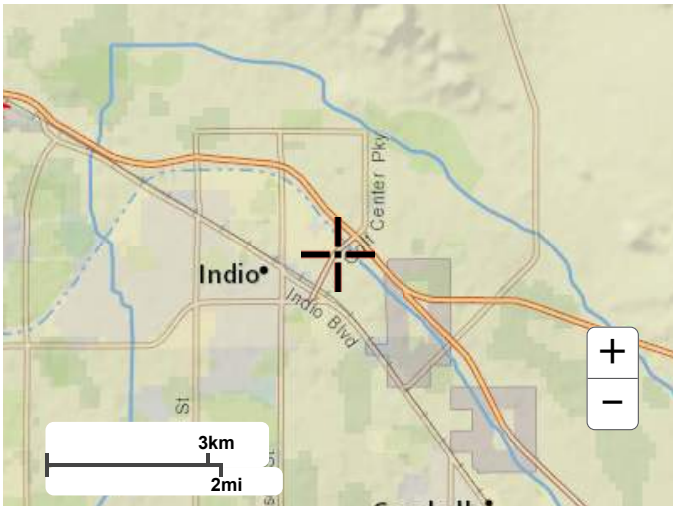
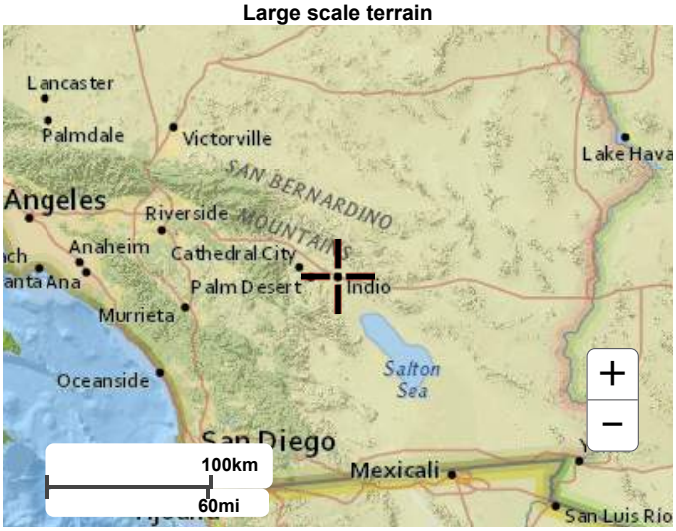
Maps & aerials

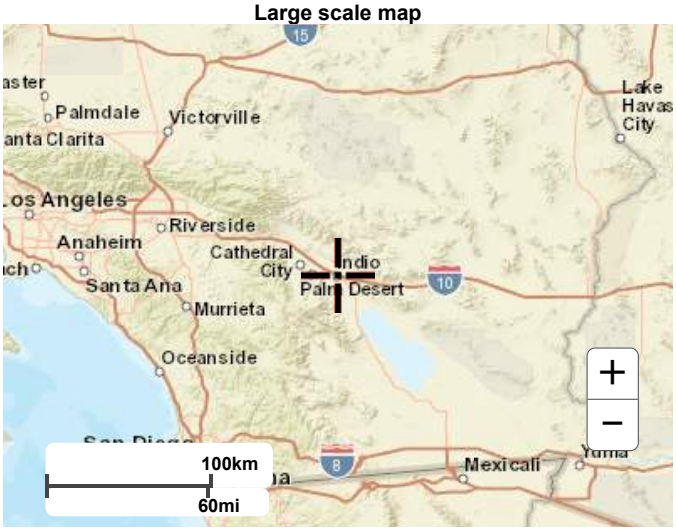
Small scale terrain



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

BASIN 1
Project: INDIO-001
Basin Description: BINFIL BASIN

Contour Elevation	Contour Area (ft) (sq. ft)	Depth Volume Avg. End (cu. ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Conic (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative
-29.000	3,792.19	N/A	N/A	0.00	N/A	0.00
-28.000	4,710.63	1.000	4251.41	4251.41	4243.12	4243.12
-27.000	5,685.63	1.000	5198.13	9449.54	5190.50	9433.62
-26.000	6,717.17	1.000	6201.40	15650.95	6194.24	15627.86
-25.000	7,805.27	1.000	7261.22	22912.17	7254.42	22882.27

U n i t H y d r o g r a p h A n a l y s i s

Study date 12/27/23 File: A110YR242410.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6394

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

A1
10YR24

Drainage Area = 3.34(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.34(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 425.00(Ft.)
Length along longest watercourse measured to centroid = 212.50(Ft.)
Length along longest watercourse = 0.080 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 2.61(Ft.)
Slope along watercourse = 32.4254 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.021 Hr.
Lag time = 1.26 Min.
25% of lag time = 0.32 Min.
40% of lag time = 0.51 Min.
Unit time = 60.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

```
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            1.16                  3.87

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            4.50                 15.03

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.160(In)
Area Averaged 100-Year Rainfall =    4.500(In)

Point rain (area averaged) =    2.534(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    2.534(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     3.340           56.00         0.780
 Total Area Entered =      3.34(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
56.0  56.0      0.511     0.780        0.152       1.000      0.152
                                                 Sum (F) =   0.152
Area averaged mean soil loss (F) (In/Hr) =  0.152
Minimum soil loss rate ((In/Hr)) =  0.076
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.280
------------------------------------------------------------------------

               U n i t  H y d r o g r a p h
                       VALLEY S-Curve
------------------------------------------------------------------------
               Unit Hydrograph Data
------------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %            (CFS)
------------------------------------------------------------------------
    1   1.000       4750.981        100.000              3.366
                               Sum = 100.000   Sum=       3.366
------------------------------------------------------------------------

 The following loss rate calculations reflect use of the minimum calculated loss
 rate subtracted from the Storm Rain to produce the maximum Effective Rain value
```

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	1.00	1.20	0.030	(0.264)	0.009	0.022
2	2.00	1.30	0.033	(0.252)	0.009	0.024
3	3.00	1.80	0.046	(0.240)	0.013	0.033
4	4.00	2.10	0.053	(0.228)	0.015	0.038
5	5.00	2.80	0.071	(0.217)	0.020	0.051
6	6.00	2.90	0.073	(0.206)	0.021	0.053
7	7.00	3.80	0.096	(0.195)	0.027	0.069
8	8.00	4.60	0.117	(0.185)	0.033	0.084
9	9.00	6.30	0.160	(0.175)	0.045	0.115
10	10.00	8.20	0.208	(0.165)	0.058	0.150
11	11.00	7.00	0.177	(0.156)	0.050	0.128
12	12.00	7.30	0.185	(0.147)	0.052	0.133
13	13.00	10.80	0.274	(0.138)	0.077	0.197
14	14.00	11.40	0.289	(0.130)	0.081	0.208
15	15.00	10.40	0.264	(0.122)	0.074	0.190
16	16.00	8.50	0.215	(0.115)	0.060	0.155
17	17.00	1.40	0.035	(0.108)	0.010	0.026
18	18.00	1.90	0.048	(0.102)	0.013	0.035
19	19.00	1.30	0.033	(0.096)	0.009	0.024
20	20.00	1.20	0.030	(0.091)	0.009	0.022
21	21.00	1.10	0.028	(0.086)	0.008	0.020
22	22.00	1.00	0.025	(0.082)	0.007	0.018
23	23.00	0.90	0.023	(0.079)	0.006	0.016
24	24.00	0.80	0.020	(0.077)	0.006	0.015
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	1.8

Flood volume = Effective rainfall 1.82(In)
times area 3.3(Ac.)/[(In)/(Ft.)] = 0.5(Ac.Ft)
Total soil loss = 0.71(In)
Total soil loss = 0.197(Ac.Ft)
Total rainfall = 2.53(In)
Flood volume = 22121.1 Cubic Feet
Total soil loss = 8602.7 Cubic Feet

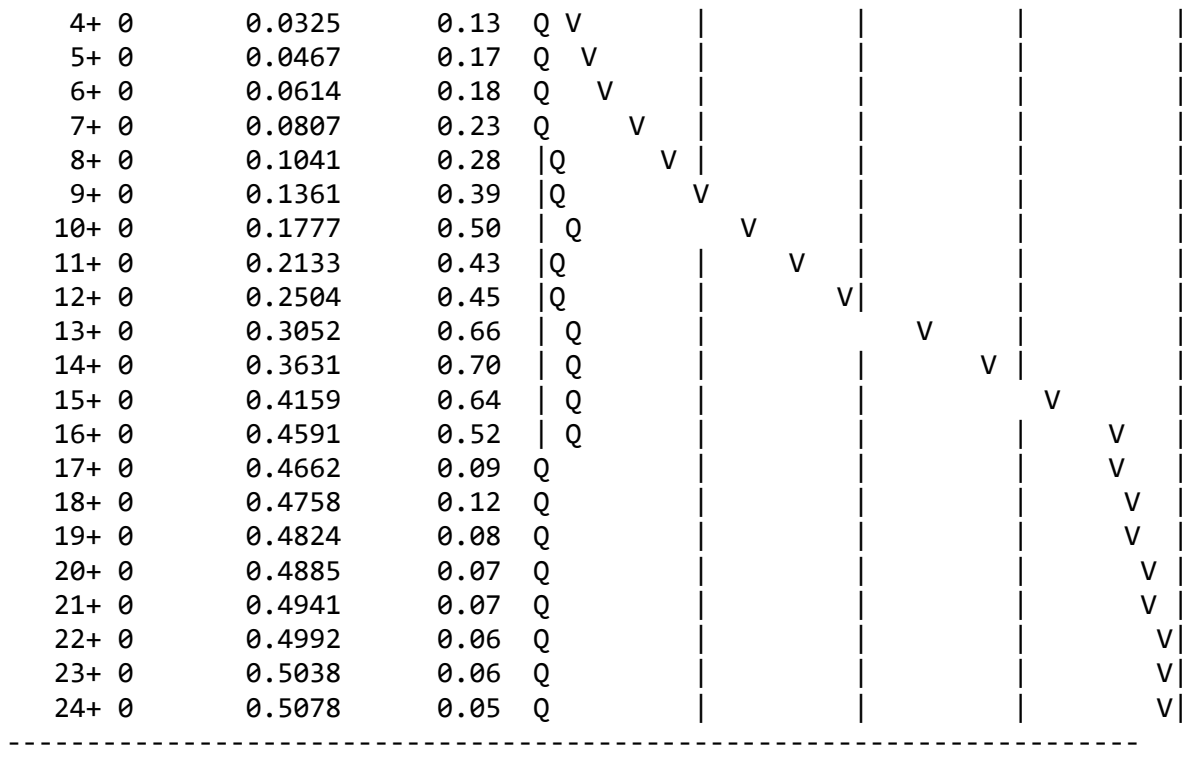
Peak flow rate of this hydrograph = 0.701(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 60 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
1+ 0	0.0061	0.07	Q	|	|	|	|
2+ 0	0.0127	0.08	Q	|	|	|	|
3+ 0	0.0218	0.11	QV	|	|	|	|


4+ 0 0.0325 0.13
5+ 0 0.0467 0.17
6+ 0 0.0614 0.18
7+ 0 0.0807 0.23
8+ 0 0.1041 0.28
9+ 0 0.1361 0.39
10+ 0 0.1777 0.50
11+ 0 0.2133 0.43
12+ 0 0.2504 0.45
13+ 0 0.3052 0.66
14+ 0 0.3631 0.70
15+ 0 0.4159 0.64
16+ 0 0.4591 0.52
17+ 0 0.4662 0.09
18+ 0 0.4758 0.12
19+ 0 0.4824 0.08
20+ 0 0.4885 0.07
21+ 0 0.4941 0.07
22+ 0 0.4992 0.06
23+ 0 0.5038 0.06
24+ 0 0.5078 0.05

U n i t H y d r o g r a p h A n a l y s i s

Study date 12/27/23 File: A1100YR2424100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6394

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

A1
100YR24

Drainage Area = 3.34(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.34(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 425.00(Ft.)
Length along longest watercourse measured to centroid = 212.50(Ft.)
Length along longest watercourse = 0.080 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 2.61(Ft.)
Slope along watercourse = 32.4254 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.021 Hr.
Lag time = 1.26 Min.
25% of lag time = 0.32 Min.
40% of lag time = 0.51 Min.
Unit time = 60.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

```
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            1.16                  3.87

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            4.50                 15.03

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.160(In)
Area Averaged 100-Year Rainfall =    4.500(In)

Point rain (area averaged) =    4.500(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    4.500(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     3.340           56.00         0.780
 Total Area Entered =      3.34(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
56.0  74.8      0.305     0.780        0.091       1.000      0.091
                                                 Sum (F) =   0.091
Area averaged mean soil loss (F) (In/Hr) =  0.091
Minimum soil loss rate ((In/Hr)) =  0.045
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.280
------------------------------------------------------------------------

                U n i t  H y d r o g r a p h
                        VALLEY S-Curve
------------------------------------------------------------------------
                Unit Hydrograph Data
------------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %            (CFS)
------------------------------------------------------------------------
    1   1.000       4750.981        100.000              3.366
                               Sum = 100.000   Sum=       3.366
------------------------------------------------------------------------

 The following loss rate calculations reflect use of the minimum calculated loss
 rate subtracted from the Storm Rain to produce the maximum Effective Rain value
```

