PRELIMINARY HYDROLOGY REPORT

For Property Located in a Portion of the Northeast ¼ of Section 12, Township 6 South, Range 7 East, SBM Coachella, California

COVA
Tentative Tract Map 39330



June 2026

Prepared for:

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PROJECT DESCRIPTION & LOCATION

The proposed project site, identified as Tentative Tract Map 39330, comprises approximately 81.2 acres located on the south side of Avenue 52 between Calhoun Street and Van Buren Street, in the City of Coachella. The site is located in a portion of Section 12, Township 6 South, Range 7 East, SBM, and is assigned Assessor's Parcel Numbers 780-040-001, -003, 780-060-001 and -002. A vicinity map obtained from the Riverside TLMA website is included as Appendix A.

EXISTING SITE CONDITIONS

Flood Rate Map

The proposed area is covered by the unpublished FIRM Panel Number 06065C2262H, effective March 6, 2018, which indicates the subject property lies within Zone X, defined *as "Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. Insurance purchase is not required in these areas.*" Refer to the attached NFIP Flood Insurance Rate Map in Appendix B.

Existing Topography

The property is an existing date orchard and grape vinery with associated buildings and irrigation pond. The site is bounded to the north by Avenue 52, to the west by Calhoun Street, to the east by Van Buren Street, and to the south by various agricultural uses and/or single-family homes. Groundwater was encountered at a depth of approximately 35 feet below existing ground surface. The site is generally flat and slopes to the southeast. See the Existing Conditions Exhibit in Appendix H.

PROPOSED FLOOD CONTROL REQUIREMENTS

The purpose of this report is to provide preliminary retention basin analyses for the subject property. The drainage requirements for this project fall under the jurisdiction of the City of Coachella. Storm flows are conveyed through the site via street flow to localized low points where they will be conveyed via underground storm drain lines to the irrigation ponds.

HYDROLOGY ANALYSIS DESIGN CRITERIA

Storm runoff volumes for the 100-year event were obtained utilizing the Synthetic Unit Hydrograph as described in the *RCFC&WCD Hydrology Manual*. The hydrologic data used for the calculations are as follows:

Hydrologic Soil Group

The existing soil is categorized primarily as hydrologic soil group 'B', with a small finger of soil group 'A', for the subject property, as shown per the attached National Cooperative Soil Survey exhibits in Appendix C.

Soil Group 'A' is defined by RCFCD as – "soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission."

Soil Group 'B' is defined by RCFCD as – "soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission".

Antecedent Moisture Condition

AMC II – Moderate runoff potential, an intermediate condition. Per RCFC & WCD Hydrology Manual (Dated: April, 1978): "For the purposes of design hydrology using District methods, AMC II should normally be assumed for both the 10 year and 100 year frequency storm".

Land Use Classifications and Runoff Index Numbers

Runoff Index Numbers were obtained from RCFCD Plates E6.1, E6.2 and E6.3 are summarized below:

Condominiums (Soil Group A)	32
Condominiums (Soil Group B)	56
Paving/Hardscape (Soil Group B)	56

Percent of Impervious Cover (RCFCD Plate E-6.3):

Impervious Areas (Buildings, Pavement, Hardscape)	100%
Open Space (Landscaping & Retention Basins)	10%

Low Loss Rates: 85%

Precipitation Frequency Estimates

Precipitation depths were obtained from NOAA Atlas 14:

100 Year – 1 Hour Precipitation:	1.30	inches
100 Year – 3 Hour Precipitation:	2.08	inches
100 Year - 6 Hour Precipitation	2.75	inches
100 Year – 24 Hour Precipitation	4.38	inches

See Appendix D for the NOAA Atlas 14 Point Precipitation Frequency Estimates and respective RCFCD Plates.

Site Infiltration

A percolation testing was performed by Sladden Engineering, in accordance with Table 1 Infiltration Basin Option 2 of *Appendix A of Riverside County – Low Impact Development BMP Design Handbook*, more specifically in accordance with *Section 2.3 Shallow Percolation Test Method*. Eight percolation tests were performed with a range of 3 to 6.67 inches/hour. Per the City of Coachella design criteria for drywells, "The maximum percolation rate shall be 1" per hour, or half of the engineered percolation test, up to a maximum of 5" per hour", giving an infiltration rate of 1.5 inches/hour based on the lowest infiltration rate. Refer to Appendix E for an excerpt from the geotechnical report.

The irrigation ponds located in the southern part of the project will also be utilized as retention basins. Since the ponds will be lined, only the ground above the pond's nominal water surface elevation will allow infiltration. As such, the 1.5 inches/hour infiltration rate was prorated based on the percentage of the surface area around the pond that allows infiltration versus the total surface area of the ponds/retention basins. An infiltration rate of 0.86 inches/hour was used in the analysis.

SUMMARY of SYNTHETIC UNIT (SHORTCUT METHOD) ANALYSES

The proposed retention basins for the associated drainage areas were sized to retain the 100-year controlling storm event flood volumes and were analyzed utilizing the RCFCD Synthetic Unit (Shortcut Method). Per the manual, for areas of less than 100 – 200 acres, and lag times less than 7 – 8 minutes, the shortcut method is applicable. This method assumes that in a small watershed, response time to effective rainfall is very short. Therefore, runoff rates for a given period of time can be assumed to be directly proportional to effective rain. This method yields only approximate results (on the conservative side) and should be used only for watersheds meeting the criteria noted above.

It should be noted that the peak flow for the 1-hour storm is not necessarily representative for peak flow. Per RCFCD, peak discharges from the 3-hour storm should normally compare well with rational peaks.

The synthetic unit worksheet is included in Appendix F and is summarized on the Preliminary Synthetic Unit Hydrology Exhibit in Appendix J.

PRELIMINARY WQMP ANALYSES

Preliminary design volume and flow for BMP measures were based on Worksheets 1 and 2 from the Riverside County – Whitewater River Region Water Quality Management Plan. Impervious area for the drainage sub-areas are derived from the preliminary land uses. The worksheet is included as Appendix G.

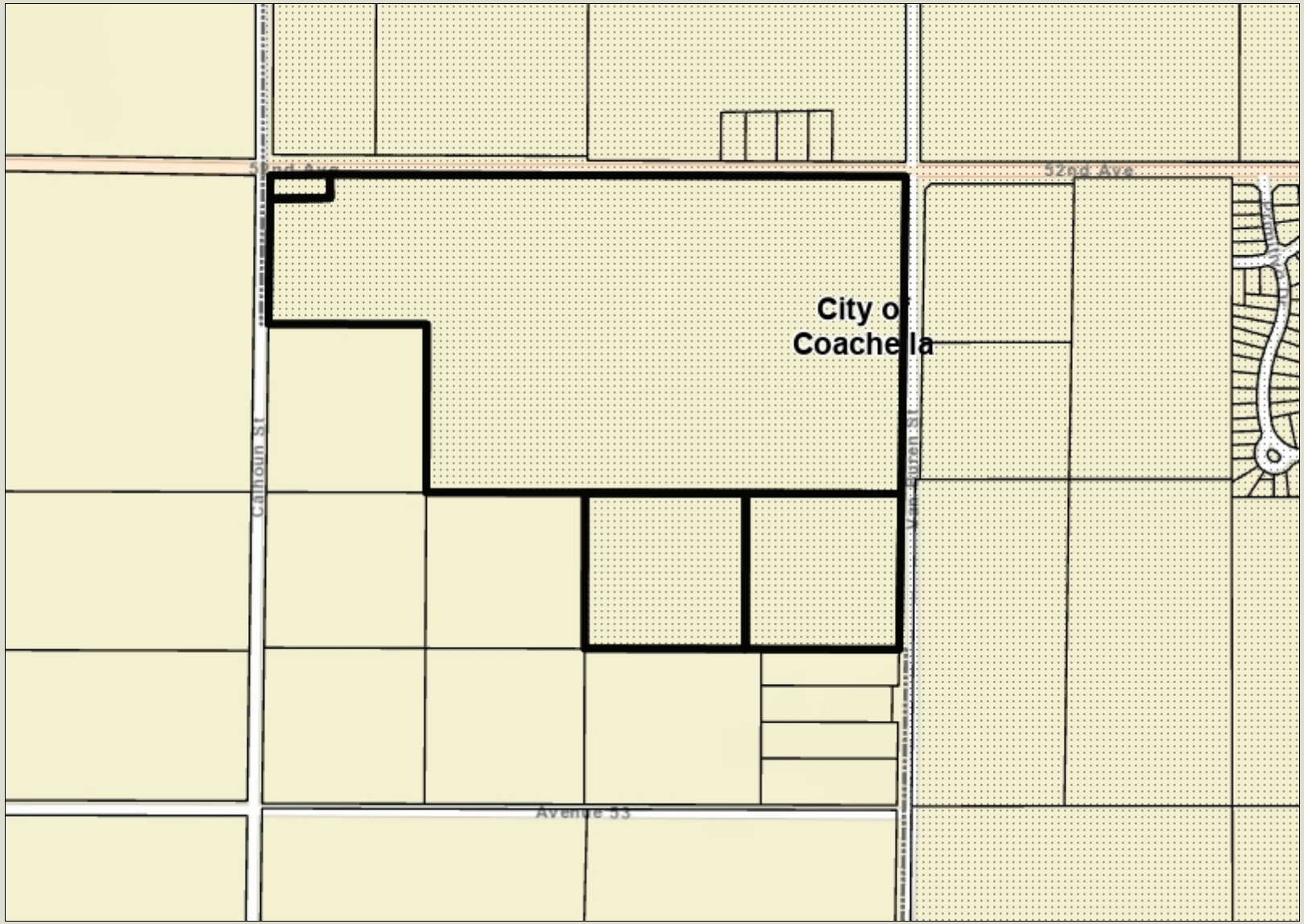
RESULTS AND CONCLUSIONS

As the above narrative and appendices confirm, the proposed retention basins are sufficiently sized to contain the flood volume from the controlling 100-year storm, therefore, meeting the hydrologic requirements established by the City of Coachella. During the final design process, a more detailed hydrology and hydraulics report will be submitted to the City for approval.

Appendix A

Riverside County TLMA Vicinity Map

Map My County Map





Legend

- County Boundary
- City Boundaries
- Parcels, Public
- Blueline Streams
- City Areas
- World_Street_Map

0 752 1,505 Feet

IMPORTANT Maps and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

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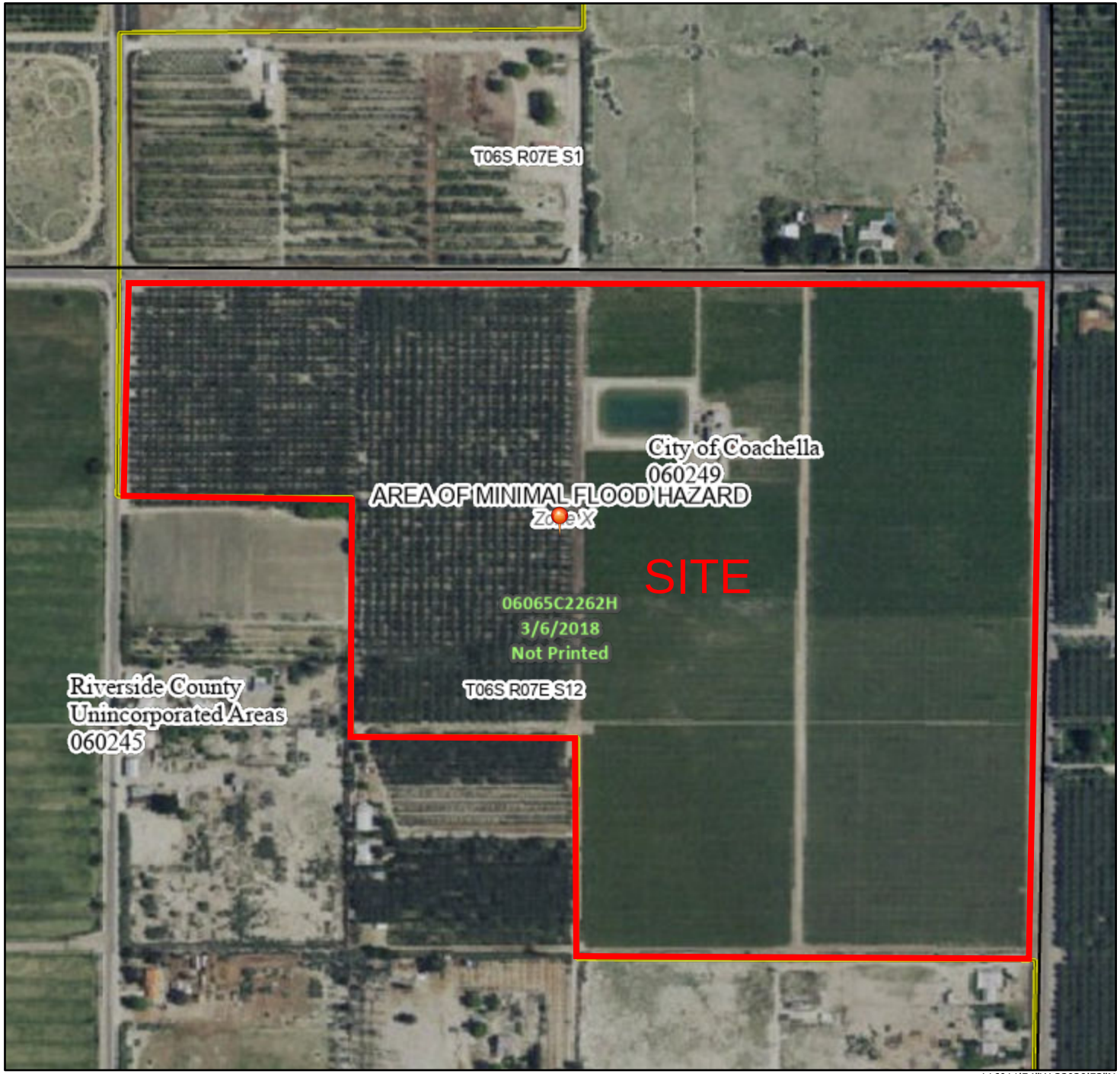
Notes

Appendix B
NFIP Flood Insurance Rate Map

National Flood Hazard Layer FIRMette

FEMA

116°12'32"W 33°40'23"N



116°11'54"W 33°39'53"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
- 513 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 9/23/2025 at 6:44 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.

DEFINITIONS OF FEMA FLOOD ZONE DESIGNATIONS

Moderate to Low Risk Areas

In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones:

ZONE	DESCRIPTION
X (Shaded)	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. Insurance purchase is not required in these zones.
X	Areas determined to be outside the 0.2% annual chance floodplain.

High Risk Areas

In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones:

ZONE	DESCRIPTION
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones. For areas of alluvial fan flooding, velocities are also determined.
AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.

