
PRELIMINARY LID REPORT

for

PALMDALE LOGISTICS PARK

South of West Avenue M,
West of Division Street,
City of Palmdale, CA

Prepared For:

**Covington Development Partners, LLC
3 Corporate Plaza, Suite 230
Newport Beach, CA 92660**

Prepared By:

**Langan Engineering and Environmental Services, Inc.
515 Flower Street, Suite 1060
Los Angeles, CA 90071**



A handwritten signature of Michael Golias in black ink, written over a horizontal line.

**Michael Golias
Professional Engineer License No. 91029**

**Prepared: September 2023
Langan Project No. 722010501**

LANGAN

TABLE OF CONTENTS

1. INTRODUCTION	1
2. PROJECT DESCRIPTION	1
2.1. Existing Site Description	1
2.2. Proposed Site Description.....	1
3. POLLUTANTS OF CONCERN.....	2
4. BEST MANAGEMENT PRACTICES.....	2
4.1. Source Control BMP's	2
4.2. Treatment Control BMP's.....	3
5. MAINTENANCE & INSPECTION.....	4
6. REFERENCES.....	5

FIGURES:

- 1 Site Vicinity Map**
- 2 Proposed Site Plan**
- 3 Post-Development LID Exhibit**

APPENDICES:

- A LA County Hydrology Map – 85th Percentile, 24 hour Storm**
- B LA County Hydrology Map – Soils 2004**
- C Impacts to Jurisdictional Resources**
- D Post-Development 0.75-Inch HydroCalc Calculations**
- E Infiltration Basin Sizing**
- F Source Control BMP Fact Sheets**
- G Maintenance and Inspection Fact Sheets**
- H Infiltration Report**

1. INTRODUCTION

The purpose of this Low Impact Development (LID) report is to show that the proposed project will comply with the water quality requirements of the National Pollution Discharge Elimination System (NPDES) MS4 Permit within Los Angeles County. The proposed project is an industrial park with over 10,000 sf of surface area which qualifies as a Designated Project. Therefore, the project will comply with the Los Angeles County Low Impact Development standards and City of Palmdale regional standards for water quality requirements. This LID report will show the calculation of the SWQDv and demonstrate how it will be 100% retained on-site through infiltration.

2. PROJECT DESCRIPTION

2.1. Existing Site Description

The project site is approximately 71.34 acres and is located in the City of Palmdale, County of Los Angeles, California. The site is bounded to the north by Avenue M, to the east by Division Street, to the west by Amargosa Creek, and to the south by an undeveloped lot. The site is currently undeveloped with open bush, buckwheat, and trees. See Figure 1 for the site vicinity map.

The existing drainage pattern generally drains from south to north and splits into 2 separate drainage areas. The eastern portion of the site drains to the northeast corner of the site and discharges to Avenue M. This runoff flows east along Avenue M and discharges into an existing catch basin at the southwest corner of Sierra Highway and Avenue M. This existing catch basin conveys stormwater east and into an existing M-RR Basin, per the City of Palmdale Master Drainage Plan

The western portion of the site drains to the northwest corner of the site and discharges directly into the Amargosa Creek. The site also accepts stormwater runoff from a ±140-acre undeveloped lot to the south of the site and north of Avenue N.

2.2. Proposed Site Description

The proposed development is two separate industrial sites. The western site is 38.41 acres and will consist of a 716,930 square foot industrial warehouse with auto parking and trailer parking spaces. The eastern site is 32.93 acres and will consist of a 703,140 square foot industrial warehouse with auto parking and trailer parking spaces. Truck docking areas will be located along the north and south of both buildings. The project site will dedicate right-of-way for Avenue M, Division Street, proposed public street A, and proposed public street B. According to the City of Palmdale's zoning map, the project site is designated as General Industrial (M2). See Figure 2 for the proposed site plan.

Off-site roadway improvements are proposed as part of this project development. Half-width improvements are proposed on Avenue M, Division Street and proposed public street A. Full-

width improvements are proposed on public street B and will divide the 2 proposed industrial parcels.

The proposed stormwater system will capture onsite runoff and store it onsite in above ground infiltration basins. The onsite basins will be sized to fully capture the SWQDv in addition to the 50-yr storm event. The offsite runoff captured along the new public streets will gutter flow to the northeast of the site and drain into the proposed catch basin located at the southwest corner of the Division St and Avenue M intersection. This catch basin will discharge into the proposed 36-inch storm drain in Division Street. This stormwater runoff will ultimately discharge to the M-RR Basin shown in the City of Palmdale Master Plan of Drainage for the Anaverde Watershed. However, due to lack of existing storm drain infrastructure, the project currently proposes that the 36-inch storm drain discharges into the existing catch basin directly north of the intersection of Division St and Avenue M as an interim condition until the City builds the proposed master planned storm drain facilities adjacent to the project frontage.

A temporary drainage channel is proposed along the south edge of proposed public street A. This drainage channel will capture offsite runoff from the undeveloped lot to the south and discharge into the proposed 36-inch storm drain in Division Street. The temporary drainage channel will be removed when the southern half of proposed public street A gets developed in the future.