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	1.00	1.20	0.054	(0.158)	0.015	0.039
2	2.00	1.30	0.058	(0.151)	0.016	0.042
3	3.00	1.80	0.081	(0.143)	0.023	0.058
4	4.00	2.10	0.094	(0.136)	0.026	0.068
5	5.00	2.80	0.126	(0.130)	0.035	0.091
6	6.00	2.90	0.130	(0.123)	0.037	0.094
7	7.00	3.80	0.171	(0.117)	0.048	0.123
8	8.00	4.60	0.207	(0.110)	0.058	0.149
9	9.00	6.30	0.283	(0.104)	0.079	0.204
10	10.00	8.20	0.369	0.099	(0.103)	0.270
11	11.00	7.00	0.315	(0.093)	0.088	0.227
12	12.00	7.30	0.328	0.088	(0.092)	0.241
13	13.00	10.80	0.486	0.083	(0.136)	0.403
14	14.00	11.40	0.513	0.078	(0.144)	0.435
15	15.00	10.40	0.468	0.073	(0.131)	0.395
16	16.00	8.50	0.382	0.069	(0.107)	0.314
17	17.00	1.40	0.063	(0.065)	0.018	0.045
18	18.00	1.90	0.085	(0.061)	0.024	0.062
19	19.00	1.30	0.058	(0.057)	0.016	0.042
20	20.00	1.20	0.054	(0.054)	0.015	0.039
21	21.00	1.10	0.049	(0.051)	0.014	0.036
22	22.00	1.00	0.045	(0.049)	0.013	0.032
23	23.00	0.90	0.040	(0.047)	0.011	0.029
24	24.00	0.80	0.036	(0.046)	0.010	0.026
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	3.5

Flood volume = Effective rainfall 3.46(In)
times area 3.3(Ac.)/[(In)/(Ft.)] = 1.0(Ac.Ft)
Total soil loss = 1.04(In)
Total soil loss = 0.288(Ac.Ft)
Total rainfall = 4.50(In)
Flood volume = 42004.3 Cubic Feet
Total soil loss = 12554.3 Cubic Feet

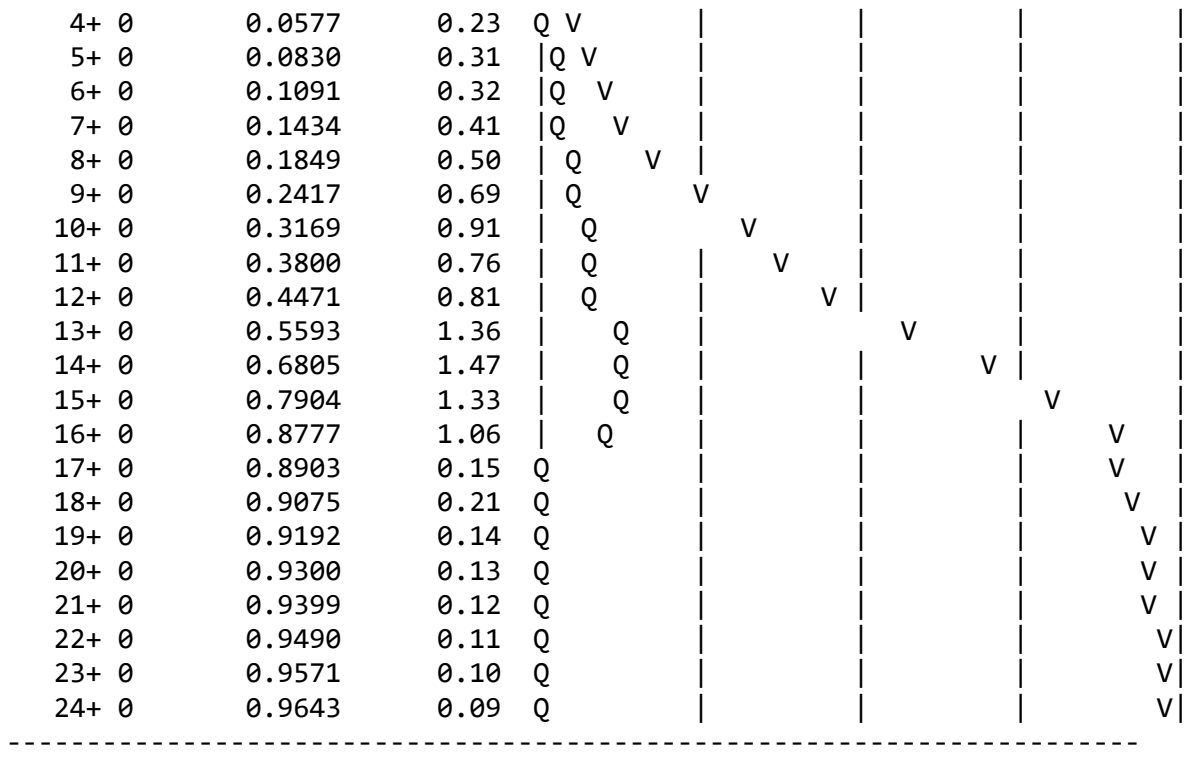
Peak flow rate of this hydrograph = 1.466(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 60 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
1+ 0	0.0108	0.13 Q	|	|	|	|	|
2+ 0	0.0225	0.14 Q	|	|	|	|	|
3+ 0	0.0388	0.20 QV	|	|	|	|	|


4+ 0 0.0577 0.23
5+ 0 0.0830 0.31
6+ 0 0.1091 0.32
7+ 0 0.1434 0.41
8+ 0 0.1849 0.50
9+ 0 0.2417 0.69
10+ 0 0.3169 0.91
11+ 0 0.3800 0.76
12+ 0 0.4471 0.81
13+ 0 0.5593 1.36
14+ 0 0.6805 1.47
15+ 0 0.7904 1.33
16+ 0 0.8777 1.06
17+ 0 0.8903 0.15
18+ 0 0.9075 0.21
19+ 0 0.9192 0.14
20+ 0 0.9300 0.13
21+ 0 0.9399 0.12
22+ 0 0.9490 0.11
23+ 0 0.9571 0.10
24+ 0 0.9643 0.09

U n i t H y d r o g r a p h A n a l y s i s

Study date 12/27/23 File: X110YR242410.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6394

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

X1
10YR24HR

Drainage Area = 3.34(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.34(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 419.00(Ft.)
Length along longest watercourse measured to centroid = 209.50(Ft.)
Length along longest watercourse = 0.079 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 3.50(Ft.)
Slope along watercourse = 44.1050 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.18 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.47 Min.
Unit time = 60.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

```
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            1.16                  3.87

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            4.50                 15.03

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.160(In)
Area Averaged 100-Year Rainfall =    4.500(In)

Point rain (area averaged) =    2.534(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    2.534(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     3.340           82.00         0.100
 Total Area Entered =      3.34(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
82.0  82.0      0.221     0.100        0.201       1.000      0.201
                                                 Sum (F) =   0.201
Area averaged mean soil loss (F) (In/Hr) =  0.201
Minimum soil loss rate ((In/Hr)) =  0.101
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.820
------------------------------------------------------------------------

               U n i t  H y d r o g r a p h
                       VALLEY S-Curve
------------------------------------------------------------------------
               Unit Hydrograph Data
------------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %            (CFS)
------------------------------------------------------------------------
    1   1.000       5091.676        100.000              3.366
                               Sum = 100.000   Sum=       3.366
------------------------------------------------------------------------

 The following loss rate calculations reflect use of the minimum calculated loss
 rate subtracted from the Storm Rain to produce the maximum Effective Rain value
```

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	1.00	1.20	0.030	(0.349)	0.025	0.005
2	2.00	1.30	0.033	(0.333)	0.027	0.006
3	3.00	1.80	0.046	(0.317)	0.037	0.008
4	4.00	2.10	0.053	(0.302)	0.044	0.010
5	5.00	2.80	0.071	(0.287)	0.058	0.013
6	6.00	2.90	0.073	(0.272)	0.060	0.013
7	7.00	3.80	0.096	(0.258)	0.079	0.017
8	8.00	4.60	0.117	(0.244)	0.096	0.021
9	9.00	6.30	0.160	(0.231)	0.131	0.029
10	10.00	8.20	0.208	(0.218)	0.170	0.037
11	11.00	7.00	0.177	(0.206)	0.145	0.032
12	12.00	7.30	0.185	(0.194)	0.152	0.033
13	13.00	10.80	0.274	0.183	(0.224)	0.091
14	14.00	11.40	0.289	0.172	(0.237)	0.117
15	15.00	10.40	0.264	0.162	(0.216)	0.102
16	16.00	8.50	0.215	0.152	(0.177)	0.063
17	17.00	1.40	0.035	(0.143)	0.029	0.006
18	18.00	1.90	0.048	(0.135)	0.039	0.009
19	19.00	1.30	0.033	(0.127)	0.027	0.006
20	20.00	1.20	0.030	(0.120)	0.025	0.005
21	21.00	1.10	0.028	(0.114)	0.023	0.005
22	22.00	1.00	0.025	(0.108)	0.021	0.005
23	23.00	0.90	0.023	(0.104)	0.019	0.004
24	24.00	0.80	0.020	(0.101)	0.017	0.004

(Loss Rate Not Used)

Sum = 100.0 Sum = 0.6

Flood volume = Effective rainfall 0.64(In)
times area 3.3(Ac.)/[(In)/(Ft.)] = 0.2(Ac.Ft)
Total soil loss = 1.89(In)
Total soil loss = 0.527(Ac.Ft)
Total rainfall = 2.53(In)
Flood volume = 7779.6 Cubic Feet
Total soil loss = 22944.2 Cubic Feet

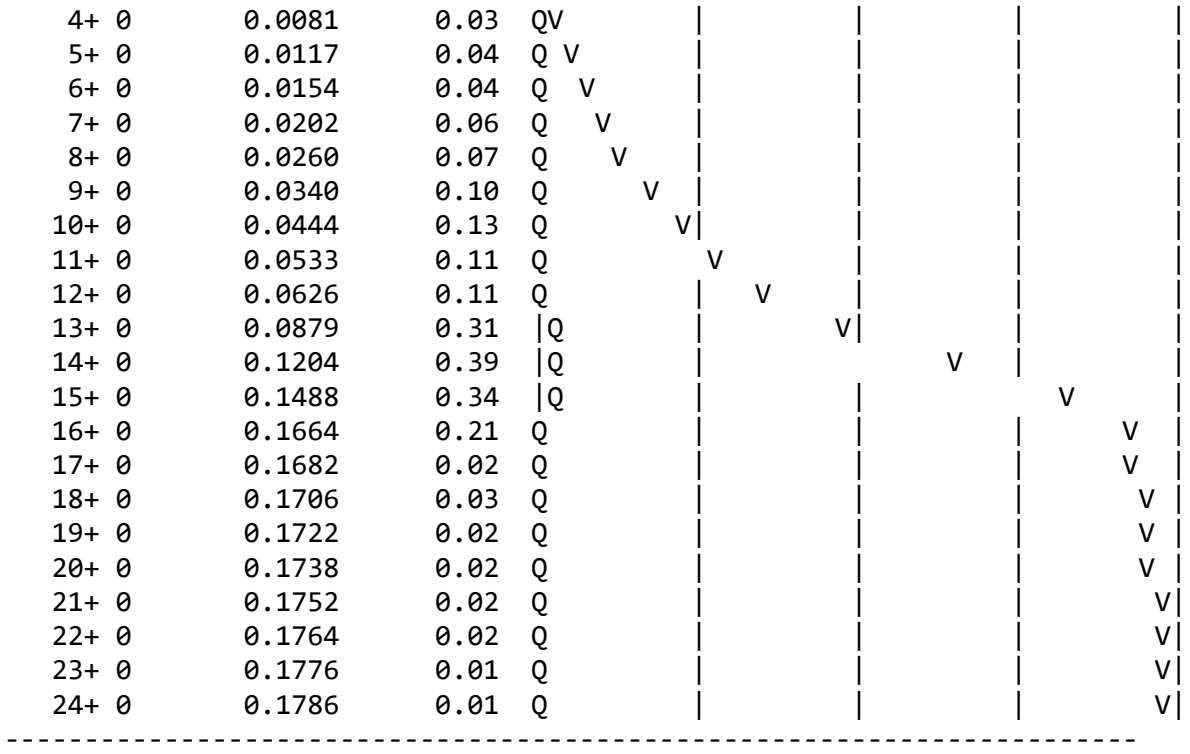
Peak flow rate of this hydrograph = 0.394(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 60 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
1+ 0	0.0015	0.02	Q	|	|	|	|
2+ 0	0.0032	0.02	Q	|	|	|	|
3+ 0	0.0055	0.03	QV	|	|	|	|


4+ 0 0.0081 0.03 QV
5+ 0 0.0117 0.04 Q V
6+ 0 0.0154 0.04 Q V
7+ 0 0.0202 0.06 Q V
8+ 0 0.0260 0.07 Q V
9+ 0 0.0340 0.10 Q V
10+ 0 0.0444 0.13 Q V
11+ 0 0.0533 0.11 Q V
12+ 0 0.0626 0.11 Q V
13+ 0 0.0879 0.31 Q V
14+ 0 0.1204 0.39 Q V
15+ 0 0.1488 0.34 Q V
16+ 0 0.1664 0.21 Q V
17+ 0 0.1682 0.02 Q V
18+ 0 0.1706 0.03 Q V
19+ 0 0.1722 0.02 Q V
20+ 0 0.1738 0.02 Q V
21+ 0 0.1752 0.02 Q V
22+ 0 0.1764 0.02 Q V
23+ 0 0.1776 0.01 Q V
24+ 0 0.1786 0.01 Q V

U n i t H y d r o g r a p h A n a l y s i s

Study date 12/27/23 File: X1100YR2424100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6394