High Risk – Coastal Areas

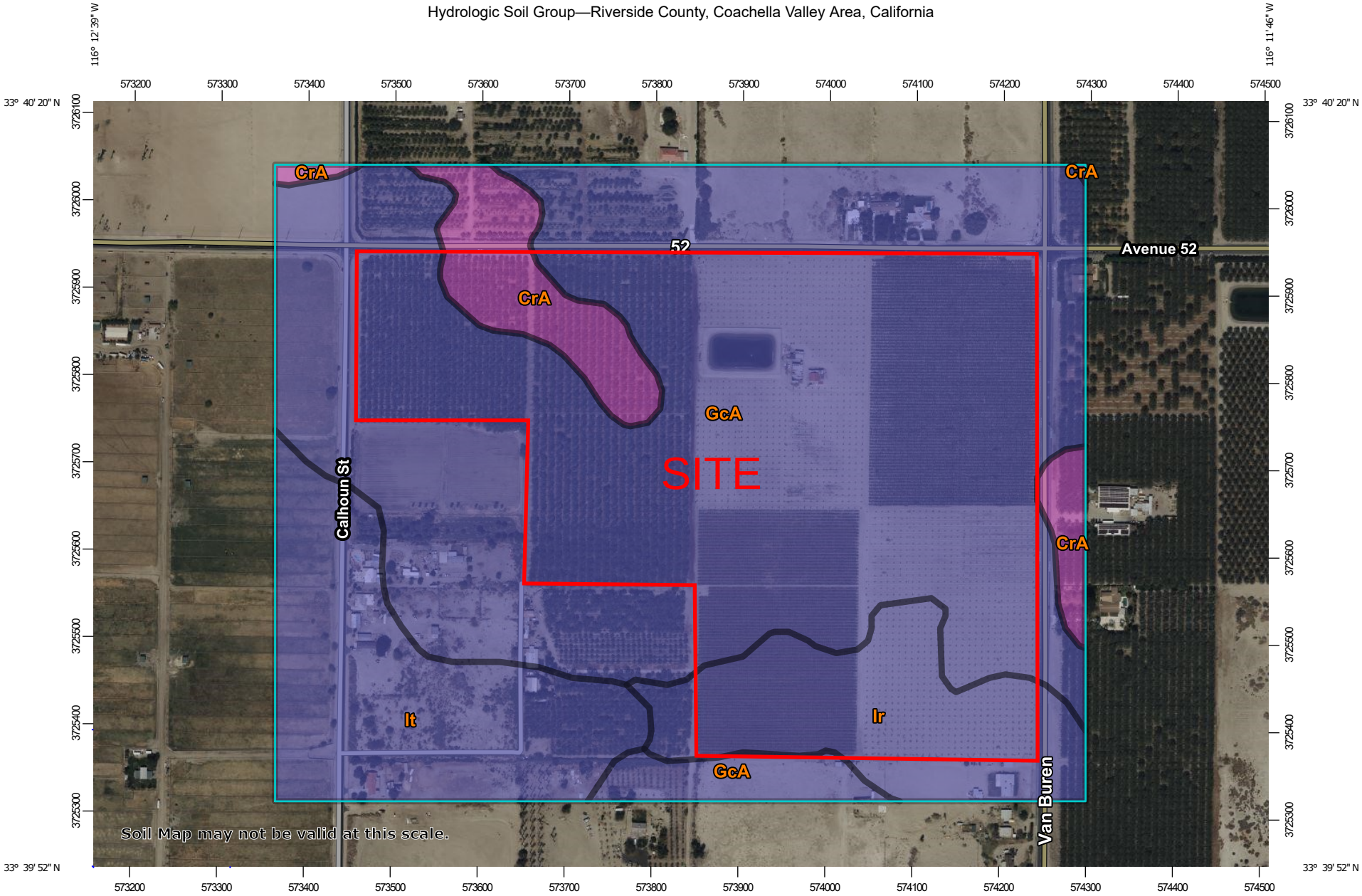
In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones:

ZONE	DESCRIPTION
V	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.
VE	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

Undetermined Risk Areas

ZONE	DESCRIPTION
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

Appendix C
USDA NCSS Hydrologic Soils Map



Map Scale: 1:6,180 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Riverside County, Coachella Valley Area, California
Survey Area Data: Version 17, Sep 10, 2024

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

Date(s) aerial images were photographed: Mar 15, 2022—May 28, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Coachella fine sand, wet, 0 to 2 percent slopes	A	10.4	6.2%
GcA	Gilman fine sandy loam, wet, 0 to 2 percent slopes	B	118.2	70.0%
Ir	Indio fine sandy loam, wet	B	17.4	10.3%
It	Indio very fine sandy loam, wet	B	22.7	13.5%
Totals for Area of Interest			**168.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D

NOAA Atlas 14

RCFCD Reference Plates

NOAA Atlas 14, Volume 6, Version 2
Location name: Coachella, California, USA*
Latitude: 33.6694°, Longitude: -116.2039°
Elevation: -54 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	**0.063** (0.052-0.076)	**0.099** (0.082-0.120)	**0.150** (0.125-0.182)	**0.195** (0.160-0.238)	**0.260** (0.208-0.330)	**0.316** (0.246-0.409)	**0.376** (0.286-0.499)	**0.442** (0.327-0.605)	**0.542** (0.384-0.773)	**0.628** (0.429-0.928)
10-min	**0.090** (0.075-0.108)	**0.141** (0.118-0.171)	**0.215** (0.179-0.261)	**0.279** (0.230-0.342)	**0.373** (0.297-0.473)	**0.452** (0.353-0.586)	**0.538** (0.409-0.715)	**0.634** (0.469-0.867)	**0.777** (0.550-1.11)	**0.900** (0.615-1.33)
15-min	**0.108** (0.091-0.131)	**0.171** (0.143-0.207)	**0.260** (0.216-0.316)	**0.337** (0.278-0.413)	**0.451** (0.360-0.572)	**0.547** (0.426-0.708)	**0.651** (0.495-0.865)	**0.767** (0.567-1.05)	**0.939** (0.665-1.34)	**1.09** (0.744-1.61)
30-min	**0.155** (0.130-0.188)	**0.245** (0.204-0.297)	**0.372** (0.309-0.451)	**0.483** (0.398-0.591)	**0.646** (0.515-0.819)	**0.783** (0.610-1.01)	**0.932** (0.709-1.24)	**1.10** (0.811-1.50)	**1.34** (0.952-1.92)	**1.56** (1.06-2.30)
60-min	**0.217** (0.182-0.263)	**0.343** (0.286-0.416)	**0.521** (0.433-0.632)	**0.676** (0.557-0.828)	**0.905** (0.721-1.15)	**1.10** (0.855-1.42)	**1.30** (0.993-1.73)	**1.54** (1.14-2.10)	**1.88** (1.33-2.69)	**2.18** (1.49-3.22)
2-hr	**0.300** (0.251-0.363)	**0.448** (0.374-0.543)	**0.667** (0.554-0.810)	**0.865** (0.713-1.06)	**1.17** (0.932-1.48)	**1.44** (1.12-1.86)	**1.73** (1.32-2.30)	**2.07** (1.53-2.83)	**2.59** (1.84-3.70)	**3.05** (2.09-4.51)
3-hr	**0.363** (0.303-0.439)	**0.531** (0.442-0.643)	**0.784** (0.651-0.952)	**1.02** (0.839-1.25)	**1.38** (1.10-1.75)	**1.71** (1.33-2.21)	**2.08** (1.58-2.76)	**2.51** (1.85-3.43)	**3.18** (2.25-4.53)	**3.77** (2.58-5.57)
6-hr	**0.480** (0.401-0.581)	**0.693** (0.578-0.840)	**1.02** (0.847-1.24)	**1.32** (1.09-1.62)	**1.81** (1.44-2.29)	**2.24** (1.75-2.90)	**2.75** (2.09-3.65)	**3.34** (2.47-4.56)	**4.27** (3.03-6.09)	**5.12** (3.50-7.56)
12-hr	**0.576** (0.481-0.697)	**0.849** (0.708-1.03)	**1.26** (1.05-1.53)	**1.64** (1.36-2.02)	**2.25** (1.79-2.85)	**2.78** (2.17-3.60)	**3.40** (2.58-4.51)	**4.12** (3.04-5.63)	**5.24** (3.71-7.48)	**6.25** (4.27-9.24)
24-hr	**0.727** (0.643-0.838)	**1.10** (0.974-1.27)	**1.66** (1.46-1.92)	**2.16** (1.89-2.52)	**2.94** (2.49-3.54)	**3.62** (3.00-4.44)	**4.38** (3.55-5.51)	**5.25** (4.15-6.79)	**6.59** (5.00-8.86)	**7.77** (5.70-10.8)
2-day	**0.837** (0.741-0.966)	**1.29** (1.14-1.49)	**1.94** (1.71-2.24)	**2.52** (2.20-2.94)	**3.39** (2.88-4.09)	**4.14** (3.43-5.08)	**4.96** (4.02-6.23)	**5.87** (4.64-7.59)	**7.25** (5.50-9.74)	**8.42** (6.18-11.7)
3-day	**0.900** (0.796-1.04)	**1.39** (1.23-1.60)	**2.09** (1.84-2.42)	**2.71** (2.37-3.17)	**3.64** (3.08-4.38)	**4.41** (3.66-5.42)	**5.26** (4.27-6.62)	**6.20** (4.90-8.01)	**7.60** (5.77-10.2)	**8.78** (6.45-12.2)
4-day	**0.951** (0.841-1.10)	**1.47** (1.30-1.70)	**2.21** (1.95-2.56)	**2.86** (2.50-3.34)	**3.82** (3.24-4.60)	**4.62** (3.84-5.68)	**5.50** (4.46-6.92)	**6.47** (5.11-8.35)	**7.89** (5.99-10.6)	**9.10** (6.68-12.6)
7-day	**1.01** (0.897-1.17)	**1.56** (1.38-1.80)	**2.32** (2.05-2.69)	**3.00** (2.62-3.49)	**3.98** (3.37-4.80)	**4.80** (3.99-5.90)	**5.69** (4.62-7.16)	**6.68** (5.27-8.63)	**8.12** (6.16-10.9)	**9.32** (6.84-13.0)
10-day	**1.05** (0.928-1.21)	**1.60** (1.42-1.85)	**2.39** (2.11-2.76)	**3.07** (2.69-3.59)	**4.08** (3.46-4.91)	**4.91** (4.08-6.04)	**5.82** (4.72-7.32)	**6.81** (5.38-8.80)	**8.26** (6.27-11.1)	**9.48** (6.96-13.2)
20-day	**1.12** (0.994-1.30)	**1.73** (1.53-2.00)	**2.58** (2.27-2.99)	**3.32** (2.90-3.87)	**4.40** (3.73-5.30)	**5.29** (4.39-6.50)	**6.25** (5.07-7.86)	**7.30** (5.76-9.43)	**8.82** (6.70-11.9)	**10.1** (7.41-14.0)
30-day	**1.18** (1.04-1.36)	**1.84** (1.62-2.12)	**2.77** (2.44-3.20)	**3.57** (3.13-4.17)	**4.75** (4.02-5.72)	**5.72** (4.75-7.02)	**6.75** (5.48-8.49)	**7.88** (6.22-10.2)	**9.51** (7.22-12.8)	**10.9** (7.97-15.1)
45-day	**1.28** (1.13-1.48)	**2.03** (1.80-2.34)	**3.09** (2.72-3.57)	**4.00** (3.50-4.67)	**5.33** (4.52-6.42)	**6.43** (5.34-7.90)	**7.60** (6.16-9.56)	**8.87** (7.00-11.5)	**10.7** (8.12-14.4)	**12.2** (8.96-17.0)
60-day	**1.35** (1.19-1.56)	**2.17** (1.92-2.50)	**3.32** (2.93-3.84)	**4.32** (3.78-5.04)	**5.77** (4.89-6.95)	**6.96** (5.78-8.55)	**8.24** (6.68-10.4)	**9.61** (7.59-12.4)	**11.6** (8.80-15.6)	**13.2** (9.70-18.4)

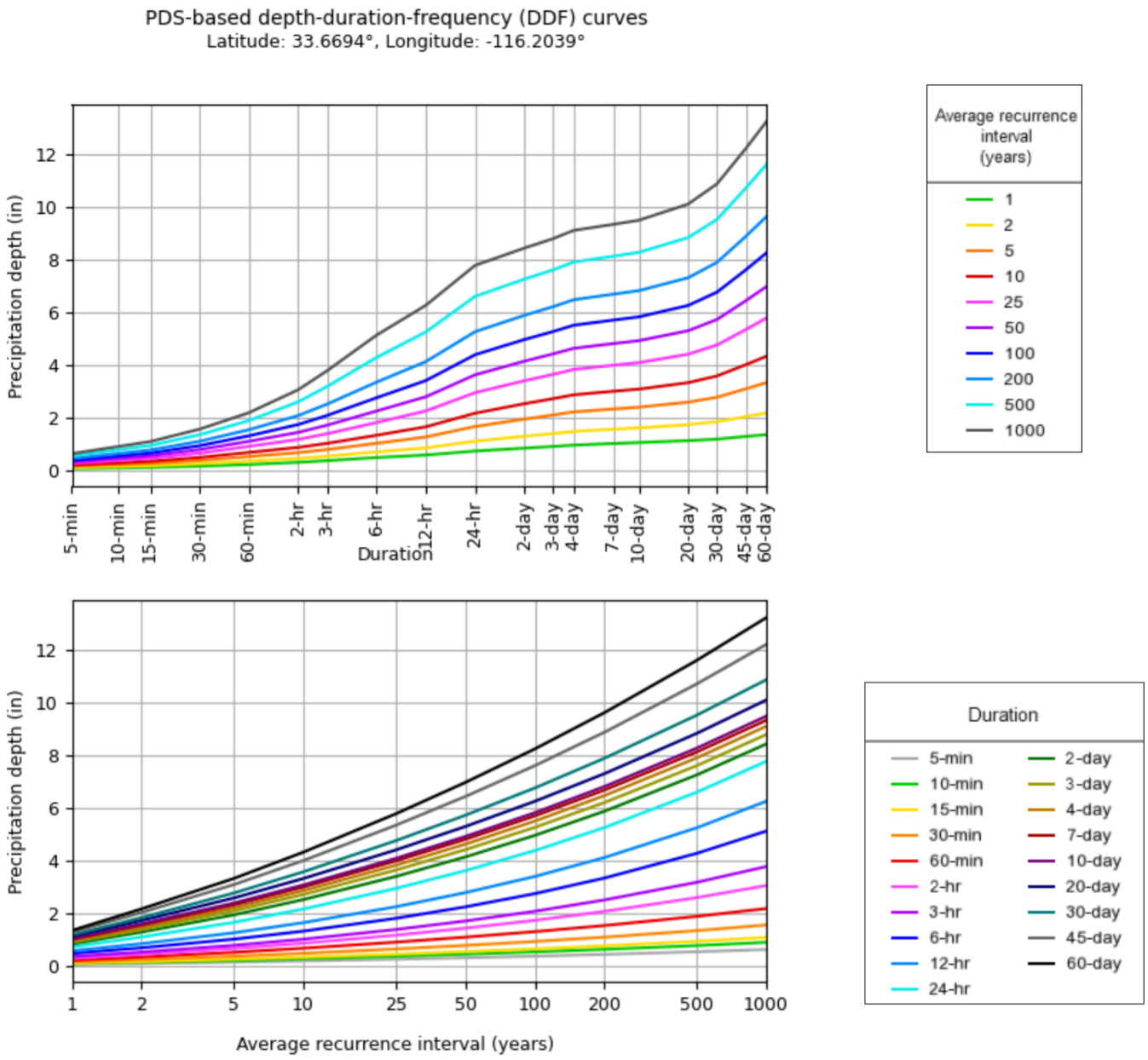
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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