3. POLLUTANTS OF CONCERN

The project site is tributary to the Amargosa Creek. According to the California Regional Water Quality Control Board (CRWQCB), the U.S. Army Corp of Engineers has determined that Amargosa Creek is not defined as a water of the United States because it flows to a closed internal dry lake basin (Rosamond Dry Lake). Therefore, stormwater discharge into the Amargosa Creek would not be subject to regulation under the NPDES program. This is consistent with the California's 2016 Water Quality Integrated Report (Clean Water Act Section 303(d) List) as Rosamond Dry Lake is not listed as impaired. However, the CRWQCB encourages implementation of best management practices (BMPs) for new development in order to protect the waters of the state.

The project site is listed as industrial land use. According to Table 7-3 of the LA County LID Manual, the development of the project site anticipates to generate the following pollutants: suspended solids, phosphorous, nitrogen, kjeldahl nitrogen, copper, lead, and zinc.

Since infiltration basins are proposed to retain the full 50-year storm event, the project will not discharge any pollutant of concerns listed above to the downstream point of discharge. Since Rosamond Dry Lake is not listed as impaired, pollutants discharged into the lake is not of concern.

4. BEST MANAGEMENT PRACTICES

4.1. Source Control BMP's

Source Control BMPs are designed to prevent pollutants from contacting stormwater runoff or prevent discharge of contaminated stormwater runoff to the storm drain system and/or receiving

water. Source Control BMPs should be implemented to the maximum extent practicable to mitigate pollutant mobilization from the project site in stormwater runoff. The following are the source control measures recommended for the project site, per Table 5-1 in the LA County LID Manual.

Storm Drain Message and Signage (S-1) – A painted message “No Dumping – Drains to the River” shall be placed at all storm drain catch basins. The message shall be inspected annually and repainted as necessary.

Outdoor Trash Storage/Waste Handling Areas (S-3) – Proposed trash enclosures are at the north and south sides of each proposed building (4 total). Trash enclosures shall have doors and a solid roof. All dumpsters should have working lids, which shall be closed at all times.

Outdoor Loading/Unloading Dock Area (S-4) – Loading docks are located at the north and south faces of each proposed building. Docking areas are covered with the building roof.

Landscape Irrigation Practices (S-8) – Irrigation system will be designed for the landscaped area specific water need. Irrigation controls shall include rain triggered shutoff devices to prevent irrigation after precipitation.

Refer to Appendix F for fact sheets for each source control measure.

4.2. Treatment Control BMP's

According to the Los Angeles County LID Manual, the stormwater quality design volume (SWQDv) is calculated using the greater of the 85th percentile, 24-hour rain event or 0.75-inches. The 85th percentile, 24-hour rainfall depth for the project is 0.61 inches as shown in the LA County Hydrology Map in Appendix A. Therefore, a rainfall depth of 0.75-inches was used to calculate the SWQDv for this project. The soil type for the project is Soil Type 124 as shown in the LA County Hydrology Map in Appendix B. The SWQDv was calculated using the LA County HydroCalc software. Refer to Appendix D for HydroCalc calculations.

Based on the infiltration report prepared by Southern California Geotechnical, dated August 23, 2022 (See Appendix H), the design infiltration rates at the basins varies between 1.7 to 2.2 inches/hour. Since these infiltration rates are greater than the LA County minimum of 0.3 inches/hour, the project site is feasible for on-site retention-based stormwater quality control measures.

The project proposes 4 aboveground infiltration basins, 2 for each parcel. These basins will be sized to capture the SWQDv and fully-retain the 50-year storm event to meet hydrology requirements. Catch basin inserts will be proposed for pre-treatment in order to capture trash and debris prior to discharging into the infiltration basins. The basins were also sized for a maximum drawdown time of 72 hours, per the LA County LID Manual. Refer to Table 4.2.1 and Table 4.2.2 for the basin sizing results summary and Appendix E for all basin sizing calculations.

Table 4.2.1 Infiltration Basin Analysis Summary - 0.75"							
Drainage Area ID	SWQDv (cf)	Basin Volume Provided (cf)	Basin Bottom Area (sf)	Basin Depth (ft)	Infiltration Rate (in/hr)	Drawdown Time (hours)	Basin Designation
A	37,633	189,429	15,319	6.0	1.7	42.4	Basin A
B	35,009	158,014	12,610	7.0	1.7	49.4	Basin B
C	34,921	169,568	12,547	6.0	1.7	42.4	Basin C
D	34,497	147,289	12,369	8.0	1.7	56.5	Basin D

Table 4.2.2 Infiltration Basin WSE Summary - 0.75"					
Drainage Area ID	Basin Bottom Elevation (ft)	Basin Top Elevation (ft)	SWQDv WSE (ft)	50-Year Storm WSE (ft)	Basin Designation
A	2,527.50	2,533.50	2529.30	2532.70	Basin A
B	2,526.20	2,533.20	2528.60	2533.00	Basin B
C	2,525.40	2,531.40	2528.30	2531.90	Basin C
D	2,522.20	2,530.20	2524.30	2530.10	Basin D