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

X1
100YR24HR

Drainage Area = 3.34(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.34(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 419.00(Ft.)
Length along longest watercourse measured to centroid = 209.50(Ft.)
Length along longest watercourse = 0.079 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 3.50(Ft.)
Slope along watercourse = 44.1050 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.18 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.47 Min.
Unit time = 60.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

```
Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            1.16                  3.87

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        3.34            4.50                 15.03

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.160(In)
Area Averaged 100-Year Rainfall =    4.500(In)

Point rain (area averaged) =    4.500(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    4.500(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     3.340           82.00         0.100
 Total Area Entered =      3.34(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
82.0  92.2      0.101     0.100        0.092       1.000      0.092
                                                 Sum (F) =   0.092
Area averaged mean soil loss (F) (In/Hr) =  0.092
Minimum soil loss rate ((In/Hr)) =  0.046
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.820
------------------------------------------------------------------------

               U n i t  H y d r o g r a p h
                       VALLEY S-Curve
------------------------------------------------------------------------
               Unit Hydrograph Data
------------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %            (CFS)
------------------------------------------------------------------------
    1   1.000       5091.676        100.000              3.366
                               Sum = 100.000   Sum=       3.366
------------------------------------------------------------------------

 The following loss rate calculations reflect use of the minimum calculated loss
 rate subtracted from the Storm Rain to produce the maximum Effective Rain value
```

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	1.00	1.20	0.054	(0.160)	0.044	0.010
2	2.00	1.30	0.058	(0.153)	0.048	0.011
3	3.00	1.80	0.081	(0.145)	0.066	0.015
4	4.00	2.10	0.094	(0.138)	0.077	0.017
5	5.00	2.80	0.126	(0.131)	0.103	0.023
6	6.00	2.90	0.130	(0.125)	0.107	0.023
7	7.00	3.80	0.171	0.118	(0.140)	0.053
8	8.00	4.60	0.207	0.112	(0.170)	0.095
9	9.00	6.30	0.283	0.106	(0.232)	0.178
10	10.00	8.20	0.369	0.100	(0.303)	0.269
11	11.00	7.00	0.315	0.094	(0.258)	0.221
12	12.00	7.30	0.328	0.089	(0.269)	0.240
13	13.00	10.80	0.486	0.084	(0.399)	0.402
14	14.00	11.40	0.513	0.079	(0.421)	0.434
15	15.00	10.40	0.468	0.074	(0.384)	0.394
16	16.00	8.50	0.382	0.070	(0.314)	0.313
17	17.00	1.40	0.063	(0.066)	0.052	0.011
18	18.00	1.90	0.085	0.062	(0.070)	0.024
19	19.00	1.30	0.058	(0.058)	0.048	0.011
20	20.00	1.20	0.054	(0.055)	0.044	0.010
21	21.00	1.10	0.049	(0.052)	0.041	0.009
22	22.00	1.00	0.045	(0.050)	0.037	0.008
23	23.00	0.90	0.040	(0.048)	0.033	0.007
24	24.00	0.80	0.036	(0.046)	0.030	0.006
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	2.8

Flood volume = Effective rainfall 2.78(In)
times area 3.3(Ac.)/[(In)/(Ft.)] = 0.8(Ac.Ft)
Total soil loss = 1.72(In)
Total soil loss = 0.478(Ac.Ft)
Total rainfall = 4.50(In)
Flood volume = 33723.6 Cubic Feet
Total soil loss = 20834.9 Cubic Feet

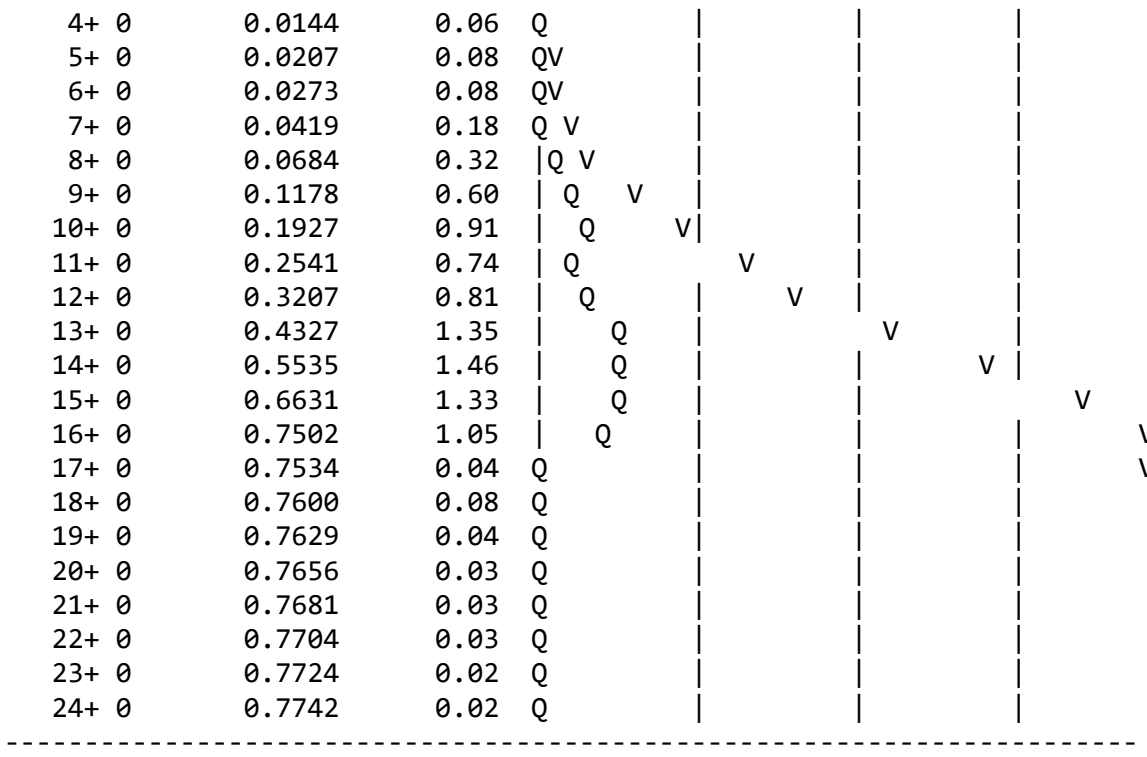
Peak flow rate of this hydrograph = 1.462(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 60 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
1+ 0	0.0027	0.03	Q	|	|	|	|
2+ 0	0.0056	0.04	Q	|	|	|	|
3+ 0	0.0097	0.05	Q	|	|	|	|


4+ 0 0.0144 0.06
5+ 0 0.0207 0.08
6+ 0 0.0273 0.08
7+ 0 0.0419 0.18
8+ 0 0.0684 0.32
9+ 0 0.1178 0.60
10+ 0 0.1927 0.91
11+ 0 0.2541 0.74
12+ 0 0.3207 0.81
13+ 0 0.4327 1.35
14+ 0 0.5535 1.46
15+ 0 0.6631 1.33
16+ 0 0.7502 1.05
17+ 0 0.7534 0.04
18+ 0 0.7600 0.08
19+ 0 0.7629 0.04
20+ 0 0.7656 0.03
21+ 0 0.7681 0.03
22+ 0 0.7704 0.03
23+ 0 0.7724 0.02
24+ 0 0.7742 0.02

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 12/28/23 File:a110.out

A1
10 YR

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6394

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Palm Springs] area used.
10 year storm 10 minute intensity = 2.830(In/Hr)
10 year storm 60 minute intensity = 1.000(In/Hr)
100 year storm 10 minute intensity = 4.520(In/Hr)
100 year storm 60 minute intensity = 1.600(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 1.000(In/Hr)
Slope of intensity duration curve = 0.5800

++
Process from Point/Station 2.000 to Point/Station 2.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 425.000(Ft.)

```
Top (of initial area) elevation =   -26.390(Ft.)
Bottom (of initial area) elevation =   -29.000(Ft.)
Difference in elevation =     2.610(Ft.)
Slope =    0.00614  s(percent)=       0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.350 min.
Rainfall intensity =      2.939(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  36.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.441(CFS)
Total initial stream area =        3.340(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            3.34 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 12/28/23 File:A1100.out

A1
100 YR

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6394

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Palm Springs] area used.
10 year storm 10 minute intensity = 2.830(In/Hr)
10 year storm 60 minute intensity = 1.000(In/Hr)
100 year storm 10 minute intensity = 4.520(In/Hr)
100 year storm 60 minute intensity = 1.600(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.600(In/Hr)
Slope of intensity duration curve = 0.5800

++

Process from Point/Station 2.000 to Point/Station 2.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 425.000(Ft.)
Top (of initial area) elevation = -26.390(Ft.)

```
Bottom (of initial area) elevation =   -29.000(Ft.)
Difference in elevation =     2.610(Ft.)
Slope =    0.00614  s(percent)=       0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.350 min.
Rainfall intensity =      4.703(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.892
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     14.014(CFS)
Total initial stream area =        3.340(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            3.34 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 12/28/23 File:X110.out

X1
10 YR

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6394

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Palm Springs] area used.
10 year storm 10 minute intensity = 2.830(In/Hr)
10 year storm 60 minute intensity = 1.000(In/Hr)
100 year storm 10 minute intensity = 4.520(In/Hr)
100 year storm 60 minute intensity = 1.600(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 1.000(In/Hr)
Slope of intensity duration curve = 0.5800

++

Process from Point/Station 1.000 to Point/Station 1.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 419.000(Ft.)

```
Top (of initial area) elevation =   -22.700(Ft.)
Bottom (of initial area) elevation =   -26.200(Ft.)
Difference in elevation =     3.500(Ft.)
Slope =    0.00835  s(percent)=       0.84
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.445 min.
Rainfall intensity =      2.197(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.645
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 1)  =  60.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.736(CFS)
Total initial stream area =        3.340(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            3.34 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  78.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 12/28/23 File:X1100.out

X1
100 YR

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6394

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Palm Springs] area used.
10 year storm 10 minute intensity = 2.830(In/Hr)
10 year storm 60 minute intensity = 1.000(In/Hr)
100 year storm 10 minute intensity = 4.520(In/Hr)
100 year storm 60 minute intensity = 1.600(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.600(In/Hr)
Slope of intensity duration curve = 0.5800

++
Process from Point/Station 1.000 to Point/Station 1.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 419.000(Ft.)
Top (of initial area) elevation = -22.700(Ft.)
Bottom (of initial area) elevation = -26.200(Ft.)