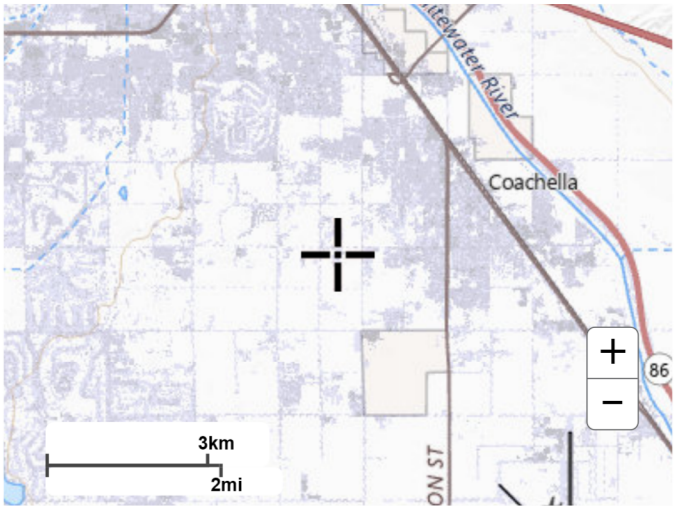
NOAA Atlas 14, Volume 6, Version 2

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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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

Disclaimer

Appendix E

Sladden Engineering - Percolation Test Results

Sladden Engineering

45090 Golf Center Parkway, Suite F, Indio, California 92201 (760) 863-0713 Fax (760) 863-0847
6782 Stanton Avenue, Suite C, Buena Park, CA 90621 (714) 523-0952 Fax (714) 523-1369
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863
www.sladdenengineering.com

October 22, 2024

Project No. 544-24159
24-10-561

Relevant Living
6417 Selma Avenue, 2nd Floor
Los Angeles, California 90028

Project: Proposed The Ranch at Coachella
Mixed-Use Development
APN's 780-040-001, 003, 780-060-001 & 002
SWC 52nd Avenue & Van Buren Street
Coachella, California

Subject: Percolation/Infiltration Testing for Stormwater Management

Ref: Geotechnical Investigation report, Proposed "The Ranch at Coachella" Mixed-Use Development, APNs 780-040-001, 003 & 780-060-001 & 002 Coachella, California, Project No. 544-24159, Report No. 24-07-358.

In accordance with your request, we have performed percolation testing on the subject site to evaluate the infiltration potential of the near-surface soil to assist in stormwater management system design. It is our understanding that on-site stormwater retention including infiltration is planned for the proposed project.

Percolation testing has been performed within 8 shallow test holes excavated on the site. Testing was performed at a depth of approximately 4 and 6 feet below the existing ground surface. The approximate locations of the test holes are presented on the attached Test Location Photograph (Figure 3). Proposed testing locations were provided to Sladden Engineering by MSA Consulting, Inc. However, final locations were adjusted based on encountered field conditions and by on site tenant's request.

Testing was performed by placing water within the test bores and recording the drop in the water surface with time. Testing was performed in general accordance with Section 2.3 of Riverside County – Low Impact Development BMP Design Handbook for percolation testing. Test results are summarized in the following table.

PERCOLATION/INFILTRATION TEST RESULTS

Test No.	Depth (Ft)	USCS	Percolation Rate (in/hr)	Infiltration Rate (in/hr)
P-1	6.00	SM	24.00	3.00
P-2	6.00	SM	27.50	3.64
P-3	4.00	SM	40.00	6.67
P-4	6.00	SM	40.00	6.67

P-5	6.00	SM	32.50	4.68
P-6	4.00	SM	40.00	6.67
P-7	4.00	SM	40.00	6.67
P-8	4.00	SM	40.00	6.67

The percolation rates determined represent the ultimate field rates that do not include a safety factor. The corresponding infiltration rates were calculated using the Porchet Method. An appropriate safety factor should be incorporated into stormwater retention/infiltration system design.

If you have any questions regarding this memo, please contact the undersigned.

Respectfully submitted,
SLADDEN ENGINEERING

James W. Minor III
Senior Geologist

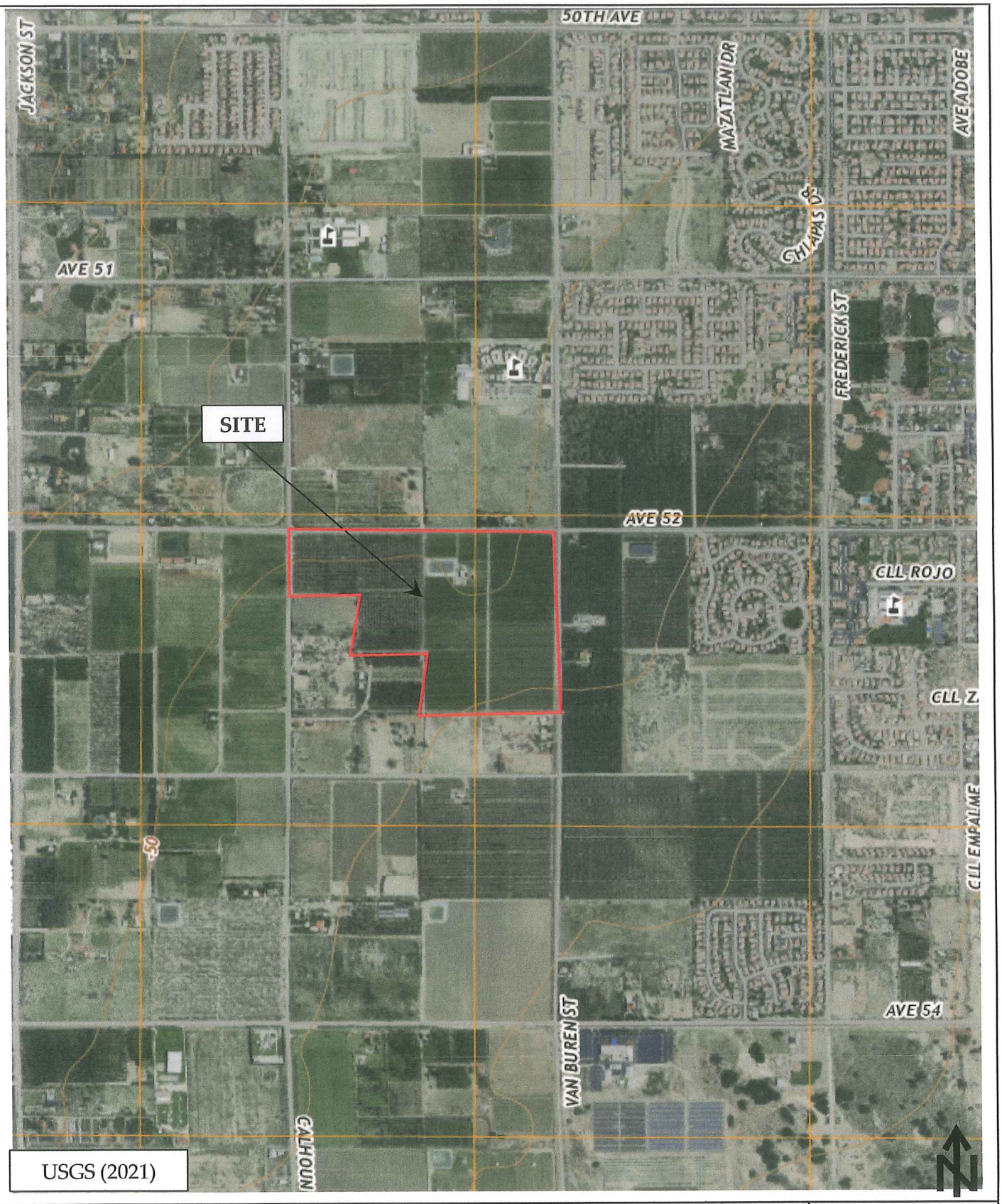
PROFESSIONAL GEOLOGIST
JAMES W. MINOR III
No. 9735
STATE OF CALIFORNIA

Brett L. Anderson
Principal Engineer

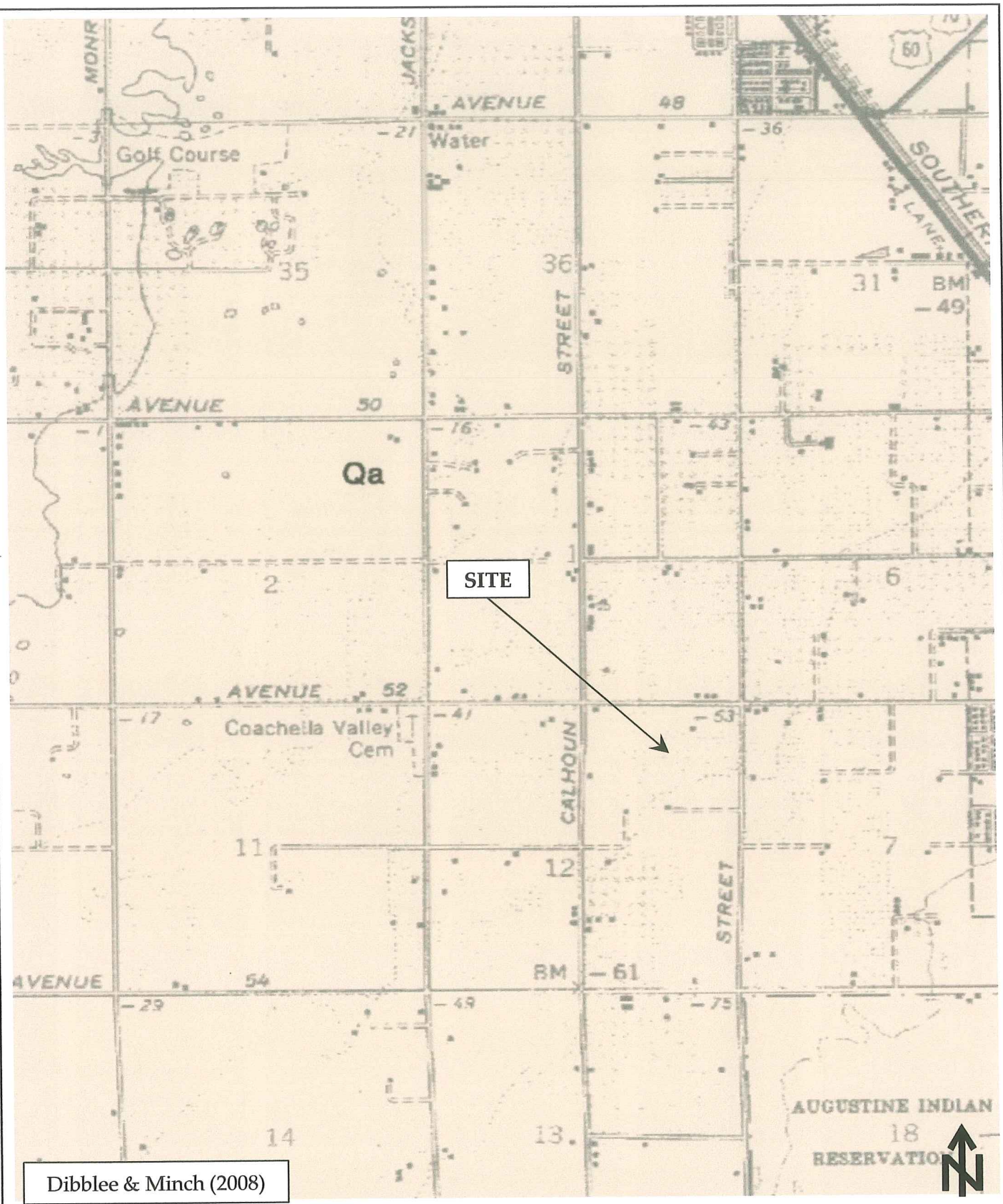
REGISTERED PROFESSIONAL ENGINEER
BRETT L. ANDERSON
No. C45389
CIVIL ENGINEERING
STATE OF CALIFORNIA

Copies: pdf/Addressee

SITE LOCATION MAP
REGIONAL GEOLOGIC MAP
TEST LOCATION PHOTOGRAPH



	SITE LOCATION MAP		FIGURE
Sladden Engineering	Project Number:	544-24159	1
	Report Number:	24-10-561	
	Date:	October 22, 2024	



Dibblee & Minch (2008)

Sladden Engineering	REGIONAL GEOLOGIC MAP		FIGURE 2
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	Report Number:	24-10-561	
	Date:	October 22, 2024	



LEGEND

P-8 Approximate Percolation Testing Location

Google Earth (2024)

Sladden Engineering

TEST LOCATION PHOTOGRAPH

FIGURE 3

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Date:	October 22, 2024

BORING LOGS
STORMWATER TESTING DATA SHEETS

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, moist, fine-to coarse-grained, micaceous, with trace of clay.
							4		
							6		
							8		Terminated at ~ 6 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

Project No:	544-24159	Page	1
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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, moist, fine-to coarse-grained, micaceous, with trace of clay.
							4		
							6		
							8		Terminated at ~ 6 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, slightly moist, fine-to coarse-grained, micaceous.
							4		
							6		
							8		
							10		Terminated at ~ 4 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-4

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, slightly moist, fine-to coarse-grained, micaceous.
							4		
							6		
							8		Terminated at ~ 6 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
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							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-5

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, slightly moist, fine-to coarse-grained, micaceous.
							4		
							6		
							8		Terminated at ~ 6 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

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BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-6

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, slightly moist, fine-to coarse-grained, micaceous.
							4		
							6		
							8		
							10		Terminated at ~ 4 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-7

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, slightly moist, fine-to coarse-grained, micaceous.
							4		
							6		
							8		
							10		Terminated at ~ 4 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	9/26/2024
Elevation:	-50 FT MSL	Boring No:	P-8

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Silty Sand (SM); grayish brown, slightly moist, fine-to coarse-grained, micaceous.
							4		
							6		
							8		
							10		Terminated at ~ 4 ft bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Borehole Cased with Perforated Pipe for Percolation Testing.
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
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							40		
							42		
							44		
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Completion Notes:

MIXED-USE DEVELOPMENT
SWC 52ND AVENUE & VAN BUREN, COACHELLA

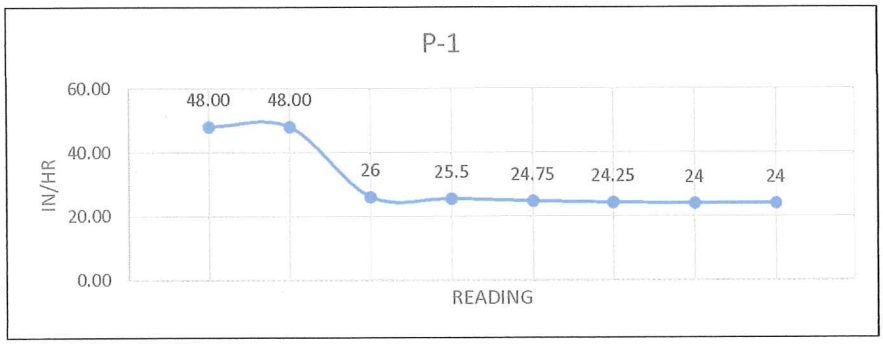
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STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	6.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-1	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	6.00	20	0	20	48.00
B	25.00	6.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	6.00	20	7	13	26
2	30.00	6.00	20	7 2/8	12 6/8	25.5
3	30.00	6.00	20	7 5/8	12 3/8	24.75
4	30.00	6.00	20	7 7/8	12 1/8	24.25
5	30.00	6.00	20	8	12	24
6	30.00	6.00	20	8	12	24



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	64.00
r =	4.00
D_0 =	52
D_t =	72.00
H_0 =	20
H_f =	8
ΔH =	12.00
H_{avg} =	14.00

Δt (minutes)
D_f (Final Depth to water)
r (hole radius in inches)
D_0 (Initial Depth to water)
D_t (Total Depth of test hole)
H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

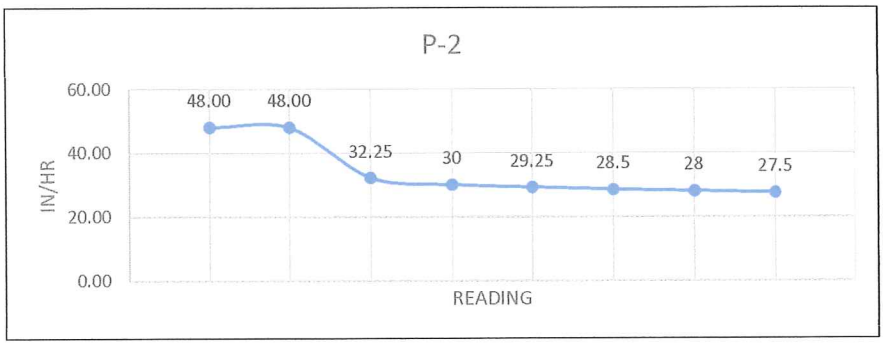
Field Rate:	24 in/hr
Infiltration Rate:	3.00 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	6.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-2	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	6.00	20	0	20	48.00
B	25.00	6.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	6.00	20	3 7/8	16 1/8	32.25
2	30.00	6.00	20	5	15	30
3	30.00	6.00	20	5 3/8	14 5/8	29.25
4	30.00	6.00	20	5 6/8	14 2/8	28.5
5	30.00	6.00	20	6	14	28
6	30.00	6.00	20	6 2/8	13 6/8	27.5



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	65.75
r =	4.00
D_0 =	52
D_t =	72.00
H_0 =	20
H_f =	6.25
ΔH =	13.75
H_{avg} =	13.13

Δt (minutes)

D_f (Final Depth to water)

r (hole radius in inches)

D_0 (Initial Depth to water)

D_t (Total Depth of test hole)

H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

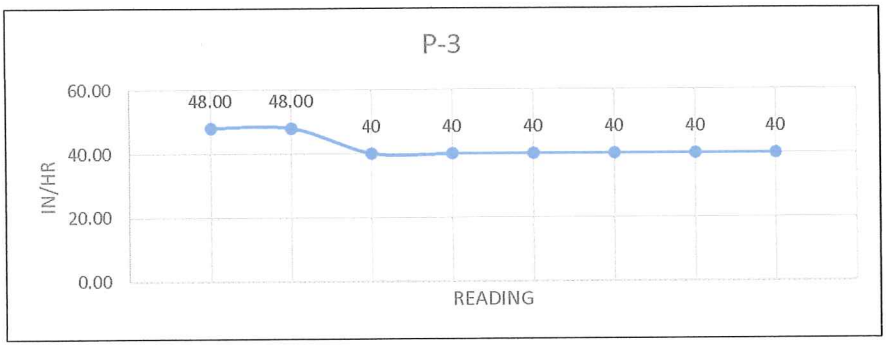
Field Rate:	27.5 in/hr
Infiltration Rate:	3.64 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	4.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-3	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	4.00	20	0	20	48.00
B	25.00	4.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	4.00	20	0	20	40
2	30.00	4.00	20	0	20	40
3	30.00	4.00	20	0	20	40
4	30.00	4.00	20	0	20	40
5	30.00	4.00	20	0	20	40
6	30.00	4.00	20	0	20	40



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	48.00
r =	4.00
D_0 =	28
D_t =	48.00
H_0 =	20
H_f =	0
ΔH =	20.00
H_{avg} =	10.00

Δt (minutes)
D_f (Final Depth to water)
r (hole radius in inches)
D_0 (Initial Depth to water)
D_t (Total Depth of test hole)
H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

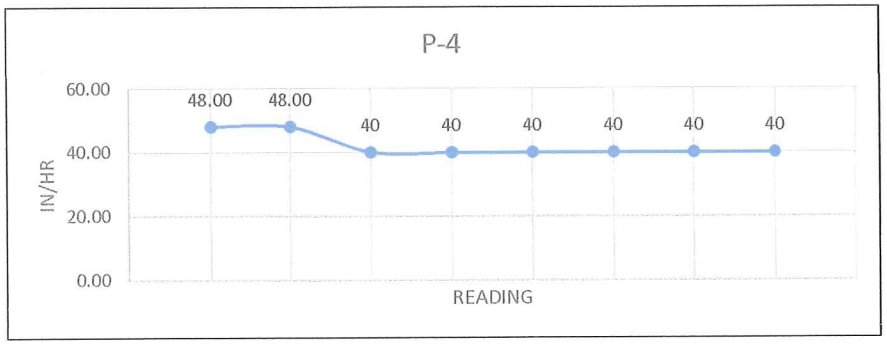
Field Rate:	40 in/hr
Infiltration Rate:	6.67 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	6.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-4	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	6.00	20	0	20	48.00
B	25.00	6.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	6.00	20	0	20	40
2	30.00	6.00	20	0	20	40
3	30.00	6.00	20	0	20	40
4	30.00	6.00	20	0	20	40
5	30.00	6.00	20	0	20	40
6	30.00	6.00	20	0	20	40



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	72.00
r =	4.00
D_0 =	52
D_t =	72.00
H_0 =	20
H_f =	0
ΔH =	20.00
H_{avg} =	10.00

Δt (minutes)
D_f (Final Depth to water)
r (hole radius in inches)
D_0 (Initial Depth to water)
D_t (Total Depth of test hole)
H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

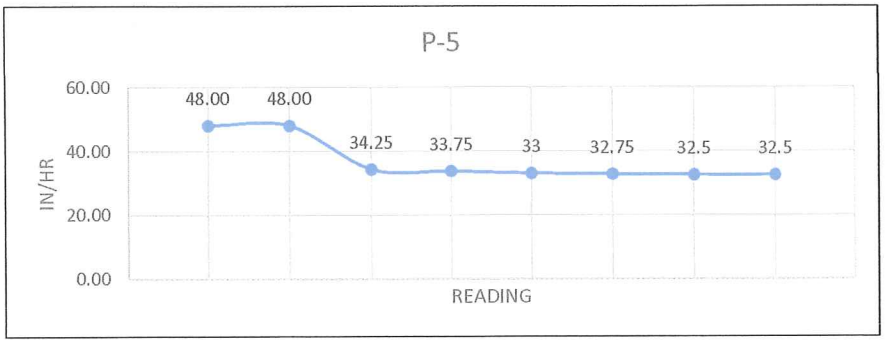
Field Rate:	40 in/hr
Infiltration Rate:	6.67 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	6.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-5	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	6.00	20	0	20	48.00
B	25.00	6.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	6.00	20	2 7/8	17 1/8	34.25
2	30.00	6.00	20	3 1/8	16 7/8	33.75
3	30.00	6.00	20	3 4/8	16 4/8	33
4	30.00	6.00	20	3 5/8	16 3/8	32.75
5	30.00	6.00	20	3 6/8	16 2/8	32.5
6	30.00	6.00	20	3 6/8	16 2/8	32.5



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	68.25
r =	4.00
D_0 =	52
D_t =	72.00
H_0 =	20
H_f =	3.75
ΔH =	16.25
H_{avg} =	11.88

Δt (minutes)

D_f (Final Depth to water)

r (hole radius in inches)

D_0 (Initial Depth to water)

D_t (Total Depth of test hole)

H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

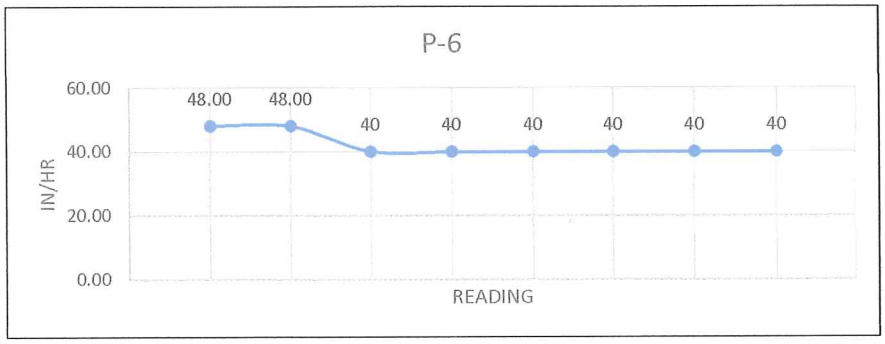
Field Rate:	32.5 in/hr
Infiltration Rate:	4.68 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	4.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-6	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	4.00	20	0	20	48.00
B	25.00	4.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	4.00	20	0	20	40
2	30.00	4.00	20	0	20	40
3	30.00	4.00	20	0	20	40
4	30.00	4.00	20	0	20	40
5	30.00	4.00	20	0	20	40
6	30.00	4.00	20	0	20	40



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	48.00
r =	4.00
D_0 =	28
D_t =	48.00
H_0 =	20
H_f =	0
ΔH =	20.00
H_{avg} =	10.00

Δt (minutes)

D_f (Final Depth to water)

r (hole radius in inches)

D_0 (Initial Depth to water)

D_t (Total Depth of test hole)

H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

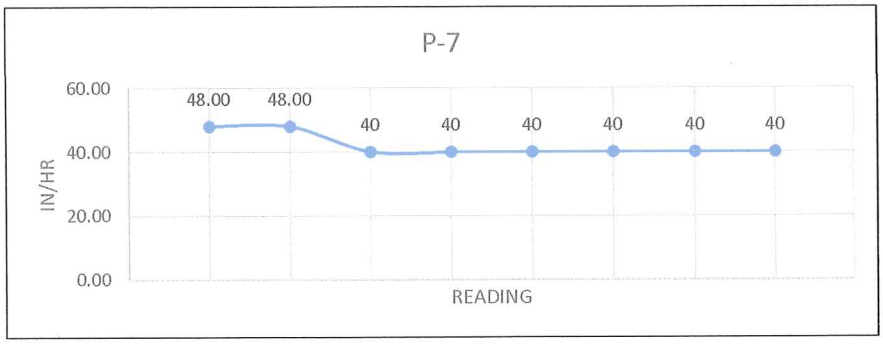
Field Rate:	40 in/hr
Infiltration Rate:	6.67 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	4.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-7	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	4.00	20	0	20	48.00
B	25.00	4.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	4.00	20	0	20	40
2	30.00	4.00	20	0	20	40
3	30.00	4.00	20	0	20	40
4	30.00	4.00	20	0	20	40
5	30.00	4.00	20	0	20	40
6	30.00	4.00	20	0	20	40



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	48.00
r =	4.00
D_0 =	28
D_t =	48.00
H_0 =	20
H_f =	0
ΔH =	20.00
H_{avg} =	10.00

Δt (minutes)
D_f (Final Depth to water)
r (hole radius in inches)
D_0 (Initial Depth to water)
D_t (Total Depth of test hole)
H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

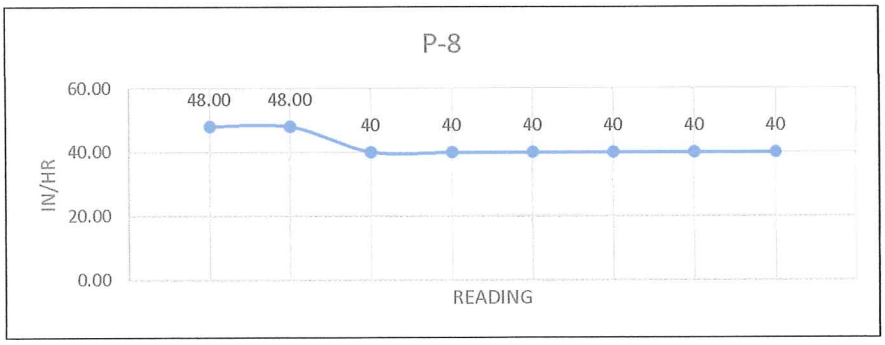
Field Rate:	40 in/hr
Infiltration Rate:	6.67 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	Mixed-Use Development	Depth (ft):	4.00
Job No. :	544-24159	USCS Soil Class:	SM
Date:	10/21/2024	Sandy Soil:	Favorable
Test Hole #:	P-8	Tested By:	Robert

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	25.00	4.00	20	0	20	48.00
B	25.00	4.00	20	0	20	48.00

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	30.00	4.00	20	0	20	40
2	30.00	4.00	20	0	20	40
3	30.00	4.00	20	0	20	40
4	30.00	4.00	20	0	20	40
5	30.00	4.00	20	0	20	40
6	30.00	4.00	20	0	20	40



PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

Δt =	30.00
D_f =	48.00
r =	4.00
D_0 =	28
D_t =	48.00
H_0 =	20
H_f =	0
ΔH =	20.00
H_{avg} =	10.00

Δt (minutes)

D_f (Final Depth to water)

r (hole radius in inches)

D_0 (Initial Depth to water)

D_t (Total Depth of test hole)

H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

Field Rate:	40 in/hr
Infiltration Rate:	6.67 in/hr

Appendix F

RCFCD Synthetic Unit Hydrograph Worksheets

RCFCD SYNTHETIC UNIT HYDROGRAPH - SHORTCUT METHOD

DATA INPUT SHEET

DATE	December 10, 2025
WORKSHEET PREPARED BY:	saw
PROJECT NAME	COVA
PROJECT NUMBER	2811
CONCENTRATION POINT DESIGNATION	Retention Basin
AREA DESIGNATION	Site
AMC NUMBER	2