```
Difference in elevation =     3.500(Ft.)
Slope =    0.00835  s(percent)=       0.84
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.445 min.
Rainfall intensity =      3.515(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.863
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.130(CFS)
Total initial stream area =        3.340(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            3.34 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  78.0
```

APPENDIX D

HYDRAULIC CALCULATIONS

TO BE PROVIDED IN FINAL

APPENDIX E

RECORD PLANS

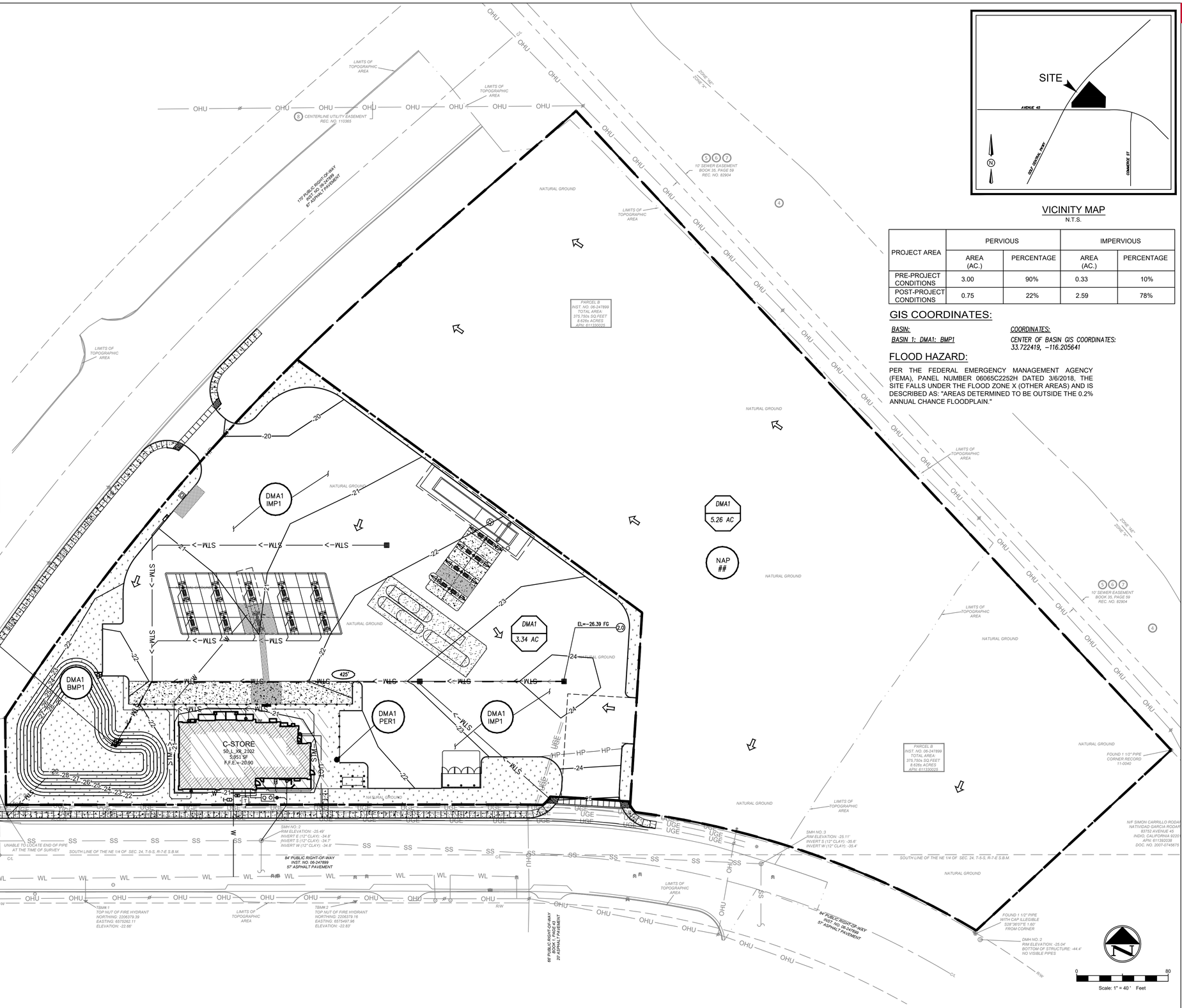
TO BE PROVIDED IN FINAL

APPENDIX F

HYDROLOGY EXHIBITS

LEGEND

#	FLOW PATH, DIRECTION, LENGTH
#	STUDY NODE NUMBER
#	CONFLUENCE POINT
	PROPOSED BIORETENTION AREA
X / ADD AREA X - X / X	DRAINAGE AREA SUB BOUNDARY, ADD AREA NODES ACREAGE
	PROPERTY LINE/ ROW
	CENTERLINE
	PROPOSED BUILDING
(100.00)	EXISTING SPOT ELEVATION
100.00	PROPOSED SPOT ELEVATION
℄	ROAD CENTERLINE
	PROP. GRADED SWALE
	PROP. STORM DRAIN PIPE
	DMA BOUNDARY (DISTURBED AREA)
	DMA BOUNDARY (EXISTING AREA - NOT A PART)
DMA # ##	DMA ID DMA SUB-AREA ID
DMA # ##	DMA ID BMP ID
NAP ##	AREAS THAT WILL NOT BE A PART OF THE SITE
	DRAINAGE FLOW DIRECTION
	DRAINAGE FLOW DIRECTION (PIPE SWALE)
	DRAINS TO BASIN
	DOWNSPOUT
	BUILDING (PROPOSED)
	PERVIOUS GRASS (PROPOSED)



VICINITY MAP
N.T.S.

PROJECT AREA	PERVIOUS		IMPERVIOUS	
	AREA (AC.)	PERCENTAGE	AREA (AC.)	PERCENTAGE
PRE-PROJECT CONDITIONS	3.00	90%	0.33	10%
POST-PROJECT CONDITIONS	0.75	22%	2.59	78%

GIS COORDINATES:

BASIN:
BASIN 1: DMA1: BMP1

COORDINATES:
CENTER OF BASIN GIS COORDINATES:
33.722419, −116.205641

FLOOD HAZARD:

PER THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), PANEL NUMBER 06065C2252H DATED 3/6/2018, THE SITE FALLS UNDER THE FLOOD ZONE X (OTHER AREAS) AND IS DESCRIBED AS: "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN."

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

MAV·RIK
185 S. STATE STREET
SALT LAKE CITY, UT 84111

MARK	DESCRIPTION	DATE

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:

243 E. 3rd Street
Long Beach, CA 90802
1333 W. McDermott Dr., Suite 200
Allen, TX 75013
Firm # F-21415

DATE: 10/10/2023

SDC
SITE DESIGN COLLABORATIVE

JOB NO.: 20230920.0

MAVERIK STORE #:
GOLF CENTRAL PKWY & AVE. 45
INDIO, CA 92201

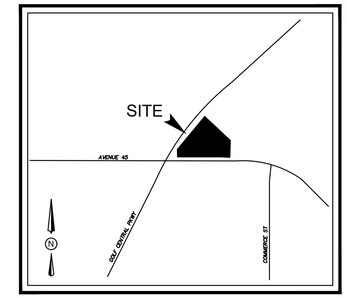
POST-DRAINAGE PLAN

REGISTERED PROFESSIONAL ENGINEER
BRIDGE KENDRICK
C 94533
CIVIL
STATE OF CALIFORNIA
12/24/2023

SHEET NO.
C-402

LEGEND

#	FLOW PATH, DIRECTION, LENGTH
#	STUDY NODE NUMBER
#	CONFLUENCE POINT
	PROPOSED BIORETENTION AREA
X ADD AREA X - X X	DRAINAGE AREA SUB BOUNDARY, ADD AREA NODES ACREAGE
	PROPERTY LINE/ ROW
	CENTERLINE
	PROPOSED BUILDING
(100.00)	EXISTING SPOT ELEVATION
100.00	PROPOSED SPOT ELEVATION
℄	ROAD CENTERLINE
	PROP. GRADED SWALE
	PROP. STORM DRAIN PIPE
	DMA BOUNDARY (DISTURBED AREA)
	DMA BOUNDARY (EXISTING AREA - NOT A PART)



VICINITY MAP
N.T.S.

PROJECT AREA	PERVIOUS		IMPERVIOUS	
	AREA (AC.)	PERCENTAGE	AREA (AC.)	PERCENTAGE
PRE-PROJECT CONDITIONS	3.00	90%	0.33	10%
POST-PROJECT CONDITIONS	0.75	22%	2.59	78%

GIS COORDINATES:

BASIN:
BASIN 1: DMA1: BMP1

COORDINATES:
CENTER OF BASIN GIS COORDINATES:
33.722419, −116.205641

FLOOD HAZARD:

PER THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA), PANEL NUMBER 06065C2252H DATED 3/6/2018, THE SITE FALLS UNDER THE FLOOD ZONE X (OTHER AREAS) AND IS DESCRIBED AS: "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN."

Know what's below.
Call before you dig.

MAV·RIK
185 S. STATE STREET
SALT LAKE CITY, UT 84111

MARK	DESCRIPTION	DATE

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:

243 E. 3rd Street
Long Beach, CA 90802
1333 W. McDermott Dr., Suite 200
Allen, TX 75013
Firm # F-21415

DATE: 10/10/2023

SDC
SITE DESIGN COLLABORATIVE

JOB NO.: 20230920.0

MAVERIK STORE #:
GOLF CENTRAL PKWY & AVE. 45
INDIO, CA 92201

PRE-DRAINAGE PLAN

REGISTERED PROFESSIONAL ENGINEER
BRIDIE KEEHNER
C 84333
STATE OF CALIFORNIA
12/24/2023

SHEET NO.
C-402

APPENDIX G

GEOTECHNICAL REPORT

ECS Southwest, LLP

Sewage Disposal Percolation Report

Proposed Maverik Gas Station and Convenience Store

Golf Center Drive and Avenue 45
Indio, California

ECS Project Number 80:1035

July 10, 2023

July 10, 2023

Mr. Zach Michels
Core States Group
7217 Watson Road
#190309
St. Louis, MO 63119

ECS Project No. 80:1035

Reference: Sewage Disposal Percolation Report
Proposed Maverik Gas Station and Convenience Store
Golf Center Drive and Avenue 45
Indio, California

Dear Mr. Michels:

ECS Southwest, LLP (ECS) and our subconsultant engineer Earth Systems have completed the subsurface exploration and testing to support the sewage disposal system design for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. The enclosed report presents our understanding of the project, the results of the field exploration conducted, and conclusions and recommendations for the project.

It has been our pleasure to be of service to you during this phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southwest, LLP

Youssef Bougataya, P.E. (CA)
Geotechnical Department Manager
ybougataya@ecslimited.com

Matthew B. Olsen, P.E. (UT)
Principal Engineer
molsen@ecslimited.com

ECS Southwest, LLP
3033 Kellway Drive
Carrallton, Texas 75006

Sewage Disposal Percolation Report
Proposed Indio California Maverik Store No.: TBD
County of Riverside PR # 8139
Golf Center Parkway and Avenue 45 (APN 611-330-025-9)
Indio, Riverside County, California

July 6, 2023

File No.: 306043-001
Doc. No.: 23-06-704

EARTH SYSTEMS
79-811B Country Club Drive | Bermuda Dunes, CA 92203-1244 | (760) 345-1588 | www.earthsystems.com

July 6, 2023

File No.: 306043-001
Doc. No.: 23-06-704

ECS Southwest, LLP
3033 Kellway Drive
Carrallton, Texas 75006

Attention: Stephen Geraci, P.E., CHMM

Subject: **Sewage Disposal Percolation Report**

Project: **Proposed Indio California Maverik Store No.: TBD**
County of Riverside PR # 8139
Golf Center Parkway and Avenue 45 (APN 611-330-025-9)
Indio, Riverside County, California

References:
1. Earth Systems Pacific, 2023, Geotechnical Engineering Report and Infiltration Testing, Proposed Indio Maverik Store No. TBD, Golf Center Parkway and Avenue 45, APN 611-330-025-9, Indio, Riverside County, California, File No. 306043-001, Document No. 23-06-702, dated July 3, 2023

2. Local Agency Management Program for Onsite Wastewater Treatment Systems (2022), County of Riverside Department of Environmental Health, dated November 17, 2022.

Earth Systems Pacific [Earth Systems] presents this soil percolation report for the proposed Maverik store to be located on the northeast corner of Avenue 45 and Golf Center Parkway in Indio, Riverside County, California. This report presents our findings and recommendations for seepage pit sewage disposal. This report should stand as a whole and no part of the report should be excerpted or used to exclusion of any other part.

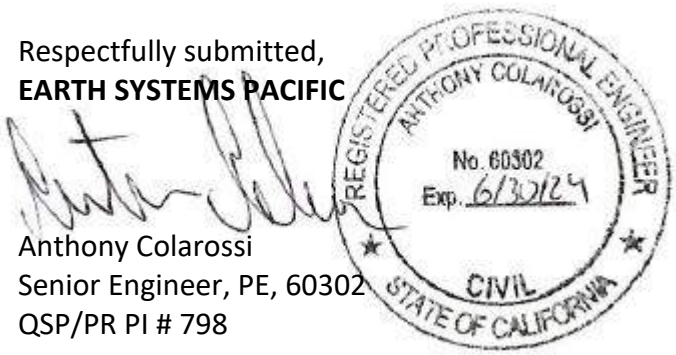
This report completes our percolation testing scope of services in accordance with our agreement (BER 23-4-001) with an authorization date of April 28, 2023. Other services that may be required, such as but not limited to, plan review, testing, etc., are additional services and will be billed according to the Fee Schedule in effect at the time services are provided. Unless requested in writing, the client is responsible for distributing this report to the appropriate governing agency.

July 6, 2023

File No.: 306043-001
Doc. No.: 23-06-704

We appreciate the opportunity to provide our professional services. Please contact our office if there are any questions or comments concerning this report or its recommendations.

Respectfully submitted,
EARTH SYSTEMS PACIFIC



Anthony Colarossi
Senior Engineer, PE, 60302
QSP/PR PI # 798

Perc Rpt/ac/cgj/mss/klp

Distribution: 4/ECS Southwest, LLP
1/Stephen Geraci: SGeraci@ecslimited.com
1/Matthew B. Olsen: MOlsen@ecslimited.com
1/BER

TABLE OF CONTENTS

Section 1
INTRODUCTION

1.1 Project Description

This soil percolation report for proposed seepage pits has been prepared for the proposed commercial development. The commercial development is located northeast corner of the intersection of Avenue 45 and Golf Center Parkway (APN # 611-330-025-9), Indio, California. We understand the site development will include a 5,600 square foot gas station store, fueling canopy, underground fuel storage tanks, biodiesel mixing vault, air station, trash enclosure, generator, RV dump area, cat scale, two drive entrances, parking area, and truck route, see Figure 1 below. Site-specific Permanent Best Management Practice (BMP) for storm water treatment improvements are not understood at this time. An Onsite Wastewater Treatment System (OWTS) is proposed for this project. The proposed commercial site location is shown on Plate 1 in Appendix A. The locations of the proposed seepage pits are shown on Plate 2. Inlet depths are assumed to be generally 4 feet below grades or shallower.

Earth Systems is currently preparing a geotechnical report for the site that included other borings within the proposed development area. Geotechnical Report information is provided in Reference No.: 1.

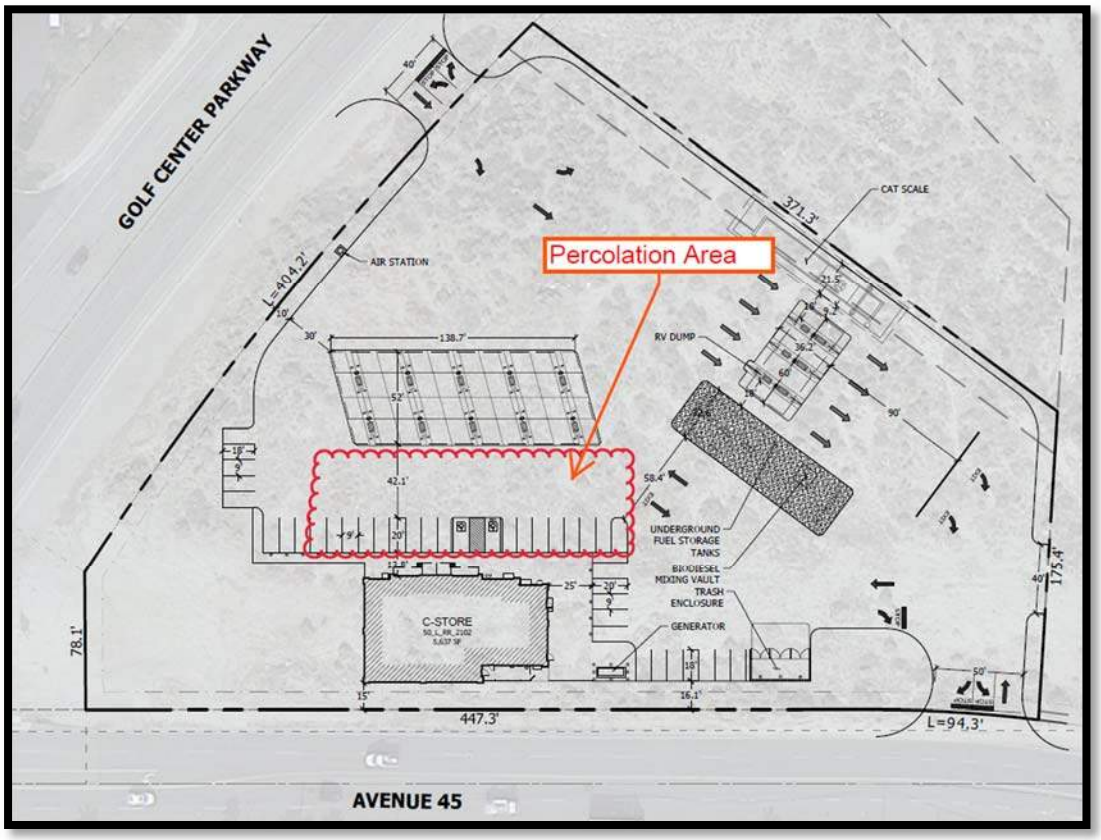


Figure 1 Preliminary Site Plan Showing Assumed Percolation Area

1.2 Site Description

The project's legal address is Accessor Parcel Number APN 611-330-025-9 in Indio, Riverside County, California. Per client provided site plan, the parcel area has a gross area of 3.34 acres. Access to the lot is via Avenue 45 that does not have a curb.

Topographically, the site is relatively flat. Per the Riverside County APN report, the site elevation is approximately -28 feet above mean sea level. Drainage is assumed by sheet flow toward Avenue 45.

The lot is currently vacant with desert vegetation and some artificial fill (Earth Systems, 2023). We researched past use of the site via select documents and we did not find past use history. During our site visits, loose sandy surface soil was evident by rubber tire vehicles getting stuck in the loose sand. This site is also has firm silty and medium dense silty sands present. Also, surficial undocumented fill was found at the site. The fill appears to be silty sand with gravel, similar to Class II base. An odd concrete and block structure was found at the eastern portion of the site, see Plate 3 in Appendix A. That odd structure appeared to be an old seepage pit; however, it was sealed, and we could not tell if it was deep or just the top portion of a seepage pit that was dumped at the site. Based on the underground utility request, orange flags were placed along the ground from a pole located near Avenue 45 toward the Whitewater Channel, see Plate 3 in the Appendix.

Currently the site is bounded by Avenue 45 to the south, Golf Center Parkway to the west, vacant land and Whitewater Channel to the north, and vacant land and industrial buildings to the east. Based on google measurements, the nearest percolation test is located more than 550 feet southwest of the top of the slope of the Whitewater Channel. The Whitewater Channel has an invert elevation of approximately -52 or 24 feet below the existing elevation of the pad (-28).

1.3 Purpose and Scope of Services

The purpose for our services was to evaluate the site soil conditions and to provide professional opinions and recommendations regarding the percolation rate for septic pit sewer waste disposal on the site. The scope of services included:

- General reconnaissance of the seepage site area.
- Shallow subsurface exploration by drilling 2 borings to approximately 20 feet below existing grades, and one boring to 71-½ feet. Other geotechnical borings were also drilled for a concurrent geotechnical report (logs attached).
- Two seepage pit percolation tests in the general area of the proposed seepage pit field and 100% expansion area.
- An engineering evaluation of the acquired data from the exploration and testing.
- A summary of our findings and recommendations in this written report, including:
    - Discussions on subsurface soil and groundwater conditions.
    - Discussions on soil percolation rate.
    - Recommendations regarding need for seepage pit systems design criteria.

Section 2
METHODS OF EXPLORATION

2.1 Field Exploration

Two exploratory borings were drilled to depths of approximately 20 feet below the existing ground surface, which is estimated to have an elevation of -28 feet (Riverside County APN Report). As mentioned, additional borings were also drilled using similar methods for a geotechnical report (under separate cover) to a maximum depth of 71-½ feet bgs. The borings were used to observe soil profiles and perform percolation testing. The explorations were excavated on May 22, 2023, using 8-inch outside diameter hollow-stem augers, powered by a Mobile B61 truck-mounted drill rig operated by Cal Pac Drilling of Calimesa, California, under subcontract to Earth Systems Pacific. The existing ground surface elevation in the seepage pit area is approximately -28 feet.

The percolation test locations are shown on the Exploration Location Map, Plate 2, in Appendix A. The locations shown are approximate, established using nearby landmarks. Samples from the borings were collected, sealed, and transported to our laboratory.

The final logs of the borings represent our interpretation of the contents of the field logs and review of the samples obtained during the subsurface exploration. The final logs of the percolation and borings are included in Appendix A of this report, respectively. The stratification lines represent the approximate boundaries between soil types, although transitions may be gradational.

Section 3
DISCUSSION

3.1 Soil Conditions

The field exploration indicates that site soils consist generally of poorly graded sands, sand with silt, silty sand, lean silts with varying sand, and lean clays (Unified Soils Classification System symbols of SP, SP-SM, SM, ML and CL). The final logs of the borings are included in Appendix A of this report.

Soils moisture contents varied from dry to wet and the current groundwater depth was estimated at 59½ feet below the ground surface at boring B-2. The moisture contents of nearby soils can be found on the attached logs.

Oversize material was not observed on the surface or in the samples. There was a man-made block and mortar cylinder that was observed along the easterly portion of the site. The man-made object appeared to be the top of a drywell pit that was plugged but we could not determine if it was constructed at the site or was moved to site.

From the boring logs, several soil layers have a fines content (smaller than 0.08 millimeters (fit through a #200 sieve)) higher than 10 percent (%) and at a depth below the proposed pits. The soils were typical of lake deposits and aeolian (windblown) deposits.

3.2 Groundwater

Earth Systems reviewed both current and historic groundwater levels near the project site. For this report, we used information dated back to 1968 for use as historic information. We also provide a brief discussion of the moisture contents of the soils found during the exploration and the ability of water features to produce a perched water table.

Mottling: Mottling observations is required by the County (Onsite Waste Treatment Systems, 2016). As shallow as 7½ feet and 15 feet below the surface mottling was observed, see borings B-2, B-4 and B-6. Please note that the elevation of Ancient Lake Cahuilla was approximately 38 feet above Sea Level. This project has surface elevations of -28 feet above Sea Level. The minus sign indicates the project surface was inundated by Ancient Lake Cahuilla). Therefore, mottling observations could lead to a shallower historic groundwater level than what is currently accepted historic groundwater level. It should be noted that FEMA 100-year flood elevations in the nearby Whitewater Channel are approximately -35 and -34 feet, which are approximately 7 feet below the pad's ground surface elevation of -28. However, current sampling and lab testing for saturation indicates the groundwater level is much deeper at the site.

Field Exploration Information: Free groundwater was encountered in boring B-2 during our exploration conducted on May 22, 2023; The groundwater was observed at a depth of 59½ feet below the ground surface. A very moist clay layer appeared at a depth of 25 feet below the ground surface (bgs) at boring B-1; however, very moist soils were not continuous until groundwater was observed at 59½ feet. As well, the aforementioned clay layer was not continuous across the boring locations. We performed 26 moisture content tests of the soil

samples recovered and obtained values varying between 0.5 percent (%) to 33% at depths ranging between 2½ feet and 71½ feet below the ground surface (bgs).

For the soil profile from the surface to a depth of 30 feet below the ground surface (minus the one clay layer that was 100% saturated), the average moisture content from was 4% percent and moisture contents varied from 0.5 to 10 percent moisture content. Based on Saturation levels of the upper 30 foot soil profile (minus the one clay layer that was 100% saturated), the average saturation level was 15 percent (%) and ranged from 2 to 47% saturation.

Nearby Well Information: We researched the California Department of Water Resources (DWR) groundwater database and found one well (Local Well 337345N1162245W001) located approximately 1.4 miles northwest of the project site. That well had readings taken on September 27, 2021, and indicates the groundwater elevation is approximately 79.92 feet below mean sea level (MSL). From Section 1.2, the project low elevation is 28 feet below MSL (or -28). Based on State Well readings, the groundwater depth at the site is approximately 51.9 feet below the ground surface. This is very close to the actual reading we found at boring B-2 showing a groundwater depth of 59½ feet below the ground surface.

Historic Groundwater Information: From observation of a 1961 Ground Water Basin Subdivisions and Contours of Ground Water Levels Map (see Figure 2 below), published by the Resources Agency of California Department of Water Resources Southern District (Department of Water Resources Bulletin 108), the historic groundwater contour nearest the project is between contour -30 and -40. Using an elevation of -38 feet near the site, the historic groundwater is at a depth of approximately 10 feet below the ground surface; however, mottling could indicate a potential depth of 7½ feet.

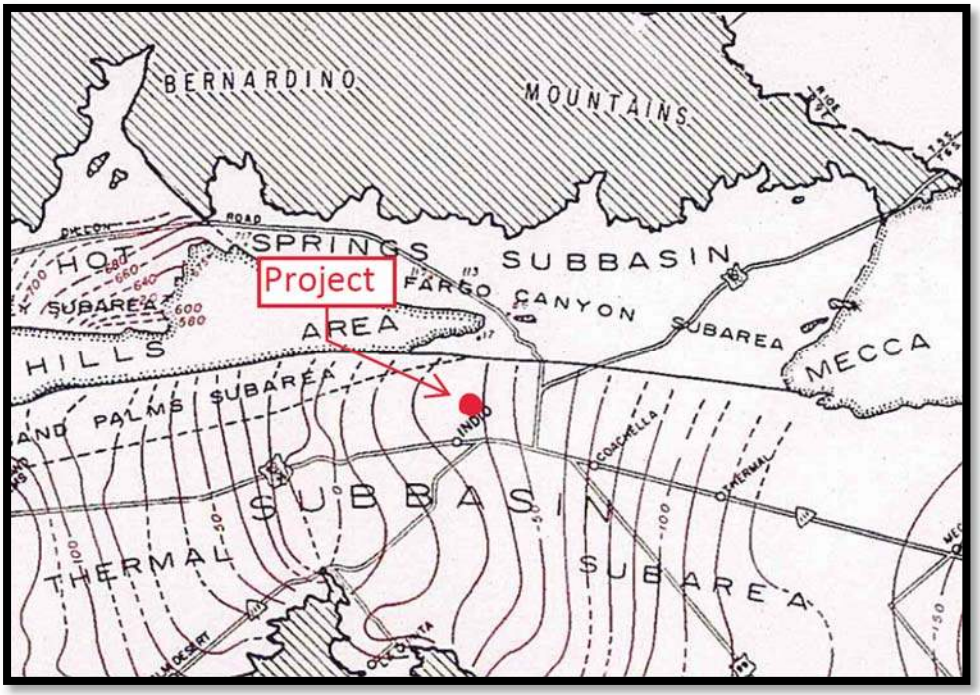


Figure 2 Historic Groundwater Map

3.3 Geologic Setting

Regional Geology: The site lies near the northeast margin of the central Coachella Valley, a part of the Colorado Desert geomorphic province. To the northeast are the Little San Bernardino Mountains which are part of the Peninsular Ranges geomorphic province. A significant feature within the Colorado Desert geomorphic province is the Salton Trough, a large northwest-trending structural depression that extends approximately 180 miles from the San Gorgonio Pass to the Gulf of California. Much of this depression in the area of the Salton Sea is below sea level.

The Coachella Valley forms the northerly part of the Salton Trough and contains a thick sequence of Miocene to Holocene sedimentary deposits. Mountains surrounding the Coachella Valley include the Little San Bernardino Mountains on the northeast, foothills of the San Bernardino Mountains on the northwest, and the San Jacinto and Santa Rosa Mountains on the southwest. These mountains expose primarily Precambrian metamorphic and Mesozoic granitic rocks. Within the immediate site area, native geologic lithologic units consist of a mix of younger (Holocene) wind-blown sand, alluvium, and lake deposits of the ancient Lake Cahuilla.

Active faults in the immediate vicinity (within 30 miles) of the site include the San Andreas, San Jacinto, Blue Cut, Pinto Mountain, Burnt Mountain, and Eureka Peak faults. The closest active faults are multiple traces of the San Andreas fault zone that traverse along the northeast margin of the valley. The site does not lie within a currently designated Alquist-Priolo Earthquake Fault zone or Riverside County designated fault zone.

Local Geology: The project site is located within the central portion of the Coachella Valley within the limits of mapped lakebed deposits associated with the ancient Lake Cahuilla (ancestral Salton Sea). The Little San Bernardino Mountains are located to the northeast. The site is southwest and adjacent to the Whitewater River channel. Sediments within this area consist of fine- to medium-grained sands with interbedded clays, silts of alluvial, aeolian (wind-blown) and lacustrine (lake) origins.

The project site is located in a mapped area where surficially, a mix of alluvial fan deposits, dunes sands, and lake deposits are prevalent. Thin deposits of artificial fill resulting from site modification are also present across the site and are generally undifferentiated from the underlying native deposits.

No active faults are currently mapped in the immediate project vicinity. The closest mapped Holocene-active faults are segments of the San Andreas fault located approximately 1.5 miles northeast of the project site.

3.4 Percolation Tests

Two percolation tests were performed on May 26, 2023, in the vicinity of the proposed seepage pits and 100% expansion area as shown on Plate 2. The County was notified on May 22, 2023, and prior to conducting our onsite percolation testing (County notification number PR # 8139). The percolation tests were performed in substantial conformance to the County percolation

test method for commercial lots (single lot) sandy soil criteria (as applicable), as described in the Onsite Waste Treatment Systems, LAMP manual for Riverside County, November 17, 2022.