Low Loss Conditions: X=Existing; D=Developed; BS=Retention

AREA DESIG	SOIL GROUP	TRIBUTARY AREAS	ACRES	LOW LOSS CONDITION	RI NUMBER	AMC II INFILTRATION RATE	IMPERVIOUS PERCENT
2	A	PAVING/HARDSCAPE	1.04	D	32	0.74	1.00
6	A	MF - CONDIMINIUMS	4.03	D	32	0.74	0.65
2	B	PAVING/HARDSCAPE	9.42	D	56	0.51	1.00
6	B	MF - CONDIMINIUMS	66.65	D	56	0.51	0.65

LENGTH OF WATERCOURSE (L)	2,675 ft
LENGTH TO POINT OPPOSITE CENTROID (Lca)	1,120 ft
ELEVATION OF HEADWATER	449.9 ft
ELEVATION OF CONCENTRATION POINT	440.4 ft
AVERAGE MANNINGS 'N' VALUE	0.015
STORM FREQUENCY (YEAR)	100
LOW LOSS RATE (Storm Events > 10 Years)	**85%**
POINT RAIN FROM NOAA ATLAS	**14**
1-HOUR	1.30 in
3-HOUR	2.08 in
6-HOUR	2.75 in
24-HOUR	4.38 in

BASIN CHARACTERISTICS:

ELEVATION	AREA
434.0 ft	60,573 sf
434.5 ft	64,163 sf
435.5 ft	71,428 sf
436.5 ft	78,807 sf
437.5 ft	86,298 sf
438.5 ft	93,903 sf
439.5 ft	101,621 sf

PERCOLATION RATE (in/hr)	0.9 in/hr
DRYWELL DATA	
NUMBER USED	0
PERCOLATION RATE	0.00 cfs
LOWEST FLOWLINE ELEVATION	440
LOWEST PAD ELEVATION	442

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM	PROJECT: COVA Job No.: 2811 BY: saw DATE: 12/10/25

PHYSICAL DATA

[1] CONCENTRATION POINT	Retention Basin
[2] AREA DESIGNATION	Site
[3] AREA - ACRES	81.14
[4] L-FEET	2675
[5] L-MILES	0.507
[6] La-FEET	1120.00
[7] La-MILES	0.212
[8] ELEVATION OF HEADWATER	449.87
[9] ELEVATION OF CONCENTRATION POINT	440.39
[10] H-FEET	9.48
[11] S-FEET/MILE	18.7
[12] S^0.5	4.33
[13] L*LCA/S^0.5	0.025
[14] AVERAGE MANNINGS 'N'	0.015
[15] LAG TIME-HOURS	0.09
[16] LAG TIME-MINUTES	5.3
[17] 100% OF LAG-MINUTES	5.3
[18] 200% OF LAG-MINUTES	10.6

RAINFALL DATA

[1] AMC	II
[2] FREQUENCY-YEARS	100
FROM NOAA ATLAS	**14**
[3] STORM DURATION:	Point Rain
1-HOUR	1.30 in
3-HOUR	2.08 in
6-HOUR	2.75 in
24-HOUR	4.38 in

STORM EVENT SUMMARY

STORM DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.10	1.50	1.60	1.78
FLOOD VOLUME	(cu-ft)	325,179	441,160	472,562	**524,686**
	(acre-ft)	7.47	10.13	10.85	**12.05**
REQUIRED STORAGE	(cu-ft)	319,900	424,813	**443,609**	431,345
	(acre-ft)	7.34	9.75	**10.18**	9.90
FACTOR OF SAFETY		1.39	1.05	1.00	1.03
STORAGE PROVIDED	(cu-ft)	444,365			
	(acre-ft)	10.20			
PEAK FLOW	(cfs)	n/a	151.42	135.16	34.93
MAXIMUM WSEL	(ft)	438.20	439.30	**439.49**	439.37
DEPTH	(ft)	4.20	5.30	**5.49**	5.37
LOWEST FLOWLINE ELEVATION		440.00			
DIFFERENCE	(ft)	1.80	0.70	0.51	0.63
LOWEST PAD ELEVATION		442.00			
DIFFERENCE	(ft)	3.80	2.70	2.51	2.63
ESTIMATED TIME TO DEWATER BASIN Based on Total Flood Volume & Average Percolation Rate	(days)	2.6	3.4	3.9	4.0

NOTE: PEAK FLOW FOR THE 1-HOUR STORM IS NOT REPRESENTATIVE. PER RCFCD PEAK DISCHARGES FROM THE 3-HOUR STORM SHOULD NORMALLY COMPARE WELL WITH RATIONAL PEAKS.

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD BASIC DATA CALCULATION FORM AMC II	PROJECT: COVA Job No.: 2811 BY: saw DATE: 12/10/25

AVERAGE ADJUSTED LOSS RATE

SOIL GROUP [Plate C-1]	LAND USE	RI NUMBER [Plate E-6.1]	PERVIOUS AREA INFILTRATION RATE (in/hr) [Plate E-6.2]	DECIMAL PERCENT OF AREA IMPERVIOUS [Plate E-6.3]	ADJUSTED INFILTRATION RATE (in/hr)	AREA	AREA WEIGHTED AVERAGE	MAX AVERAGE ADJUSTED INFILTRATION RATE (in/hr)	LOW LOSS CONDITION	LOW LOSS RATE PER RCFC/2322	MIN AVERAGE ADJUSTED INFILTRATION RATE
A	PAVING/HARDSCAPE	32	0.74	100%	0.07	1.04	0.013	0.0009	DEVELOPED	0.1000	0.0013
A	MF - CONDIMINIUMS	32	0.74	65%	0.31	4.03	0.050	0.0153	DEVELOPED	0.3800	0.0189
B	PAVING/HARDSCAPE	56	0.51	100%	0.05	9.42	0.116	0.0059	DEVELOPED	0.1000	0.0116
B	MF - CONDIMINIUMS	56	0.51	65%	0.21	66.65	0.821	0.1739	DEVELOPED	0.3800	0.3121
					SUM	81.14	SUM	0.1960			0.3439

VARIABLE LOSS RATE CURVE (24-HOUR STORM ONLY)

Fm= 0.097987833

C= 0.00181

$F_t=C(24-(T/60))^{1.55}+F_m$ = 0.00181 (24-(T/60))^1.55 + 0.10 in/hr

CONSTANT LOSS RATE (3 & 6 HOUR STORMS) = **0.1960**

LOW LOSS RATE = **0.8500**

Where:

T=Time in minutes. To get an average value for each unit time period, Use T=1/2 the unit time for the first time period, T=1 1/2 unit time for the second period, etc.

NOTE: Low loss rates established per RCFC/2322 (Dated: May-30-95)
For 10 Year Storms or Less
Undeveloped Condition: Low Loss = 90%
Developed Condition: Low Loss = 0.9 - (0.8 * %impervious)
Basin Site: Low Loss = 10%
For 100 Year Storm - Low Loss should be between 80% & 90% of the Rainfall Rate

RCFC & WCD
HYDROLOGY
MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

1-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE 12/10/25

DRAINAGE AREA-ACRES	81.14
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	5.30
UNIT TIME-PERCENT OF LAG	94.3
TOTAL ADJUSTED STORM RAIN-INCHES	1.30
CONSTANT LOSS RATE-in/hr	0.20
LOW LOSS RATE - PERCENT	85.00%

Basin Percolation Rate	0.9 in/hr	
Maxwell Drywells		
Number	0	
Drywell Percolation Rate	0.00 cfs	0.00 cfm

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Volume In	Basin Volume	Basin Losses			Total In Basin		Basin WSEL
	Minutes	Hours	(Plate E-5.9)		Max	Low	in/hr	cfs	cu-ft	cu-ft	Percolation Area sf	Maximum Percolation cu-ft	Percolation Out cu-ft	cu-ft	ac-ft	ft
1	5	0.08	3.6	0.56	0.20	0.48	0.37	29.91	8,974	8,974	61,606	368	368	8,606	0.20	434.14
2	10	0.17	4.2	0.66	0.20	0.56	0.46	37.57	11,272	19,878	62,862	375	375	19,503	0.45	434.31
3	15	0.25	4.4	0.69	0.20	0.58	0.49	40.12	12,037	31,540	64,202	383	383	31,157	0.72	434.50
4	20	0.33	4.6	0.72	0.20	0.61	0.52	42.68	12,803	43,960	65,533	391	391	43,568	1.00	434.68
5	25	0.42	5.0	0.78	0.20	0.66	0.58	47.78	14,335	57,903	67,028	400	400	57,503	1.32	434.89
6	30	0.50	5.6	0.87	0.20	0.74	0.68	55.44	16,632	74,135	68,768	411	411	73,724	1.69	435.13
7	35	0.58	6.4	1.00	0.20	0.85	0.80	65.65	19,695	93,420	70,836	423	423	92,997	2.13	435.41
8	40	0.67	8.1	1.26	0.20	1.07	1.07	87.35	26,205	119,202	73,419	438	438	118,763	2.73	435.76
9	45	0.75	13.1	2.04	0.20	1.74	1.85	151.17	45,350	164,113	77,832	465	465	163,648	3.76	436.36
10	50	0.83	34.5	5.38	0.20	4.57	5.19	**424.30**	**127,291**	290,939	89,201	533	533	290,406	6.67	437.88
11	55	0.92	6.7	1.05	0.20	0.89	0.85	69.48	20,844	311,250	90,916	543	543	310,707	7.13	438.10
12	60	1.00	3.8	0.59	0.20	0.50	0.40	32.47	9,740	320,447	91,693	548	548	**319,900**	**7.34**	**438.20**

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

EFFECTIVE RAIN	1.10 in
FLOOD VOLUME	7.47 acft
FLOOD VOLUME	325,179 cu-ft
REQUIRED STORAGE	7.34
REQUIRED STORAGE	319,900 cu-ft
MAX WSEL	438.20 ft
PEAK FLOW RATE	424.30 cfs
TOTAL BASIN LOSSES	5,279 cu-ft
AVERAGE PERCOLATION RATE	87.98 cf/min

RCFC & WCD
HYDROLOGY MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

3-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE

DRAINAGE AREA-ACRES	81.14
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	5.30
UNIT TIME-PERCENT OF LAG	94.3
TOTAL ADJUSTED STORM RAIN (in)	2.08
CONSTANT LOSS RATE (in/hr)	0.20
LOW LOSS RATE - PERCENT	85.00%

Basin Percolation Rate	0.9 in/hr	
Maxwell Drywells		
Number	0	
Drywell Percolation Rate	0.00 cfs	0.00 cfm

Unit Time Period	Time		Pattern	Storm	Loss Rate		Effective	Flood	Volume	Basin	Basin Losses			Total In Basin		Basin
	Minutes	Hours	Percent	Rain	in/hr		Rain	Hydrograph	In	Volume	Percolation	Maximum	Percolation			WSEL
				in/hr				Flow			Area	Percolation	Out			
			(Plate E-5.9)		Max	Low	in/hr	cfs	cu-ft	cu-ft	sf	cu-ft	cu-ft	cu-ft	ac-ft	ft
1	5	0.08	1.3	0.32	0.20	0.28	0.13	10.51	3,154	3,154	60,936	364	364	2,790	0.06	434.04
2	10	0.17	1.3	0.32	0.20	0.28	0.13	10.51	3,154	5,944	61,257	366	366	5,578	0.13	434.09
3	15	0.25	1.1	0.27	0.20	0.23	0.08	6.43	1,929	7,507	61,437	367	367	7,140	0.16	434.11
4	20	0.33	1.5	0.37	0.20	0.32	0.18	14.60	4,379	11,520	61,899	370	370	11,150	0.26	434.18
5	25	0.42	1.5	0.37	0.20	0.32	0.18	14.60	4,379	15,530	62,361	372	372	15,157	0.35	434.24
6	30	0.50	1.8	0.45	0.20	0.38	0.25	20.72	6,217	21,374	63,034	376	376	20,998	0.48	434.34
7	35	0.58	1.5	0.37	0.20	0.32	0.18	14.60	4,379	25,377	63,495	379	379	24,998	0.57	434.40
8	40	0.67	1.8	0.45	0.20	0.38	0.25	20.72	6,217	31,216	64,167	383	383	30,832	0.71	434.49
9	45	0.75	1.8	0.45	0.20	0.38	0.25	20.72	6,217	37,050	64,792	387	387	36,663	0.84	434.58
10	50	0.83	1.5	0.37	0.20	0.32	0.18	14.60	4,379	41,042	65,220	390	390	40,653	0.93	434.64
11	55	0.92	1.6	0.40	0.20	0.34	0.20	16.64	4,992	45,645	65,714	392	392	45,252	1.04	434.71
12	60	1.00	1.8	0.45	0.20	0.38	0.25	20.72	6,217	51,470	66,338	396	396	51,073	1.17	434.79
13	65	1.08	2.2	0.55	0.20	0.47	0.35	28.89	8,668	59,741	67,225	401	401	59,340	1.36	434.92
14	70	1.17	2.2	0.55	0.20	0.47	0.35	28.89	8,668	68,008	68,111	407	407	67,601	1.55	435.04
15	75	1.25	2.2	0.55	0.20	0.47	0.35	28.89	8,668	76,269	68,997	412	412	75,857	1.74	435.16
16	80	1.33	2.0	0.50	0.20	0.42	0.30	24.81	7,443	83,299	69,751	417	417	82,883	1.90	435.26
17	85	1.42	2.6	0.65	0.20	0.55	0.45	37.06	11,118	94,001	70,898	423	423	93,578	2.15	435.42
18	90	1.50	2.7	0.67	0.20	0.57	0.48	39.10	11,731	105,309	72,054	430	430	104,879	2.41	435.58
19	95	1.58	2.4	0.60	0.20	0.51	0.40	32.98	9,893	114,772	72,984	436	436	114,336	2.62	435.71
20	100	1.67	2.7	0.67	0.20	0.57	0.48	39.10	11,731	126,067	74,094	443	443	125,625	2.88	435.86
21	105	1.75	3.3	0.82	0.20	0.70	0.63	51.36	15,407	141,032	75,564	451	451	140,580	3.23	436.05
22	110	1.83	3.1	0.77	0.20	0.66	0.58	47.27	14,182	154,762	76,913	459	459	154,303	3.54	436.24
23	115	1.92	2.9	0.72	0.20	0.62	0.53	43.19	12,956	167,259	78,142	467	467	166,792	3.83	436.40
24	120	2.00	3.0	0.75	0.20	0.64	0.55	45.23	13,569	180,361	79,382	474	474	179,887	4.13	436.57