The tests were performed using 8-inch diameter boreholes made to a depth of about 20 feet below existing ground surface. Drilled borehole sidewalls were cleared of smeared material. A 3-inch diameter perforated PVC pipe was installed in the excavated hole to reduce the potential for caving or disturbance from the addition of water. The boreholes had gravel placed around the sides of the pipe and on the sides and bottom of the hole to minimize sidewall disturbance and sedimentation. The boreholes were filled with water on May 22 and 25, 2023, presoaked within 24 hours of testing and for approximately 2 hours immediately prior to testing. The presoak met the sandy soil criteria whereby greater than ½ the wetted length drained away in less than 25 minutes. For testing, successive readings of the drop in water level were made over several 10-minute periods (sandy soil criteria) until a stabilized drop was recorded. Measurements were referenced from demarcations on the perforated pipe. The field percolation test results are included in Table 1 below. The results consider the effect of the gravel pack. Hole caving did not occur. Laboratory test results are included in Appendix A.

Table 1
Onsite Seepage Pit Percolation Results

Test Hole	Test Type	Soil Condition	USCS Soil Description**	General Test Zone Below Existing Grades (feet)	Percolation Rates (Gal/S.F./Day)***
P-1	Seepage Pit	Native	ML Interbedded with SM	4-20	9.2*
P-2	Seepage Pit	Native	ML Interbedded with SM	4-20	5.4*

*For sizing septic tanks, a maximum of 1.11 to 4 Gal/Square Foot/Day shall be used for absorption, *Onsite Waste Treatment Systems (OWTS), County of Riverside, see page 30 Table 5.1 (Commercial)*.

**ML is Sandy Silt and SM is Silty Sand

***Gal/S.F./Day is Gallons per Square Foot per Day.

Section 4
CONCLUSIONS AND RECOMMENDATIONS

The following is a summary of our conclusions and professional opinions based on the data obtained from the site evaluation.

- The site is feasible for soil percolation and will support seepage pit system if the agency in charge allows the groundwater elevation to that of the current exploration or nearby State Well Monitoring data, see Section 3.2.

- Percolation testing indicates generally consistent results based on the soils tested.

- No continuous impermeable soil layers were observed.

- See Table 1 for rates measured, as well as rate restrictions.

- Percolation rates are not faster than 10 gal/sf/day and profiles are found to have alternating layers of silty soils (SM and ML) with more than 10% fines (passing a # 200 sieve) to depths of 50 feet below ground surface, see attached borings and lab tests.

- Each seepage pit shall be circular in shape and shall have an excavated diameter of not less than five feet.

- Each pit shall be lined with whole new hard burned clay brick, concrete brick, concrete circular type cesspool blocks or other approved materials.

- Each seepage pit shall have a minimum sidewall of 10 feet below the inlet with a maximum total depth of 40 feet (not including the arched cap), unless approved by the Department. Depths tested for this study correspond to a maximum 20-foot-deep seepage pit.

- The designed system shall be located in natural undisturbed soil at the depth the tests were performed. System depths should correspond to the tested elevations. Seepage pit covers should be approximately 18 inches but no more than 4 feet below surface of the ground.

- The horizontal distance from a seepage pit to the top of a cut bank shall be equal to 5 times the vertical height of the bank or 25 feet, whichever is less.

- A minimum 6-inch annulus filled with clean ¾ inch gravel shall be provided between the pit structure and the excavation wall. Slag is acceptable if it is clean and uniformly sized at 3/4 inch.

- An ephemeral channel (Whitewater Channel) was noted on a geologic map and located approximately 400 feet east of the project site. Seepage pits and septic tanks must be setback from ephemeral streams at least 15 feet, Onsite Waste Treatment Systems (2022), County of Riverside, Appendix A.

- Seepage pits should be located at least 8 feet from property lines, 8 feet from buildings or covered areas, 25 feet from pressure public water main lines (see footnote in *OWTS*, and

150 feet away from on-site or off property wells). Other separations detailed in *Onsite* Waste Treatment Systems (2022)*, County of Riverside, Appendix A,* and should be referred to in design.

- Maintenance of onsite waste disposal systems can be the most critical element in determining the success of a design. Due to general accessibility limitations which typically exist with drainage systems and infiltration structures, they must be protected from clogging of any filter medium, and the near-structure and pavement drainage devices. The potential for clogging can be reduced by a pre-treating structure inflow through the installation of a proper septic tank. In addition, sediment, paper, and debris must be removed from the tank on a regular basis.

- Based on the data presented in this report and using the recommendations set forth, it is the judgment of this professional that there is sufficient area to support a primary and expansion OWTS that will meet the current standards of the Department of Environmental Health and the Regional Water Quality Control Board (RWQCB). Based on the data presented in this report and the testing information accumulated, it is the judgment of this professional that the groundwater table will not encroach within the current allowable limit set forth by County and State requirements.

- This report should be submitted to the Riverside County Department of Environmental Health (RCDEH) for their review and comment. Earth Systems should have the opportunity to review the plan of the septic system and details.

- The referenced OWTS Manual should be followed for system design. Where any discrepancy between this report and the OWTS is found, the OWTS shall govern.

- The planning and construction process is an integral design component with respect to the geotechnical aspects of this project. Because geotechnical engineering is an inexact science due to the variability of natural processes and because we sample only a small portion of the soil and material affecting the performance of the proposed structure, unanticipated or changed conditions can be disclosed during construction. Proper geotechnical observation and testing during construction is imperative to allow the geotechnical engineer the opportunity to verify assumptions made during the design process and to verify that our geotechnical recommendations have been properly interpreted and implemented during construction. Therefore, we recommend that Earth Systems be retained during construction of the proposed improvements to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this commission. If we are not accorded the privilege of performing this review, we can assume no responsibility for misinterpretation of our recommendations. The above services can be provided in accordance with our current Fee Schedule.

Section 5
LIMITATIONS

Our findings and recommendations in this report are based on selected points of field exploration, percolation testing, and our understanding of the planned development. Furthermore, our findings and recommendations are based on the assumption that soil conditions do not vary significantly from those found at specific exploratory locations. Variations in soil or groundwater conditions could exist between and beyond the exploration points.

Findings of this report are valid as of the issued date of the report. However, changes in conditions of a property can occur with passage of time, whether they are from natural processes or works of man, on this or adjoining properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or broadening of knowledge. Accordingly, findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of one year.

This report is issued with the understanding that the owner or the owner's representative has the responsibility to bring the information and recommendations contained herein to the attention of the designer for the septic systems and are incorporated into the plans and specifications. The owner or the owner's representative also has the responsibility to take the necessary steps to see that the contractor carry out such recommendations in the field. It is further understood that the owner or the owner's representative is responsible for submittal of this report to the appropriate governing agencies.

Earth Systems has striven to provide our services in accordance with generally accepted geotechnical engineering practices in this locality at this time. No warranty or guarantee, express or implied, is made. This report was prepared for the exclusive use of the Client and the client's authorized agents.

Earth Systems should be provided the opportunity for a general review of the septic tank and seepage pit plan in order that our recommendations may be properly interpreted and implemented in the design. If Earth Systems is not accorded the privilege of making this recommended review, we can assume no responsibility for misinterpretation of our recommendations.

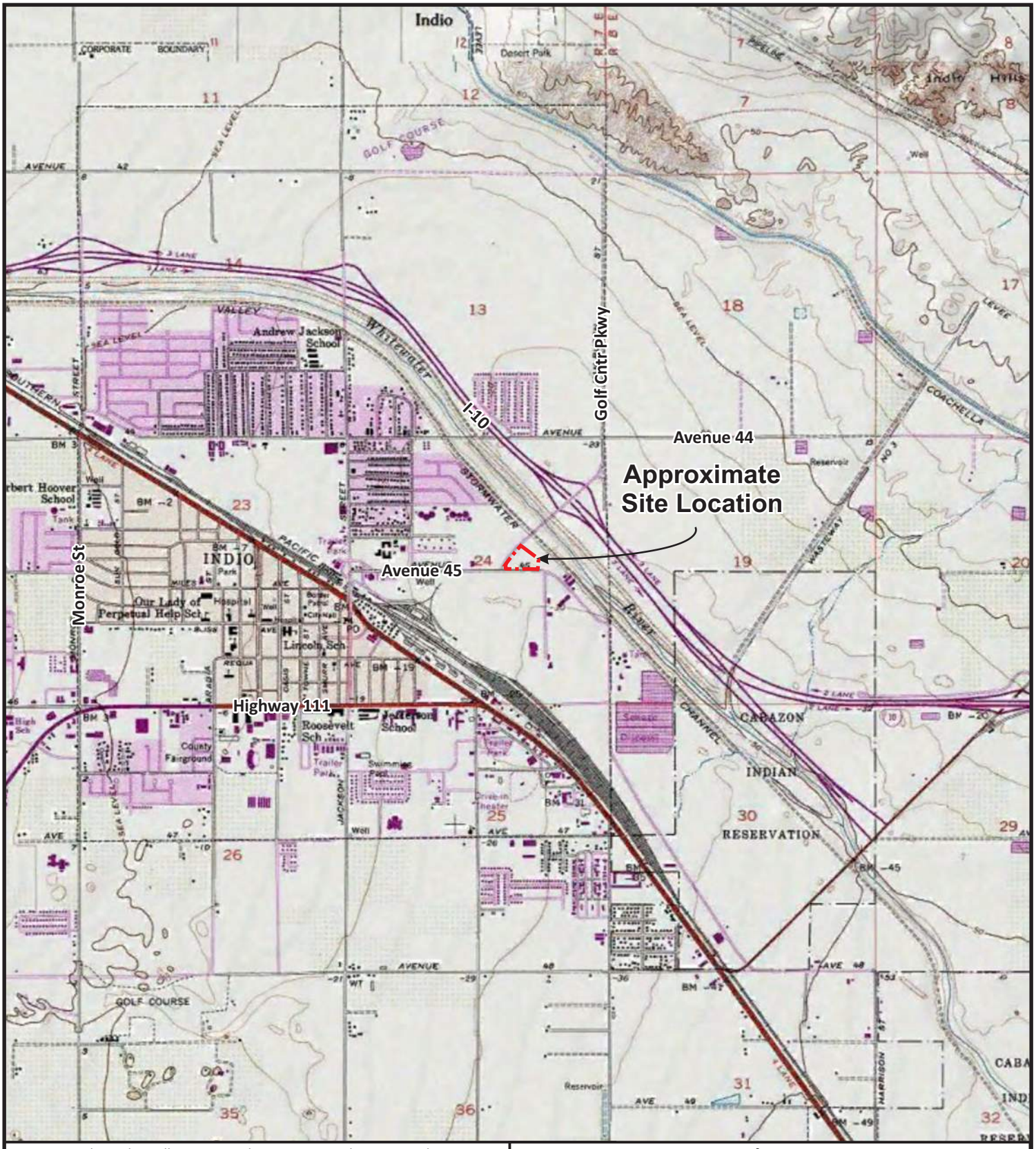
Although available through Earth Systems Pacific, the current scope of our services does not include an environmental assessment or an investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or adjacent to the subject property.

-o0o-

Appendices as cited are attached and complete this report.

APPENDIX A

Plate 1 – Site Location Map
Plate 2 – Test Location Map
Terms and Symbols Used on Boring Logs
Soil Classification System
Logs of Borings
Percolation Test Results (P-1 & P-2)
Laboratory Test Results



Source: Google Earth satellite image with USGS topographic map overlay.

LEGEND

Approximate Site Location

Approximate Scale: 1" = 1/2 Mile

0 1/2 Mile 1 Mile

N

Plate 1
Site Location Map

Proposed Indio Maverik Store
Indio Center Drive & Avenue 45
Indio, Riverside County, California

Earth Systems

7/6/2023 | File No.: 306043-001

LEGEND

- **B-6** Approximate Exploration Locations
- **P-2** Approximate Percolation Test Locations
- **I-2** Approximate Infiltration Test Locations

N

Approximate Scale: 1" = 200’

0 200’ 400’

Source: Google Earth satellite image dated 6/11/2021, with Conceptual Site Plan 09 overlay dated 3/27/2023.

Plate 2
Exploration Location Map

Proposed Indio Maverik Store
Indio Center Drive & Avenue 45
Indio, Riverside County, California

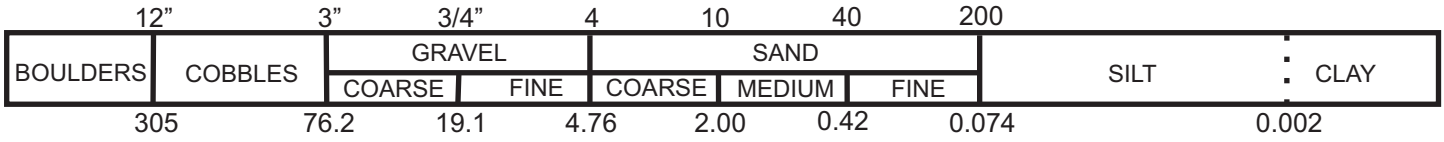
Earth Systems

7/6/2023 | File No.: 306043-001

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on ASTM Designations D 2487 and D 2488 (Unified Soil Classification System). Information on each boring log is a compilation of subsurface conditions obtained from the field as well as from laboratory testing of selected samples. The indicated boundaries between strata on the boring logs are approximate only and may be transitional.