RCFC & WCD
HYDROLOGY MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

3-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE

DRAINAGE AREA-ACRES	81.14
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	5.30
UNIT TIME-PERCENT OF LAG	94.3
TOTAL ADJUSTED STORM RAIN (in)	2.08
CONSTANT LOSS RATE (in/hr)	0.20
LOW LOSS RATE - PERCENT	85.00%

Basin Percolation Rate	0.9 in/hr	
Maxwell Drywells		
Number	0	
Drywell Percolation Rate	0.00 cfs	0.00 cfm

Unit Time Period	Time		Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain in/hr	Flood Hydrograph Flow cfs	Volume In cu-ft	Basin Volume cu-ft	Basin Losses			Total In Basin		Basin WSEL ft
	Minutes	Hours	(Plate E-5.9)		Max	Low					Percolation Area sf	Maximum Percolation cu-ft	Percolation Out cu-ft	cu-ft	ac-ft	
25	125	2.08	3.1	0.77	0.20	0.66	0.58	47.27	14,182	194,069	80,626	482	482	193,588	4.44	436.74
26	130	2.17	4.2	1.05	0.20	0.89	0.85	69.74	20,921	214,508	82,481	493	493	214,016	4.91	436.98
27	135	2.25	5.0	1.25	0.20	1.06	1.05	86.07	25,822	239,838	84,781	506	506	239,331	5.49	437.29
28	140	2.33	3.5	0.87	0.20	0.74	0.68	55.44	16,632	255,963	86,244	515	515	255,448	5.86	437.49
29	145	2.42	6.8	1.70	0.20	1.44	1.50	122.83	36,849	292,298	89,316	533	533	291,764	6.70	437.89
30	150	2.50	7.3	1.82	0.20	1.55	1.63	133.04	39,913	331,677	92,641	553	553	331,124	7.60	438.33
31	155	2.58	8.2	2.05	0.20	1.74	1.85	**151.42**	**45,426**	376,550	96,266	575	575	375,975	8.63	438.80
32	160	2.67	5.9	1.47	0.20	1.25	1.28	104.45	31,336	407,311	98,695	589	589	406,722	9.34	439.11
33	165	2.75	2.0	0.50	0.20	0.42	0.30	24.81	7,443	414,164	99,236	593	593	413,571	9.49	439.18
34	170	2.83	1.8	0.45	0.20	0.38	0.25	20.72	6,217	419,789	99,680	595	595	419,194	9.62	439.24
35	175	2.92	1.8	0.45	0.20	0.38	0.25	20.72	6,217	425,411	100,124	598	598	**424,813**	**9.75**	**439.30**
36	180	3.00	0.6	0.15	0.20	0.13	0.02	1.84	551	425,364	100,121	598	598	424,766	9.75	439.30

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

EFFECTIVE RAIN	1.50 in
FLOOD VOLUME	10.13 acft
FLOOD VOLUME	441,160 cu-ft
REQUIRED STORAGE	9.75 acft
REQUIRED STORAGE	424,813 cu-ft
MAX WSEL	439.30 ft
PEAK FLOW RATE	151.42 cfs
TOTAL BASIN LOSSES	16,394 cu-ft
AVERAGE PERCOLATION RATE	91.08 cf/min

RCFC & WCD
HYDROLOGY MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

6-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE 12/10/25

DRAINAGE AREA-ACRES	81.14
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	5.30
UNIT TIME-PERCENT OF LAG	94.3
TOTAL ADJUSTED STORM RAIN (in)	2.75
CONSTANT LOSS RATE (in/hr)	0.20
LOW LOSS RATE - PERCENT	85.00%

Basin Percolation Rate	0.9 in/hr	
Maxwell Drywells		
Number	0	
Drywell Percolation Rate	0.00 cfs	0.00 cfm

Unit Time Period	Time		Pattern	Storm Rain	Loss Rate in/hr		Effective Rain	Flood Hydrograph	Volume In	Basin Volume	Basin Losses			Total In Basin		Basin WSEL
	Minutes	Hours	Percent	in/hr	Max	Low	in/hr	Flow cfs	cu-ft	cu-ft	Percolation Area sf	Maximum Percolation cu-ft	Percolation Out cu-ft	cu-ft	ac-ft	ft
			(Plate E-5.9)													
1	5	0.08	0.5	0.17	0.20	0.14	0.02	2.02	607	607	60,643	362	362	245	0.01	434.00
2	10	0.17	0.6	0.20	0.20	0.17	0.00	0.17	50	295	60,607	362	295	0	0.00	434.00
3	15	0.25	0.6	0.20	0.20	0.17	0.00	0.17	50	50	60,579	362	50	0	0.00	434.00
4	20	0.33	0.6	0.20	0.20	0.17	0.00	0.17	50	50	60,579	362	50	0	0.00	434.00
5	25	0.42	0.6	0.20	0.20	0.17	0.00	0.17	50	50	60,579	362	50	0	0.00	434.00
6	30	0.50	0.7	0.23	0.20	0.20	0.04	2.87	860	860	60,672	362	362	497	0.01	434.01
7	35	0.58	0.7	0.23	0.20	0.20	0.04	2.87	860	1,357	60,729	363	363	994	0.02	434.02
8	40	0.67	0.7	0.23	0.20	0.20	0.04	2.87	860	1,854	60,786	363	363	1,491	0.03	434.02
9	45	0.75	0.7	0.23	0.20	0.20	0.04	2.87	860	2,351	60,844	363	363	1,987	0.05	434.03
10	50	0.83	0.7	0.23	0.20	0.20	0.04	2.87	860	2,847	60,901	364	364	2,483	0.06	434.04
11	55	0.92	0.7	0.23	0.20	0.20	0.04	2.87	860	3,343	60,958	364	364	2,979	0.07	434.05
12	60	1.00	0.8	0.26	0.20	0.22	0.07	5.57	1,670	4,648	61,108	365	365	4,284	0.10	434.07
13	65	1.08	0.8	0.26	0.20	0.22	0.07	5.57	1,670	5,953	61,258	366	366	5,587	0.13	434.09
14	70	1.17	0.8	0.26	0.20	0.22	0.07	5.57	1,670	7,257	61,409	367	367	6,890	0.16	434.11
15	75	1.25	0.8	0.26	0.20	0.22	0.07	5.57	1,670	8,560	61,559	368	368	8,192	0.19	434.13
16	80	1.33	0.8	0.26	0.20	0.22	0.07	5.57	1,670	9,862	61,708	369	369	9,493	0.22	434.15
17	85	1.42	0.8	0.26	0.20	0.22	0.07	5.57	1,670	11,163	61,858	369	369	10,794	0.25	434.17
18	90	1.50	0.8	0.26	0.20	0.22	0.07	5.57	1,670	12,463	62,008	370	370	12,093	0.28	434.19
19	95	1.58	0.8	0.26	0.20	0.22	0.07	5.57	1,670	13,763	62,158	371	371	13,391	0.31	434.21
20	100	1.67	0.8	0.26	0.20	0.22	0.07	5.57	1,670	15,061	62,307	372	372	14,689	0.34	434.24
21	105	1.75	0.8	0.26	0.20	0.22	0.07	5.57	1,670	16,359	62,457	373	373	15,986	0.37	434.26
22	110	1.83	0.8	0.26	0.20	0.22	0.07	5.57	1,670	17,655	62,606	374	374	17,281	0.40	434.28
23	115	1.92	0.8	0.26	0.20	0.22	0.07	5.57	1,670	18,951	62,755	375	375	18,576	0.43	434.30
24	120	2.00	0.9	0.30	0.20	0.25	0.10	8.27	2,480	21,056	62,997	376	376	20,680	0.47	434.33
25	125	2.08	0.8	0.26	0.20	0.22	0.07	5.57	1,670	22,349	63,146	377	377	21,972	0.50	434.35
26	130	2.17	0.9	0.30	0.20	0.25	0.10	8.27	2,480	24,452	63,388	379	379	24,073	0.55	434.39
27	135	2.25	0.9	0.30	0.20	0.25	0.10	8.27	2,480	26,553	63,630	380	380	26,173	0.60	434.42
28	140	2.33	0.9	0.30	0.20	0.25	0.10	8.27	2,480	28,652	63,872	381	381	28,271	0.65	434.45
29	145	2.42	0.9	0.30	0.20	0.25	0.10	8.27	2,480	30,751	64,114	383	383	30,368	0.70	434.49
30	150	2.50	0.9	0.30	0.20	0.25	0.10	8.27	2,480	32,847	64,342	384	384	32,463	0.75	434.52
31	155	2.58	0.9	0.30	0.20	0.25	0.10	8.27	2,480	34,943	64,566	386	386	34,557	0.79	434.55
32	160	2.67	0.9	0.30	0.20	0.25	0.10	8.27	2,480	37,037	64,791	387	387	36,650	0.84	434.58
33	165	2.75	1.0	0.33	0.20	0.28	0.13	10.97	3,290	39,939	65,102	389	389	39,551	0.91	434.62
34	170	2.83	1.0	0.33	0.20	0.28	0.13	10.97	3,290	42,840	65,413	391	391	42,450	0.97	434.67
35	175	2.92	1.0	0.33	0.20	0.28	0.13	10.97	3,290	45,739	65,724	393	393	45,347	1.04	434.71

RCFC & WCD
HYDROLOGY
MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

6-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE 12/10/25

DRAINAGE AREA-ACRES	81.14
UNIT TIME-MINUTES	5
LAG TIME - MINUTES	5.30
UNIT TIME-PERCENT OF LAG	94.3
TOTAL ADJUSTED STORM RAIN (in)	2.75
CONSTANT LOSS RATE (in/hr)	0.20
LOW LOSS RATE - PERCENT	85.00%

Basin Percolation Rate	0.9 in/hr	
Maxwell Drywells		
Number	0	
Drywell Percolation Rate	0.00 cfs	0.00 cfm

Unit Time Period	Time		Pattern	Storm Rain	Loss Rate in/hr		Effective Rain	Flood Hydrograph	Volume In	Basin Volume	Basin Losses			Total In Basin		Basin WSEL
	Minutes	Hours	Percent	in/hr	Max	Low	in/hr	Flow cfs	cu-ft	cu-ft	Percolation Area sf	Maximum Percolation cu-ft	Percolation Out cu-ft	cu-ft	ac-ft	ft
			(Plate E-5.9)													
36	180	3.00	1.0	0.33	0.20	0.28	0.13	10.97	3,290	48,636	66,035	394	394	48,242	1.11	434.75
37	185	3.08	1.0	0.33	0.20	0.28	0.13	10.97	3,290	51,532	66,345	396	396	51,135	1.17	434.79
38	190	3.17	1.1	0.36	0.20	0.31	0.17	13.67	4,100	55,235	66,742	399	399	54,836	1.26	434.85
39	195	3.25	1.1	0.36	0.20	0.31	0.17	13.67	4,100	58,936	67,139	401	401	58,535	1.34	434.90
40	200	3.33	1.1	0.36	0.20	0.31	0.17	13.67	4,100	62,635	67,535	403	403	62,231	1.43	434.96
41	205	3.42	1.2	0.40	0.20	0.34	0.20	16.37	4,910	67,141	68,018	406	406	66,735	1.53	435.02
42	210	3.50	1.3	0.43	0.20	0.36	0.23	19.07	5,720	72,454	68,588	410	410	72,045	1.65	435.10
43	215	3.58	1.4	0.46	0.20	0.39	0.27	21.77	6,530	78,574	69,244	414	414	78,161	1.79	435.19
44	220	3.67	1.4	0.46	0.20	0.39	0.27	21.77	6,530	84,690	69,900	417	417	84,273	1.93	435.28
45	225	3.75	1.5	0.50	0.20	0.42	0.30	24.47	7,340	91,612	70,642	422	422	91,190	2.09	435.39
46	230	3.83	1.5	0.50	0.20	0.42	0.30	24.47	7,340	98,530	71,384	426	426	98,103	2.25	435.49
47	235	3.92	1.6	0.53	0.20	0.45	0.33	27.17	8,150	106,253	72,146	431	431	105,822	2.43	435.59
48	240	4.00	1.6	0.53	0.20	0.45	0.33	27.17	8,150	113,972	72,905	435	435	113,536	2.61	435.69
49	245	4.08	1.7	0.56	0.20	0.48	0.37	29.87	8,960	122,496	73,743	440	440	122,055	2.80	435.81
50	250	4.17	1.8	0.59	0.20	0.50	0.40	32.56	9,769	131,825	74,659	446	446	131,379	3.02	435.93
51	255	4.25	1.9	0.63	0.20	0.53	0.43	35.26	10,579	141,958	75,655	452	452	141,507	3.25	436.07
52	260	4.33	2.0	0.66	0.20	0.56	0.46	37.96	11,389	152,896	76,730	458	458	152,438	3.50	436.21
53	265	4.42	2.1	0.69	0.20	0.59	0.50	40.66	12,199	164,637	77,884	465	465	164,172	3.77	436.37
54	270	4.50	2.1	0.69	0.20	0.59	0.50	40.66	12,199	176,372	79,020	472	472	175,900	4.04	436.52
55	275	4.58	2.2	0.73	0.20	0.62	0.53	43.36	13,009	188,909	80,158	479	479	188,430	4.33	436.67
56	280	4.67	2.3	0.76	0.20	0.65	0.56	46.06	13,819	202,250	81,369	486	486	201,764	4.63	436.84
57	285	4.75	2.4	0.79	0.20	0.67	0.60	48.76	14,629	216,393	82,652	494	494	215,900	4.96	437.01
58	290	4.83	2.4	0.79	0.20	0.67	0.60	48.76	14,629	230,529	83,936	501	501	230,028	5.28	437.18
59	295	4.92	2.5	0.83	0.20	0.70	0.63	51.46	15,439	245,467	85,292	509	509	244,958	5.62	437.36
60	300	5.00	2.6	0.86	0.20	0.73	0.66	54.16	16,249	261,207	86,691	518	518	260,689	5.98	437.55
61	305	5.08	3.1	1.02	0.20	0.87	0.83	67.66	20,299	280,988	88,361	528	528	280,461	6.44	437.77
62	310	5.17	3.6	1.19	0.20	1.01	0.99	81.16	24,349	304,810	90,372	540	540	304,270	6.99	438.03
63	315	5.25	3.9	1.29	0.20	1.09	1.09	89.26	26,779	331,049	92,588	553	553	330,496	7.59	438.32
64	320	5.33	4.2	1.39	0.20	1.18	1.19	97.36	29,209	359,706	94,936	567	567	359,139	8.24	438.63
65	325	5.42	4.7	1.55	0.20	1.32	1.36	110.86	33,259	392,398	97,517	582	582	391,815	8.99	438.96
66	330	5.50	5.6	1.85	0.20	1.57	1.65	**135.16**	**40,549**	432,364	100,673	601	601	431,763	9.91	439.37
67	335	5.58	1.9	0.63	0.20	0.53	0.43	35.26	10,579	442,342	101,461	606	606	441,736	10.14	439.47
68	340	5.67	0.9	0.30	0.20	0.25	0.10	8.27	2,480	444,216	101,609	607	607	**443,609**	**10.18**	**439.49**
69	345	5.75	0.6	0.20	0.20	0.17	0.00	0.17	50	443,659	101,565	607	607	443,052	10.17	439.49
70	350	5.83	0.5	0.17	0.20	0.14	0.02	2.02	607	443,660	101,565	607	607	443,053	10.17	439.49