SOIL GRAIN SIZE



SOIL GRAIN SIZE IN MILLIMETERS

RELATIVE DENSITY OF GRANULAR SOILS (GRAVELS, SANDS, AND NON-PLASTIC SILTS)

Very Loose	*N=0-4	RD=0-30	Easily push a 1/2-inch reinforcing rod by hand
Loose	N=5-10	RD=30-50	Push a 1/2-inch reinforcing rod by hand
Medium Dense	N=11-30	RD=50-70	Easily drive a 1/2-inch reinforcing rod with hammer
Dense	N=31-50	RD=70-90	Drive a 1/2-inch reinforcing rod 1 foot with difficulty by a hammer
Very Dense	N>50	RD=90-100	Drive a 1/2-inch reinforcing rod a few inches with hammer

*N=Blows per foot in the Standard Penetration Test at 60% theoretical energy. For the 3-inch diameter Modified California sampler,140-pound weight, multiply the blow count by 0.63 (about 2/3) to estimate N. If automatic hammer is used, multiply a factor of 1.3 to 1.5 to estimate N. RD=Relative Density (%). C=Undrained shear strength (cohesion).

CONSISTENCY OF COHESIVE SOILS (CLAY OR CLAYEY SOILS)

Very Soft	*N=0-1	*C=0-250 psf	Squeezes between fingers
Soft	N=2-4	C=250-500 psf	Easily molded by finger pressure
Firm	N=5-8	C=500-1000 psf	Molded by strong finger pressure
Stiff	N=9-15	C=1000-2000 psf	Dented by strong finger pressure
Very Stiff	N=16-30	C=2000-4000 psf	Dented slightly by finger pressure
Hard	N>30	C>4000	Dented slightly by a pencil point or thumbnail

MOISTURE DENSITY

Moisture Condition: An observational term; dry, damp, moist, wet, saturated.
Moisture Content: The weight of water in a sample divided by the weight of dry soil in the soil sample expressed as a percentage.
Dry Density: The pounds of dry soil in a cubic foot.

MOISTURE CONDITION

Dry.....Absence of moisture, dusty, dry to the touch
Damp.....Slight indication of moisture
Slightly Moist.....Very quick (less than 1 minute) color change when exposed to air (granular soil), Below optimum (granular)
Moist.....Color change with period of air exposure (granular soil)
Below optimum moisture content (cohesive soil)
Very Moist.....High degree of saturation by visual and touch (granular soil)
Above optimum moisture content (cohesive soil), No free water
Wet.....Free surface water

PLASTICITY

DESCRIPTION	FIELD TEST
Nonplastic	A 1/8 in. (3-mm) thread cannot be rolled at any moisture content.
Low	The thread can barely be rolled.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit.
High	The thread can be rerolled several times after reaching the plastic limit.

GROUNDWATER LEVEL

Water Level (measured or after drilling)

Water Level (during drilling)

RELATIVE PROPORTIONS

Trace.....minor amount (<5%)
some.....significant amount
with.....(Typically greater than 15%)
modifier/and...sufficient amount to influence material behavior (Typically >30%)

LOG KEY SYMBOLS

Bulk, Bag or Grab Sample

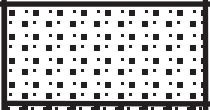
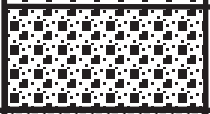
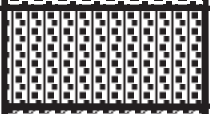
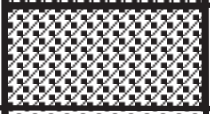
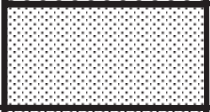
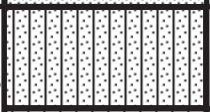
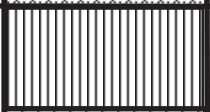
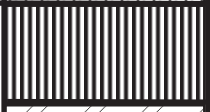
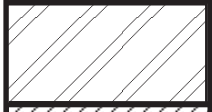
Standard Penetration Split Spoon Sampler (2” outside diameter)

Modified California Sampler (3” outside diameter)

No Recovery

Terms and Symbols Used on Boring Logs

Earth Systems

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than 50% of material is larger than No. 200 sieve size	GRAVEL AND GRAVELLY SOILS More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures. Little or no fines
		GRAVELS WITH FINES		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS More than 50% of coarse fraction passing No. 4 sieve	CLEAN SAND (Little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		SAND WITH FINES (appreciable amount of fines)		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	Inorganic silts and very fine sands, rock flour, silty low clayey fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
		LIQUID LIMIT GREATER THAN 50		MH	Inorganic silty, micaceous, or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS				PT	Peat, humus, swamp soils with high organic contents
VARIOUS SOILS AND MAN MADE MATERIALS					Fill Materials
MAN MADE MATERIALS					Asphalt and concrete

Soil Classification System

Earth Systems

Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. B-1

Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

Drilling Date: 5/22/23
Drilling Method: Mobile B-61 w/auto hammer
Drill Type: 8" HSA
Logged By: Julian G.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	Symbol	USCS	Dry Density (pcf)	Moisture Content (%)	Description of Units
0				SP			GRAVELLY SAND: grey brown, very loose, dry, fine to coarse grained sand, asphalt grindings (AF*)
				SM			
		5,6,6			96	1	SILTY SAND: tan brown, loose, dry, fine to medium grained sand, lenses of silt, trace root hairs, slight porosity
5		4,5,8		ML	94	1	SILT WITH SAND: olive brown, firm, dry, fine grained sand, trace of shells, moderately porous
		7,8,11			95	1	stiff
10		6,9,11			104	4	damp, no porosity
15		9,13,25		ML	107	10	SANDY SILT: olive brown, very stiff, slightly moist, fine grained sand, interbedded with equal layers of silty sand
20		9,12,18					
25		7,8,11		CL	89	33	SANDY LEAN CLAY: olive brown, stiff, very moist, mottled, interbedded with layers of silt, cemented nodules
30		6,17,26					hard
35							
40							
45							*AF - Artificial Fill Boring completed at 31-1/2 feet No groundwater encountered Backfilled with cuttings
50							

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

Graphic Trend
Blow Count Dry Density

Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. B-2

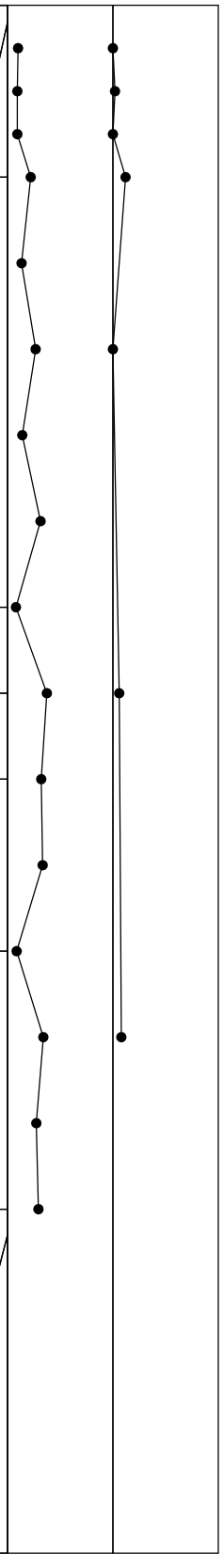
Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

Drilling Date: 5/22/23
Drilling Method: Mobile B-61 w/auto hammer
Drill Type: 8" HSA
Logged By: Julian G.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	Symbol	USCS	Dry Density (pcf)	Moisture Content (%)	Description of Units
0				SP			POORLY GRADED SAND: light grey, very loose, dry, fine grained sand
	MOD	5,6,9		SP-SM	99	0	
5	MOD	4,5,9			101	6	POORLY GRADED SAND WITH SILT: light olive brown, loose, dry to moist, fine grained sand
	MOD	3,5,8			85	10	
10	MOD	8,11,22		ML	106	7	SANDY SILT: light olive brown, firm, damp, fine grained sand, some small shells
15	MOD	7,7,13					with carbonate stringers and small nodules
20	MOD	9,14,26			99	7	interbedded silt, silty sand, fine sand
25	MOD	7,8,13					interbedded with layers of clay
30	MOD	10,21,26					hard
35	MOD	3,5,7		CL			LEAN CLAY: olive brown, stiff, moist
40	MOD	12,25,31		SM	103	2	SILTY SAND: light olive brown, dense, damp, fine grained sand
45	MOD	11,19,29		SP			POORLY GRADED SAND: light olive brown, very dense, damp, fine grained sand, mica
50	MOD	21,50,50/3"					varies fine to medium and fine to coarse
55	MOD	4,5,8		CL			SANDY LEAN CLAY: olive brown, very stiff, very moist, fine grained sand
60	MOD	4,15,36			104	22	hard, wet
65	MOD	8,14,27					olive grey
70	MOD	8,13,31		SM			SILTY SAND: gray, dense, wet, fine to medium grained sand
75							Boring completed at 71-1/2 feet
							Groundwater encountered at 59-1/2 feet
80							Backfilled with cuttings
85							
90							

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

Graphic Trend
Blow Count Dry Density



Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. B-3

Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

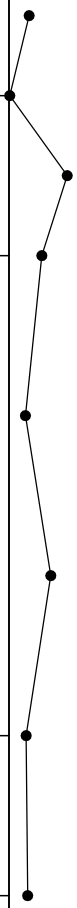
Drilling Date: 6/6/2023
Drilling Method: Track Rig
Drill Type: 8" HSA
Logged By: Julian G.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	Symbol	USCS	Dry Density (pcf)	Moisture Content (%)	Description of Units
0				SM			SILTY SAND: light grey brown, very loose, dry, fine to medium grained sand
	MOD Calif.	7,11,16					
5	MOD Calif.	5,9,12		ML			SILT WITH SAND: light grey brown, loose, dry, fine grained sand, slight porosity
	MOD Calif.	9,30,45					
10	MOD Calif.	12,16,28		SM			SILTY SAND: light tan brown, dense, dry, traces of small shells
15	Bulk	9,9,13					no shells
20	MOD Calif.	11,24,32					
25	Bulk	6,11,12		ML			SANDY SILT: brown, hard, moist, fine grained sand, slight mottling, interbedded with equal layers of lean clay with sand
30	Bulk	12,12,13		SM			SILTY SAND: gray brown, dense, moist, fine grained sand
35							
40							
45							Boring completed at 31-1/2 feet No groundwater encountered Backfilled with cuttings
50							

Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

Graphic Trend
Blow Count Dry Density



Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. B-4

Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

Drilling Date: 5/22/23
Drilling Method: Mobile B-61 w/auto hammer
Drill Type: 8" HSA
Logged By: Julian G.

Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	USCS	Dry Density (pcf)	Moisture Content (%)	Description
0			SM			SILTY SAND: light gray brown, very loose, dry, fine grained sand, with mica
	MOD	5,3,3		88	1	
5	MOD	3,5,10	ML	94	2	SANDY SILT: olive brown, stiff, dry, fine grained sand, with mica, traces of small shells, slightly porous
	MOD	9,9,10		88	4	damp
10	MOD	7,10,17		98	3	no porosity
15	Bulk	7,7,9				interbedded with silt, lenses of lean clay, very stiff, damp
20	MOD	5,14,20		104	4	
25	Bulk	6,10,15				
30	MOD	10,28,50/5"	SM	112	1	SILTY SAND: olive brown, very dense, dry, fine grained sand
35						
40						
45						Boring completed at 31-1/2 feet No groundwater encountered Backfilled with cuttings
50						

Graphic Trend
Blow Count Dry Density

Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. B-5

Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

Drilling Date: 5/22/23
Drilling Method: Mobile B-61 w/auto hammer
Drill Type: 8" HSA
Logged By: Julian G.

Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	Symbol	USCS	Dry Density (pcf)	Moisture Content (%)	Description
0	Bulk			ML			SANDY SILT: tan brown, firm, dry, fine grained sand, mica
	MOD Calif.	3,4,5			94	2	soft
5	MOD Calif.	3,3,6			96	7	olive brown, firm, moist, small shells, slight carbonate staining
	MOD Calif.	3,10,17			104	3	very stiff
10	MOD Calif.	7,13,15		SP-SM	107	3	POORLY GRADED SAND WITH SILT: tan brown, medium dense, dry, fine grained sand, interbedded with silty sand, lean clay
15	SPT	6,8,11					
20	MOD Calif.	6,12,19		ML			SILT: olive brown, very stiff, damp, interbedded with thin layer of lean clay and silty sand, clay layers are mottled, mica
25	SPT	4,8,12					
30	MOD Calif.	5,13,20					
35							
40							
45							Boring completed at 31-1/2 feet No groundwater encountered Backfilled with cuttings
50							

Graphic Trend
Blow Count Dry Density

Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. B-6

Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

Drilling Date: 5/22/23
Drilling Method: Mobile B-61 w/auto hammer
Drill Type: 8" HSA
Logged By: Julian G.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	Symbol	USCS	Dry Density (pcf)	Moisture Content (%)	Description of Units
0				SM			SILTY SAND: light olive brown, loose, dry, fine to medium grainded sand, trace of gravel 1 inch
	MOD Calif.	5,6,8			91	2	
5	MOD Calif.	3,5,8			97	1	olive brown, micaceous
	MOD Calif.	6,8,9		ML	92	6	SILT: olive brown, stiff, damp, trace small shells and, roots, slightly porous
10	MOD Calif.	5,8,16					very stiff, mottled with carbonate stringers, no porosity
15	Bulk / MOD Calif.	9,12,16					moist, hard, alternating layers of silty sand
20							Boring completed at 16-1/2 feet No groundwater encountered Backfilled with cuttings
25							
30							
35							
40							
45							
50							

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

Graphic Trend
Blow Count Dry Density

Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. P-1

Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

Drilling Date: 5/22/23
Drilling Method: Mobile B-61 w/auto hammer
Drill Type: 8" HSA
Logged By: Julian G.

Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	Symbol	USCS	Dry Density (pcf)	Moisture Content (%)	Description of Units	Graphic Trend: Blow Count	Graphic Trend: Dry Density
0				SM			SILTY SAND: light tan brown, very loose, dry, fine grained sand, with mica		
5				ML			SANDY SILT: olive brown, dry, fine grained sand, with mica		
20	MOD Calif.	10,13,23					mottled, medium grained sand		
45							pipe, sock and rock installed Perc Test completed at 21-1/2 feet No groundwater encountered Backfilled with cuttings		

Earth Systems

1680 Illinois Ave., Perris, CA 92571
Phone (951) 928-9799, Fax (951) 928-9948

Boring No. P-2

Project Name: Indio Maverik Store
Project Number: 306043-001
Boring Location: See Plate 2

Drilling Date: 5/22/23
Drilling Method: Mobile B-61 w/auto hammer
Drill Type: 8" HSA
Logged By: Julian G.

Depth (Ft.)	Sample Type (Bulk / SPT / MOD Calif.)	Penetration Resistance (Blows/6")	Symbol	USCS	Dry Density (pcf)	Moisture Content (%)	Description of Units	Graphic Trend: Blow Count / Dry Density
0				SM			SILTY SAND: light tan brown, very loose, dry, with mica	
	MOD Calif.	3,4,4						
5				ML			SANDY SILT: olive brown, damp, fine grained sand, traces of small shells and mica	
10								
15								
20	MOD Calif.	11,18,33					mottled, very dense	
25								
30								
35								
40								
45							(Pipe, sock and rock installed) Perc Test completed at 21-1/2 feet No groundwater encountered Backfilled with cuttings	
50								

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

FALLING HEAD PERCOLATION TEST

Time Lag	Hydraulic Conductivity	
T (min)	k (fpm)	k (in/hr)
68	**0.00015**	**0.11**

Project: **Maverik Indio Store**
Project No.: 306043-001
Date: 5/26/2023

Test Borehole ID: P-1
Borehole Diameter, D: 8 inches 0.67 feet
Borehole Test Depth: 20.0 feet

Effective Borehole Area, A' (sf): 0.174 sf $= \pi D^2/4*GF$
Tranformation Ratio, m: 1.0
Clear Water (CW) Factor: 1.0
Thickness of Pervious Layer, Ts: 20.0 feet

$k = A'/F/T$
$k = A'/F/t*\ln(H1/H2)$

Gravel Factor:		Perforations begins at		Top Impervious to:		Impervious (GWT) at:		based on
GF	0.50	0.0	feet	0.0	feet	20.0	feet	Horslev (1949)

Reading No.	ti Initial Time (min)	tf Final Time (min)	t Time Interval (min)	Initial Water Level feet	Final Water Level feet	F Fall in Water Level (feet)	L(avg) Average Wetted Length (ft)	Seepage Pit 9F/t*D/L(avg) Percolation Rate (gal/sf/day)	Elapsed Time (min)	Active Length L (feet)	Initial Head H1 (feet)	Final Head H2 (feet)	mL/D	Shape Factor F (feet)	Hydraulic Conductivity k (fpm)	Hydraulic Conductivity k (in/hr)
1	10:25	10:50	25	3.42	19.32	15.90	8.63	13.3	25	8.63	16.58	0.68	12.9	16.7	0.00134	0.96
2	10:52	11:17	25	1.75	15.15	13.40	11.55	8.3	52	11.55	18.25	4.85	17.3	20.5	0.00045	0.33
3	11:54	12:04	10	1.60	11.95	10.35	13.23	14.1	99	13.23	18.40	8.05	19.8	22.6	0.00064	0.46
4	12:09	12:22	13	3.44	12.73	9.29	11.92	10.8	117	11.92	16.56	7.27	17.9	20.9	0.00053	0.38
5	12:25	12:35	10	3.65	11.41	7.76	12.47	11.2	130	12.47	16.35	8.59	18.7	21.6	0.00052	0.37
6	12:37	12:47	10	3.01	11.36	8.35	12.82	11.7	142	12.82	16.99	8.64	19.2	22.1	0.00053	0.38
7	12:50	13:00	10	3.25	11.25	8.00	12.75	11.3	155	12.75	16.75	8.75	19.1	22.0	0.00052	0.37
8	13:03	13:13	10	3.21	10.10	6.89	13.35	9.3	168	13.35	16.79	9.90	20.0	22.7	0.00041	0.29
9	13:15	13:25	10	3.52	10.40	6.88	13.04	9.5	180	13.04	16.48	9.60	19.6	22.3	0.00042	0.30
10	13:26	13:36	10	3.44	10.20	6.76	13.18	9.2	191	13.18	16.56	9.80	19.8	22.5	0.00041	0.29

FALLING HEAD PERCOLATION TEST

Time Lag	Hydraulic Conductivity	
T (min)	k (fpm)	k (in/hr)
68	**0.00014**	**0.10**

Project: **Maverik Indio Store**
Project No.: 306043-001
Date: 5/26/2023

Test Borehole ID: P-2
Borehole Diameter, D: 8 inches 0.67 feet
Borehole Test Depth: 20.0 feet

Effective Borehole Area, A' (sf): 0.174 sf = $\pi D^2/4*GF$
Tranformation Ratio, m: 1.0
Clear Water (CW) Factor: 1.0
Thickness of Pervious Layer, Ts: 20.0 feet

k = A'/F/T
k = A'/F/t*ln(H1/H2)
based on Horslev (1949)

Gravel Factor:		Perforations begins at		Top Impervious to:		Impervious at:	
GF	0.50	0.0	feet	0.0	feet	20.0	feet

Reading No.	ti Initial Time (min)	tf Final Time (min)	t Time Interval (min)	Initial Water Level feet	Final Water Level feet	F Fall in Water Level (feet)	L(avg) Average Wetted Length (ft)	Seepage Pit 9F/t*D/L(avg) Percolation Rate (gal/sf/day)	Elapsed Time (min)	Active Length L (feet)	Initial Head H1 (feet)	Final Head H2 (feet)	mL/D	Shape Factor F (feet)	Hydraulic Conductivity k (fpm)	Hydraulic Conductivity k (in/hr)
1	11:34	11:59	25	4.00	16.50	12.50	9.75	9.2	25	9.75	16.00	3.50	14.6	18.1	0.00058	0.42
2	12:02	12:27	25	1.20	14.30	13.10	12.25	7.7	53	12.25	18.80	5.70	18.4	21.4	0.00039	0.28
3	13:23	13:33	10	3.26	9.81	6.55	13.47	8.8	119	13.47	16.74	10.19	20.2	22.9	0.00038	0.27
4	13:35	13:45	10	3.05	8.31	5.26	14.32	6.6	131	14.32	16.95	11.69	21.5	23.9	0.00027	0.19
5	13:48	13:58	10	3.15	8.95	5.80	13.95	7.5	144	13.95	16.85	11.05	20.9	23.5	0.00031	0.23
6	14:03	14:13	10	3.20	8.94	5.74	13.93	7.4	159	13.93	16.80	11.06	20.9	23.4	0.00031	0.22
7	14:19	14:29	10	3.50	8.21	4.71	14.15	6.0	175	14.15	16.50	11.79	21.2	23.7	0.00025	0.18
8	14:33	14:43	10	3.65	7.95	4.30	14.20	5.4	189	14.20	16.35	12.05	21.3	23.8	0.00022	0.16
9	14:43	14:53	10	3.55	8.00	4.45	14.23	5.6	199	14.23	16.45	12.00	21.3	23.8	0.00023	0.17
10	15:03	15:13	10	3.50	7.80	4.30	14.35	5.4	219	14.35	16.50	12.20	21.5	24.0	0.00022	0.16

File No.: 306043-001 July 3, 2023

Lab No.: 23-144

UNIT DENSITIES AND MOISTURE CONTENT ASTM D2937 & D2216

Job Name: Indio Maverik Store

Sample Location	Depth (feet)	Unit Dry Density (pcf)	Moisture Content (%)	USCS Group Symbol
B-1	2.5	96	1	SM
B-1	5	94	1	ML
B-1	7.5	95	1	ML
B-1	10	104	4	ML
B-1	15	107	10	ML
B-1	25	89	33	CL
B-2	2.5	99	0	SP-SM
B-2	5	101	6	SP-SM
B-2	7.5	85	10	SP-SM
B-2	10	106	7	ML
B-2	20	99	7	ML
B-2	40	103	2	SM
B-2	60	104	22	CL
B-4	2.5	88	1	SM
B-4	5	94	2	ML
B-4	7.5	88	4	ML
B-4	10	98	3	ML
B-4	20	104	4	ML
B-4	30	112	1	SM

File No.: 306043-001 July 3, 2023

Lab No.: 23-144

UNIT DENSITIES AND MOISTURE CONTENT ASTM D2937 & D2216

Job Name: Indio Maverik Store

Sample Location	Depth (feet)	Unit Dry Density (pcf)	Moisture Content (%)	USCS Group Symbol
B-5	2.5	94	2	ML
B-5	5	96	7	ML
B-5	7.5	104	3	ML
B-5	10	107	3	SP-SM
B-6	2.5	91	2	SM
B-6	5	97	1	SM
B-6	7.5	92	6	ML

File No.: 306043-001

July 3, 2023

Job Name: Indio Maverik Store

Lab Number: 23-144

ASTM D-1140 or Earth Systems Method (circle one)

AMOUNT PASSING NO. 200 SIEVE

(Earth Systems Method Transfers Sample until water runs clear)

Sample Location	Depth (feet)	Fines Content (%)	USCS Group Symbol	Soaking Time
B-2	7.5	10.0	SP-SM	10

File No.: 306043-001 July 3, 2023
Lab No.: 23-144

EXPANSION INDEX **ASTM D-4829**

Job Name: Indio Maverik Store
Sample ID: B-1 @ 1-7'
Soil Description: Silty Sand (SM)

Initial Moisture, %:	7.4	
Initial Compacted Dry Density, pcf:	109.4	
Initial Saturation, %:	49	
Final Moisture, %:	18.4	
Volumetric Swell, %:	0.1	
Expansion Index, EI:	**1**	**Very Low**

EI	ASTM Classification
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

File No.: 306043-001 July 3, 2023
Lab No.: 23-144

EXPANSION INDEX **ASTM D-4829**

Job Name: Indio Maverik Store
Sample ID: B-4 @ 2.5'
Soil Description: Silty Sand (SM)

Initial Moisture, %:	9.2	
Initial Compacted Dry Density, pcf:	111.2	
Initial Saturation, %:	49	
Final Moisture, %:	19.8	
Volumetric Swell, %:	0.1	
Expansion Index, EI:	**0**	**Very Low**

EI	ASTM Classification
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

File No.: 306043-001 7/3/2023

Lab No.: 23-144

SOIL CHEMICAL ANALYSES

Job Name: Indio Maverik Store

Job No.: 306043-001

Sample ID:

Sample Location:	B-1 @ 1-9'	B-4 @ 2.5'
Resistivity (Units)		
as-received (ohm-cm)	>4,400,000	>4,400,000
saturated (ohm-cm)	880	1,440
pH	7.0	7.2
Electrical Conductivity (mS/cm)	0.34	0.24
Chemical Analyses		
Cations		
calcium Ca^{2+} (mg/kg)	132	113
magnesium Mg^{2+} (mg/kg)	10	5
sodium Na^{1+} (mg/kg)	123	81
potassium K^{1+} (mg/kg)	98	53
ammonium NH41+ (mg/kg)	ND	ND
Anions		
carbonate CO_3^{2-} (mg/kg)	ND	ND
bicarbonate HCO_3^{1-}(mg/kg)	143	70
fluoride F^{1-} (mg/kg)	ND	ND
chloride Cl^{1-} (mg/kg)	129	72
sulfate SO_4^{2-} (mg/kg)	146	136
nitrate NO31- (mg/kg)	56	41
phosphate PO_4^{3-} (mg/kg)	ND	ND
Other Tests		
sulfide S^{2-} (qual)	na	na
Redox (mV)	na	na

Note: Tests performed by Subcontract Laboratory:
HDR Engineering, Inc.
431 West Baseline Road
Claremont, California 91711 Tel: (909) 962-5485

mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed
T.O.P. = top of pipe

Resistivity per ASTM G187, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B. Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.

General Guidelines for Soil Corrosivity

Chemical Agent	Amount in Soil	Degree of Corrosivity
Soluble Sulfates[1]	0 -1,000 mg/Kg (ppm) [0-.1%]	Low
	1,000 - 2,000 mg/Kg (ppm) [0.1-0.2%]	Moderate
	2,000 - 20,000 mg/Kg (ppm) [0.2-2.0%]	Severe
	> 20,000 mg/Kg (ppm) [>2.0%]	Very Severe
Resistivity[2] (Saturated)	0- 900 ohm-cm	Very Severely Corrosive
	900 to 2,300 ohm-cm	Severely Corrosive
	2,300 to 5,000 ohm-cm	Moderately Corrosive
	5,000-10,000 ohm-cm	Mildly Corrosive
	10,000+ ohm-cm	Progressively Less Corrosive

1 - General corrosivity to concrete elements. American Concrete Institute (ACI) Water Soluble Sulfate in Soil by Weight, ACI 318, Tables 4.2.2 - Exposure Conditions and Table 4.3.1 - Requirements for Concrete Exposed to Sulfate-Containing Solutions. It is recommended that concrete be proportioned in accordance with the requirements of the two ACI tables listed above (4.2.2 and 4.3.1). The current ACI should be referred to for further information.

2 - General corrosivity to metallic elements (iron, steel, etc.). Although no standard has been developed and accepted by corrosion engineering organizations, it is generally agreed that the classification shown above, or other similar classifications, reflect soil corrosivity. Source: Corrosionsource.com. The classification presented is excerpted from ASTM STP 1013 titled "Effects of Soil Characteristics on Corrosion" (February, 1989)

3 - Earth Systems does not practice corrosion engineering. Results should be reviewed by an engineer competent in corrosion evaluation, especially in regard to nitrites and ammonium.