RCFC & WCD HYDROLOGY MANUAL	SYNTHETIC UNIT HYDROGRAPH METHOD SHORTCUT METHOD 6-HOUR STORM UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM	PROJECT: COVA Job No.: 2811 BY: saw DATE 12/10/25

DRAINAGE AREA-ACRES	81.14	Basin Percolation Rate	0.9 in/hr
UNIT TIME-MINUTES	5		
LAG TIME - MINUTES	5.30	Maxwell Drywells	
UNIT TIME-PERCENT OF LAG	94.3	Number	0
TOTAL ADJUSTED STORM RAIN (in)	2.75	Drywell Percolation Rate	0.00 cfs 0.00 cfm
CONSTANT LOSS RATE (in/hr)	0.20		
LOW LOSS RATE - PERCENT	85.00%		

Unit Time Period	Time		Pattern	Storm	Loss Rate		Effective	Flood	Volume	Basin	Basin Losses			Total In Basin		Basin
	Minutes	Hours	Percent	Rain	in/hr		Rain	Hydrograph	In	Volume	Percolation	Maximum	Percolation			WSEL
				in/hr	Max	Low		Flow			Area	Percolation	Out			
			(Plate E-5.9)				in/hr	cfs	cu-ft	cu-ft	sf	cu-ft	cu-ft	cu-ft	ac-ft	ft
71	355	5.92	0.3	0.10	0.20	0.08	0.01	1.21	364	443,418	101,546	606	606	442,811	10.17	439.48
72	360	6.00	0.2	0.07	0.20	0.06	0.01	0.81	243	443,054	101,518	606	606	442,448	10.16	439.48

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

EFFECTIVE RAIN	1.60 in
FLOOD VOLUME	10.85 acft
FLOOD VOLUME	472,562 cu-ft
REQUIRED STORAGE	10.18 acft
REQUIRED STORAGE	443,609 cu-ft
MAX WSEL	439.49 ft
PEAK FLOW RATE	135.16 cfs
TOTAL BASIN LOSSES	30,114 cu-ft
AVERAGE PERCOLATION RATE	83.65 cf/min

RCFC & WCD
HYDROLOGY
MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

24-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE 12/10/25

DRAINAGE AREA-ACRES	81.14	VARIABLE LOSS RATE (AVG) IN/HR		Basin Percolation Rate	0.9 in/hr
UNIT TIME-MINUTES	15	Fm = Minimum value on loss curve (in/hr)	0.10		
LAG TIME - MINUTES	5.30	C	0.00181	Maxwell Drywells	
UNIT TIME-PERCENT OF LAG	283%	Low Loss Rate (percent)	85.00%	Number	0
TOTAL ADJUSTED STORM RAIN (in)	4.38			Drywell Percolation Rate	0.00 cfs 0.00 cfm

Unit Time Period	Time Minutes	Hours	Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Volume In	Basin Volume	Basin Losses			Total In Basin		Basin WSEL
											Percolation Area	Maximum Percolation	Percolation Out			
			(Plate E-5.9)		Max	Low	in/hr	cfs	cu-ft	cu-ft	sf	cu-ft	cu-ft	cu-ft	ac-ft	ft
1	15	0.25	0.2	0.035	0.346	0.030	0.01	0.43	387	387	60,618	1,086	387	0	0.00	434.00
2	30	0.50	0.3	0.053	0.342	0.045	0.01	0.65	581	581	60,640	1,086	581	0	0.00	434.00
3	45	0.75	0.3	0.053	0.338	0.045	0.01	0.65	581	581	60,640	1,086	581	0	0.00	434.00
4	60	1.00	0.4	0.070	0.334	0.060	0.01	0.86	774	774	60,662	1,087	774	0	0.00	434.00
5	75	1.25	0.3	0.053	0.330	0.045	0.01	0.65	581	581	60,640	1,086	581	0	0.00	434.00
6	90	1.50	0.3	0.053	0.326	0.045	0.01	0.65	581	581	60,640	1,086	581	0	0.00	434.00
7	105	1.75	0.3	0.053	0.322	0.045	0.01	0.65	581	581	60,640	1,086	581	0	0.00	434.00
8	120	2.00	0.4	0.070	0.318	0.060	0.01	0.86	774	774	60,662	1,087	774	0	0.00	434.00
9	135	2.25	0.4	0.070	0.315	0.060	0.01	0.86	774	774	60,662	1,087	774	0	0.00	434.00
10	150	2.50	0.4	0.070	0.311	0.060	0.01	0.86	774	774	60,662	1,087	774	0	0.00	434.00
11	165	2.75	0.5	0.088	0.307	0.074	0.01	1.08	968	968	60,684	1,087	968	0	0.00	434.00
12	180	3.00	0.5	0.088	0.303	0.074	0.01	1.08	968	968	60,684	1,087	968	0	0.00	434.00
13	195	3.25	0.5	0.088	0.299	0.074	0.01	1.08	968	968	60,684	1,087	968	0	0.00	434.00
14	210	3.50	0.5	0.088	0.296	0.074	0.01	1.08	968	968	60,684	1,087	968	0	0.00	434.00
15	225	3.75	0.5	0.088	0.292	0.074	0.01	1.08	968	968	60,684	1,087	968	0	0.00	434.00
16	240	4.00	0.6	0.105	0.288	0.089	0.02	1.29	1,161	1,161	60,707	1,088	1,088	73	0.00	434.00
17	255	4.25	0.6	0.105	0.285	0.089	0.02	1.29	1,161	1,234	60,715	1,088	1,088	147	0.00	434.00
18	270	4.50	0.7	0.123	0.281	0.104	0.02	1.51	1,355	1,501	60,746	1,088	1,088	413	0.01	434.01
19	285	4.75	0.7	0.123	0.277	0.104	0.02	1.51	1,355	1,767	60,777	1,089	1,089	679	0.02	434.01
20	300	5.00	0.8	0.140	0.274	0.119	0.02	1.72	1,548	2,227	60,829	1,090	1,090	1,137	0.03	434.02
21	315	5.25	0.6	0.105	0.270	0.089	0.02	1.29	1,161	2,298	60,838	1,090	1,090	1,208	0.03	434.02
22	330	5.50	0.7	0.123	0.267	0.104	0.02	1.51	1,355	2,562	60,868	1,091	1,091	1,472	0.03	434.02
23	345	5.75	0.8	0.140	0.263	0.119	0.02	1.72	1,548	3,020	60,921	1,091	1,091	1,929	0.04	434.03
24	360	6.00	0.8	0.140	0.260	0.119	0.02	1.72	1,548	3,477	60,973	1,092	1,092	2,384	0.05	434.04
25	375	6.25	0.9	0.158	0.256	0.134	0.02	1.94	1,742	4,126	61,048	1,094	1,094	3,032	0.07	434.05
26	390	6.50	0.9	0.158	0.253	0.134	0.02	1.94	1,742	4,774	61,123	1,095	1,095	3,679	0.08	434.06
27	405	6.75	1.0	0.175	0.250	0.149	0.03	2.15	1,935	5,614	61,219	1,097	1,097	4,517	0.10	434.07
28	420	7.00	1.0	0.175	0.246	0.149	0.03	2.15	1,935	6,452	61,316	1,099	1,099	5,353	0.12	434.09
29	435	7.25	1.0	0.175	0.243	0.149	0.03	2.15	1,935	7,288	61,412	1,100	1,100	6,188	0.14	434.10
30	450	7.50	1.1	0.193	0.240	0.164	0.03	2.37	2,129	8,317	61,531	1,102	1,102	7,214	0.17	434.12
31	465	7.75	1.2	0.210	0.236	0.179	0.03	2.58	2,322	9,537	61,671	1,105	1,105	8,432	0.19	434.14
32	480	8.00	1.3	0.228	0.233	0.194	0.03	2.80	2,516	10,947	61,833	1,108	1,108	9,839	0.23	434.16
33	495	8.25	1.5	0.263	0.230	0.223	0.03	2.70	2,432	12,271	61,986	1,111	1,111	11,160	0.26	434.18
34	510	8.50	1.5	0.263	0.227	0.223	0.04	2.96	2,667	13,828	62,165	1,114	1,114	12,714	0.29	434.20
35	525	8.75	1.6	0.280	0.223	0.238	0.06	4.66	4,191	16,905	62,519	1,120	1,120	15,785	0.36	434.25
36	540	9.00	1.7	0.298	0.220	0.253	0.08	6.35	5,713	21,498	63,048	1,130	1,130	20,368	0.47	434.33
37	555	9.25	1.9	0.333	0.217	0.283	0.12	9.47	8,523	28,891	63,900	1,145	1,145	27,746	0.64	434.44
38	570	9.50	2.0	0.350	0.214	0.298	0.14	11.16	10,040	37,787	64,871	1,162	1,162	36,624	0.84	434.58
39	585	9.75	2.1	0.368	0.211	0.313	0.16	12.84	11,556	48,180	65,986	1,182	1,182	46,998	1.08	434.73
40	600	10.00	2.2	0.385	0.208	0.328	0.18	14.52	13,069	60,067	67,260	1,205	1,205	58,862	1.35	434.91
41	615	10.25	1.5	0.263	0.205	0.223	0.06	4.73	4,260	63,122	67,588	1,211	1,211	61,911	1.42	434.95
42	630	10.50	1.5	0.263	0.202	0.223	0.06	4.98	4,478	66,389	67,938	1,217	1,217	65,172	1.50	435.00
43	645	10.75	2.0	0.350	0.199	0.298	0.15	12.38	11,146	76,318	69,002	1,236	1,236	75,081	1.72	435.15

RCFC & WCD
HYDROLOGY MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

24-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE 12/10/25

DRAINAGE AREA-ACRES	81.14	VARIABLE LOSS RATE (AVG) IN/HR		Basin Percolation Rate	0.9 in/hr
UNIT TIME-MINUTES	15	Fm = Minimum value on loss curve (in/hr)	0.10		
LAG TIME - MINUTES	5.30	C	0.00181	Maxwell Drywells	
UNIT TIME-PERCENT OF LAG	283%	Low Loss Rate (percent)	85.00%	Number	0
TOTAL ADJUSTED STORM RAIN (in)	4.38			Drywell Percolation Rate	0.00 cfs 0.00 cfm

Unit Time Period	Time Minutes	Hours	Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Volume In	Basin Volume	Basin Losses			Total In Basin		Basin WSEL
											Percolation Area	Maximum Percolation	Percolation Out			
			(Plate E-5.9)		Max	Low	in/hr	cfs	cu-ft	cu-ft	sf	cu-ft	cu-ft	cu-ft	ac-ft	ft
44	660	11.00	2.0	0.350	0.196	0.298	0.15	12.62	11,360	86,441	70,088	1,256	1,256	85,186	1.96	435.30
45	675	11.25	1.9	0.333	0.193	0.283	0.14	11.42	10,282	95,468	71,055	1,273	1,273	94,195	2.16	435.43
46	690	11.50	1.9	0.333	0.190	0.283	0.14	11.66	10,492	104,687	71,992	1,290	1,290	103,397	2.37	435.56
47	705	11.75	1.7	0.298	0.188	0.253	0.11	9.02	8,120	111,517	72,664	1,302	1,302	110,215	2.53	435.65
48	720	12.00	1.8	0.315	0.185	0.268	0.13	10.68	9,615	119,830	73,481	1,317	1,317	118,513	2.72	435.76
49	735	12.25	2.5	0.438	0.182	0.372	0.26	20.94	18,849	137,362	75,204	1,347	1,347	136,015	3.12	435.99
50	750	12.50	2.6	0.456	0.179	0.387	0.28	22.60	20,340	156,355	77,070	1,381	1,381	154,974	3.56	436.25
51	765	12.75	2.8	0.491	0.177	0.417	0.31	25.69	23,118	178,092	79,176	1,419	1,419	176,673	4.06	436.53
52	780	13.00	2.9	0.508	0.174	0.432	0.33	27.34	24,604	201,278	81,280	1,456	1,456	199,821	4.59	436.81
53	795	13.25	3.4	0.596	0.171	0.506	0.42	34.72	31,248	231,070	83,985	1,505	1,505	229,565	5.27	437.17
54	810	13.50	3.4	0.596	0.169	0.506	0.43	**34.93**	**31,439**	261,004	86,674	1,553	1,553	259,452	5.96	437.53
55	825	13.75	2.3	0.403	0.166	0.343	0.24	19.37	17,437	276,889	88,015	1,577	1,577	275,312	6.32	437.71
56	840	14.00	2.3	0.403	0.164	0.343	0.24	19.58	17,623	292,935	89,370	1,601	1,601	291,334	6.69	437.89
57	855	14.25	2.7	0.473	0.161	0.402	0.31	25.52	22,968	314,302	91,174	1,634	1,634	312,668	7.18	438.12
58	870	14.50	2.6	0.456	0.159	0.387	0.30	24.29	21,859	334,527	92,881	1,664	1,664	332,863	7.64	438.35
59	885	14.75	2.6	0.456	0.156	0.387	0.30	24.49	22,037	354,900	94,556	1,694	1,694	353,206	8.11	438.57
60	900	15.00	2.5	0.438	0.154	0.372	0.28	23.25	20,923	374,129	96,075	1,721	1,721	372,408	8.55	438.76
61	915	15.25	2.4	0.420	0.151	0.357	0.27	22.01	19,806	392,214	97,503	1,747	1,747	390,467	8.96	438.95
62	930	15.50	2.3	0.403	0.149	0.343	0.25	20.76	18,687	409,154	98,841	1,771	1,771	407,383	9.35	439.12
63	945	15.75	1.9	0.333	0.147	0.283	0.19	15.22	13,695	421,078	99,782	1,788	1,788	419,290	9.63	439.24
64	960	16.00	1.9	0.333	0.145	0.283	0.19	15.40	13,860	433,150	100,735	1,805	1,805	**431,345**	**9.90**	**439.37**
65	975	16.25	0.4	0.070	0.142	0.060	0.01	0.86	774	432,119	100,654	1,803	1,803	430,316	9.88	439.36
66	990	16.50	0.4	0.070	0.140	0.060	0.01	0.86	774	431,090	100,573	1,802	1,802	429,288	9.86	439.35
67	1005	16.75	0.3	0.053	0.138	0.045	0.01	0.65	581	429,869	100,476	1,800	1,800	428,068	9.83	439.33
68	1020	17.00	0.3	0.053	0.136	0.045	0.01	0.65	581	428,649	100,380	1,798	1,798	426,850	9.80	439.32
69	1035	17.25	0.5	0.088	0.134	0.074	0.01	1.08	968	427,818	100,314	1,797	1,797	426,021	9.78	439.31
70	1050	17.50	0.5	0.088	0.132	0.074	0.01	1.08	968	426,988	100,249	1,796	1,796	425,192	9.76	439.30
71	1065	17.75	0.5	0.088	0.130	0.074	0.01	1.08	968	426,160	100,183	1,795	1,795	424,365	9.74	439.30
72	1080	18.00	0.4	0.070	0.128	0.060	0.01	0.86	774	425,139	100,103	1,794	1,794	423,345	9.72	439.28
73	1095	18.25	0.4	0.070	0.126	0.060	0.01	0.86	774	424,119	100,022	1,792	1,792	422,327	9.70	439.27
74	1110	18.50	0.4	0.070	0.124	0.060	0.01	0.86	774	423,101	99,942	1,791	1,791	421,311	9.67	439.26
75	1125	18.75	0.3	0.053	0.123	0.045	0.01	0.65	581	421,891	99,846	1,789	1,789	420,102	9.64	439.25
76	1140	19.00	0.2	0.035	0.121	0.030	0.01	0.43	387	420,489	99,736	1,787	1,787	418,702	9.61	439.24
77	1155	19.25	0.3	0.053	0.119	0.045	0.01	0.65	581	419,283	99,640	1,785	1,785	417,498	9.58	439.23
78	1170	19.50	0.4	0.070	0.117	0.060	0.01	0.86	774	418,272	99,561	1,784	1,784	416,488	9.56	439.21
79	1185	19.75	0.3	0.053	0.116	0.045	0.01	0.65	581	417,069	99,466	1,782	1,782	415,286	9.53	439.20
80	1200	20.00	0.2	0.035	0.114	0.030	0.01	0.43	387	415,673	99,355	1,780	1,780	413,893	9.50	439.19
81	1215	20.25	0.3	0.053	0.113	0.045	0.01	0.65	581	414,474	99,261	1,778	1,778	412,695	9.47	439.18
82	1230	20.50	0.3	0.053	0.111	0.045	0.01	0.65	581	413,276	99,166	1,777	1,777	411,499	9.45	439.16
83	1245	20.75	0.3	0.053	0.110	0.045	0.01	0.65	581	412,080	99,072	1,775	1,775	410,305	9.42	439.15
84	1260	21.00	0.2	0.035	0.109	0.030	0.01	0.43	387	410,692	98,962	1,773	1,773	408,919	9.39	439.14
85	1275	21.25	0.3	0.053	0.107	0.045	0.01	0.65	581	409,499	98,868	1,771	1,771	407,728	9.36	439.13
86	1290	21.50	0.2	0.035	0.106	0.030	0.01	0.43	387	408,115	98,758	1,769	1,769	406,346	9.33	439.11

RCFC & WCD
HYDROLOGY MANUAL

SYNTHETIC UNIT HYDROGRAPH METHOD

SHORTCUT METHOD

24-HOUR STORM

UNIT HYDROGRAPH and EFFECTIVE RAIN CALCULATION FORM

PROJECT: COVA
Job No.: 2811
BY: saw DATE 12/10/25

DRAINAGE AREA-ACRES	81.14	VARIABLE LOSS RATE (AVG) IN/HR		Basin Percolation Rate	0.9 in/hr
UNIT TIME-MINUTES	15	Fm = Minimum value on loss curve (in/hr)	0.10		
LAG TIME - MINUTES	5.30	C	0.00181	Maxwell Drywells	
UNIT TIME-PERCENT OF LAG	283%	Low Loss Rate (percent)	85.00%	Number	0
TOTAL ADJUSTED STORM RAIN (in)	4.38			Drywell Percolation Rate	0.00 cfs 0.00 cfm

Unit Time Period	Time Minutes	Hours	Pattern Percent	Storm Rain in/hr	Loss Rate in/hr		Effective Rain	Flood Hydrograph Flow	Volume In	Basin Volume	Basin Losses			Total In Basin		Basin WSEL
					Max	Low					Percolation Area	Maximum Percolation	Percolation Out			
			(Plate E-5.9)				in/hr	cfs	cu-ft	cu-ft	sf	cu-ft	cu-ft	cu-ft	ac-ft	ft
87	1305	21.75	0.3	0.053	0.105	0.045	0.01	0.65	581	406,926	98,665	1,768	1,768	405,158	9.30	439.10
88	1320	22.00	0.2	0.035	0.104	0.030	0.01	0.43	387	405,545	98,556	1,766	1,766	403,780	9.27	439.08
89	1335	22.25	0.3	0.053	0.103	0.045	0.01	0.65	581	404,360	98,462	1,764	1,764	402,596	9.24	439.07
90	1350	22.50	0.2	0.035	0.102	0.030	0.01	0.43	387	402,983	98,353	1,762	1,762	401,221	9.21	439.06
91	1365	22.75	0.2	0.035	0.101	0.030	0.01	0.43	387	401,608	98,245	1,760	1,760	399,848	9.18	439.04
92	1380	23.00	0.2	0.035	0.100	0.030	0.01	0.43	387	400,235	98,136	1,758	1,758	398,476	9.15	439.03
93	1395	23.25	0.2	0.035	0.099	0.030	0.01	0.43	387	398,863	98,028	1,756	1,756	397,107	9.12	439.02
94	1410	23.50	0.2	0.035	0.099	0.030	0.01	0.43	387	397,494	97,920	1,754	1,754	395,740	9.08	439.00
95	1425	23.75	0.2	0.035	0.098	0.030	0.01	0.43	387	396,127	97,812	1,752	1,752	394,374	9.05	438.99
96	1440	24.00	0.2	0.035	0.098	0.030	0.01	0.43	387	394,761	97,704	1,751	1,751	393,011	9.02	438.97

EFFECTIVE RAIN & FLOOD VOLUMES SUMMARY

EFFECTIVE RAIN	1.78 in
FLOOD VOLUME	12.05 acft
FLOOD VOLUME	524,686 cu-ft
REQUIRED STORAGE	9.90 acft
REQUIRED STORAGE	431,345 cu-ft
MAX WSEL	439.37 ft
PEAK FLOW RATE	34.93 cfs
TOTAL BASIN LOSSES	131,675 cu-ft
AVERAGE PERCOLATION RATE	91.44 cf/min

BASIN VOLUME WORKSHEET

PROECT COVA
JOB No. 2811
BASIN DESIGNATION: Retention Basin

BASIN CHARACTERISTICS

CONTOUR ELEVATION	DEPTH		AREA		VOLUME		
	INCR (ft)	TOTAL (ft)	INCR (sf)	TOTAL (sf)	INCR (cuft)	TOTAL (cuft)	(acre-ft)
434	0	0		60,573	0	0	0.00
434.5	0.5	0.5	3,590	64,163	31,180	31,180	0.72
435.5	1	1.5	7,265	71,428	67,763	98,943	2.27
436.5	1	2.5	7,379	78,807	75,087	174,030	4.00
437.5	1	3.5	7,491	86,298	82,524	256,554	5.89
438.5	1	4.5	7,605	93,903	90,074	346,628	7.96
439.5	1	5.5	7,718	101,621	97,737	444,365	10.20

WHERE:

$$V = \frac{1}{3}(E_1 - E_2)\left(A_1 + A_2 + \sqrt{A_1 A_2}\right)$$

Appendix G

Riverside County Whitewater River Region WQMP Worksheets

Whitewater Watershed

BMP Design Volume, V_{BMP} & Design Flow Rate, Q_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	MSA Consulting, Inc	Date	December 10, 2025
Designed By	SAW	County/City Case No.	
Company Project Number/Name	COVA - MSA Job No. 2811		
Drainage Area Number/Name	Site		

Enter the Area Tributary to this Feature (A_{TRIB}) — A_{TRIB} = 81.140 acres

Determine the Impervious Area Ratio

Determine the Impervious Area Within A_{TRIB} (A_{IMP}) — A_{IMP} = 56.410 acres

Calculate the Impervious Area Ratio (I_F)

$I_F = A_{IMP}/A_{TRIB}$ — I_F = 0.70

Calculate the Composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ — C_{BMP} = 0.49

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ — V_U = 0.20 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12(in/ft)}$$

V_{BMP} = 57,660 ft^3

BMP Design Flow Rate, Q_{BMP}

$Q_{BMP} = C_{BMP} \times I \times A_{TRIB}$ — Q_{BMP} = 7.94 ft^3/s

I = Design Rainfall Intensity, 0.2 in/hr

Notes:

Appendix H
Existing Conditions Exhibit

AVENUE 52

CALHOUN STREET

VAN BUREN STREET

CITY OF COACHELLA
COUNTY OF RIVERSIDE

778-350-005
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

778-350-009
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

778-350-002
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

778-350-004
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

778-350-006
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

778-350-008
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

780-040-002
EX. ZONING:
LIGHT AGRICULTURE (A-1-20)
EX. GENERAL PLAN:
RURAL COMMUNITY - ESTATE DENSITY RESIDENTIAL

780-060-004
EX. ZONING:
LIGHT AGRICULTURE (A-1-20)
EX. GENERAL PLAN:
AGRICULTURE

780-060-003
EX. ZONING:
LIGHT AGRICULTURE (A-1-20)
EX. GENERAL PLAN:
AGRICULTURE

PROJECT NAME:	COVA
MAP NUMBER:	TENTATIVE TRACT MAP NO. 39330
PLAN:	EXISTING CONDITIONS EXHIBIT
EXHIBIT DATE:	DECEMBER 10, 2025

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CHECK BY	JAD

NORTH

0' 60' 120' 180' 240'
SCALE 1"=60'

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Appendix J
Preliminary SUH Exhibit

AVENUE 52

CALHOUN STREET

VAN BUREN STREET

779-360-008
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

779-360-009
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

779-360-002
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

779-360-004
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

779-360-006
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

779-360-005
EX. ZONING:
REGIONAL COMMERCIAL (R-C)
EX. GENERAL PLAN:
REGIONAL RETAIL DISTRICT

780-040-002
EX. ZONING:
LIGHT AGRICULTURE (A-1-20)
EX. GENERAL PLAN:
RURAL COMMUNITY - ESTATE DENSITY RESIDENTIAL

CITY OF COACHELLA
COUNTY OF RIVERSIDE

780-050-004
EX. ZONING:
LIGHT AGRICULTURE (A-1-20)
EX. GENERAL PLAN:
AGRICULTURE

780-050-003
EX. ZONING:
LIGHT AGRICULTURE (A-1-20)
EX. GENERAL PLAN:
AGRICULTURE

SOIL TYPE B

LAGOON
WSE 440.0
BOT 430.0

SOIL TYPE A

SOIL TYPE B

LAGOON
WSE 440.0
BOT 430.0

SOIL TYPE B

SOIL TYPE B

SITE
A=81.14

LAGOON
WSE 440.0
BOT 430.0

LAGOON
WSE 440.0
BOT 430.0

SOIL TYPE B

LAGOON
WSE 440.0
BOT 430.0

SOIL TYPE B

POND
MAXIMUM WSE 439.5
NORMAL WSE 434.5
BOT 430.0

POND
MAXIMUM WSE 439.5
NORMAL WSE 434.5
BOT 430.0

LAND USE SUMMARY	
LAND USE	TOTAL (ac)
SOIL TYPE A	
PAVING/HARDSCAPE	1.04
CONDOMINIUMS	4.03
SOIL TYPE B	
PAVING/HARDSCAPE	9.42
CONDOMINIUMS	66.65
TOTAL	81.14

STORM EVENT SUMMARY					
DURATION		1-HOUR	3-HOUR	6-HOUR	24-HOUR
EFFECTIVE RAIN	(in)	1.10	1.50	1.60	1.78
FLOOD VOLUME	(cu-ft)	325,179	441,160	472,562	524,686
	(acre-ft)	7.47	10.13	10.85	12.05
REQUIRED STORAGE	(cu-ft)	319,900	424,813	**443,609**	431,345
	(acre-ft)	7.34	9.75	**10.18**	9.90
STORAGE PROVIDED	(cu-ft)		444,365		
	(acre-ft)		10.20		
PEAK FLOW	(cfs)	N/A	151.42	135.16	34.93
MAXIMUM WSE		438.20	439.30	**439.49**	439.37
DEPTH	(ft)	4.20	5.30	**5.49**	5.37

BASIN VOLUME SUMMARY							
CONTOUR ELEVATION	DEPTH INCR (FT)	DEPTH TOTAL (FT)	AREA INCR (SF)	AREA TOTAL (SF)	VOLUME INCR (CUFT)	VOLUME TOTAL (CUFT)	VOLUME TOTAL (AC-FT)
434.0	0	0		60,573	0	0	0
434.5	0.5	0.5	3,590	64,163	31,380	31,380	0.72
435.5	1	1.5	7,265	71,428	67,763	98,943	2.27
436.5	1	2.5	7,379	78,807	75,087	174,030	4.00
437.5	1	3.5	7,491	86,298	82,524	256,554	5.89
438.5	1	4.5	7,605	93,903	90,074	346,628	7.96
439.5	1	5.5	7,718	101,621	97,737	444,365	10.20

LEGEND

- DRAINAGE AREA BOUNDARY
- HARDSCAPE – SOIL TYPE A
- HARDSCAPE – SOIL TYPE B
- CONDOMINIUMS – SOIL TYPE A
- CONDOMINIUMS – SOIL TYPE B
- SITE A=81.14 — DRAINAGE SUB-AREA ID AREA (AC)

NORTH

0' 60' 120' 180' 240'

SCALE 1"=60'

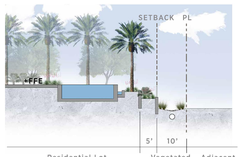
PROJECT NAME:	COVA
MAP NUMBER:	TENTATIVE TRACT MAP NO. 39330
PLAN:	PRELIMINARY SUH EXHIBIT
EXHIBIT DATE:	JUNE 2026

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Appendix K
Preliminary Grading Exhibit



SECTION A-A
SOUTHERN PROPERTY LINE
N.T.S.

ESTIMATED EARTHWORK QUANTITIES

	CUT (CY)	FILL (CY)
RAW QUANTITIES	374,676	231,055
SUBSIDENCE	12,534	13,866
RAW ADJUSTED	362,142	244,921
SHRINKAGE		43,221
OVER EXCAVATION	268,620	268,620
OVER EXCAVATION SHRINKAGE		47,404
SUBTOTAL	630,762	604,166
EXPORT		26,596
TOTAL EARTHWORK	630,762	630,762

EARTHWORK FACTORS:

THE FOLLOWING FACTORS WERE USED IN THE PREPARATION OF THE EARTHWORK ANALYSIS:
SHRINKAGE: 15%
SUBSIDENCE: 0.20'
OVER-EX. : 4'

PROJECT NAME:	COVA
MAP NUMBER:	TENTATIVE TRACT MAP NO. 39330
PLAN:	PRELIMINARY GRADING EXHIBIT
EXHIBIT DATE:	JUNE 2026

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0' 60' 120' 180' 240'
SCALE 1"=60'

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