5. MAINTENANCE & INSPECTION

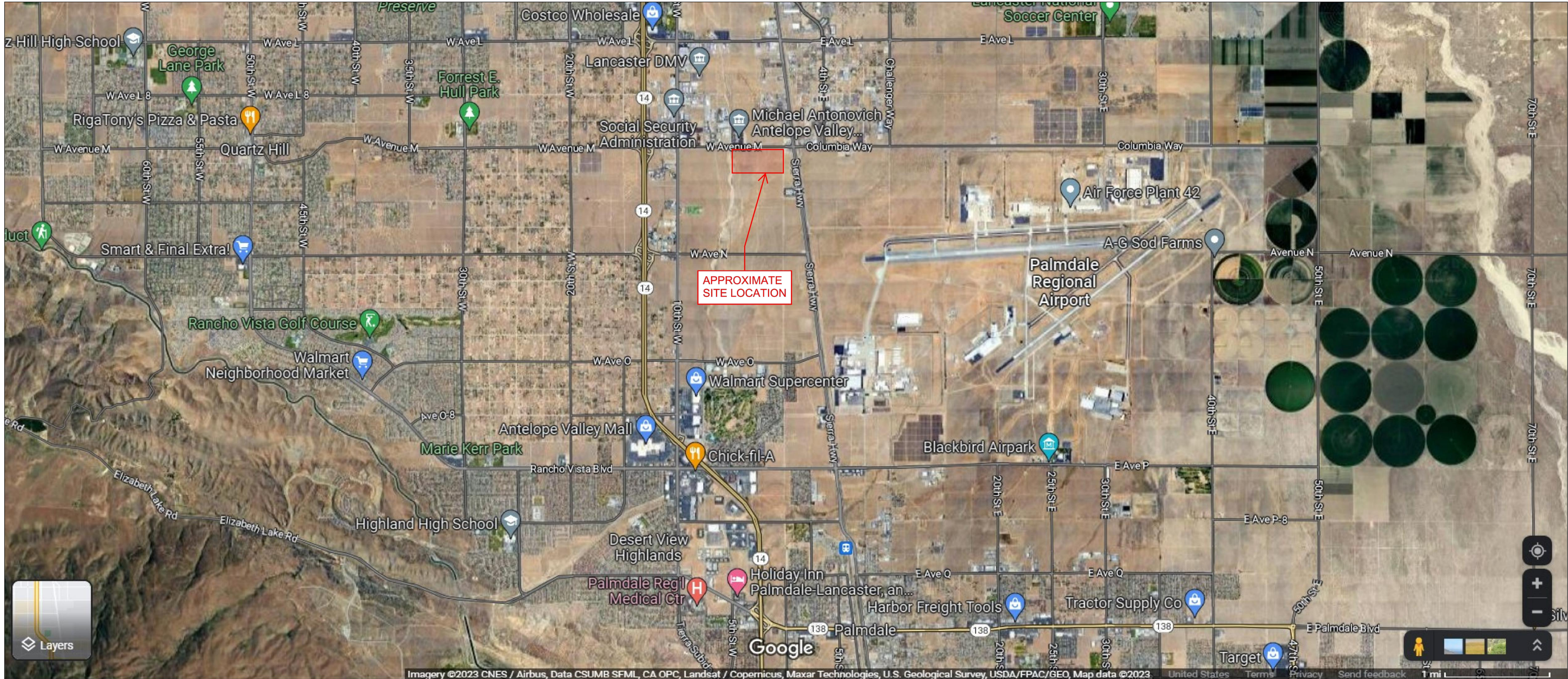
All BMPs included as part of this project are required to be maintained through regular scheduled inspection and maintenance. Table 5.0.1 summarizes the maintenance and minimum frequency required for each BMP. Educational materials and fact sheets for maintenance and inspection activities are shown in Appendix G. The property owner will be the responsible party to maintain each BMP as noted on Table 5.0.1.

Table 5.0.1 BMP Inspection and Maintenance		
BMP	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
Above Ground Infiltration Basin	Observe sediment building up and infiltration capacity. Cleaning of accumulated trash, debris, and sediment as determined by inspections.	Every 3 months and/or after 72 hours following a storm event to verify no standing water
Catch Basin Inserts	Cleaning if accumulated trash and debris.	Every 3 months and/or after a rain event
Storm Drain Message and Signage (S-1)	Clean the stencil/signage surfaces to remove any excess dirt. Re-paint if necessary.	Every 3 months
Outdoor Trash Storage (S-3)	Empty trash receptacles. Clean the areas around by sweeping.	Weekly
Loading Dock Area (S-4)	Clean the areas by sweeping. Clear out trash and debris	Weekly
Landscape Irrigation (S-8)	Implement mowing, trimming, and pruning practices; Control fertilizer, herbicide, & pesticide applications to prevent stormwater contamination	Monthly

6. REFERENCES

1. Los Angeles County Department of Public Works Low Impact Development Standards Manual, February 2014
2. Los Angeles County Department of Public Works Stormwater Best Management Practice Design and Maintenance Manual, August 2010

FIGURES



Date	Description	No.
Revisions		

Signature _____ Date _____

LANGAN

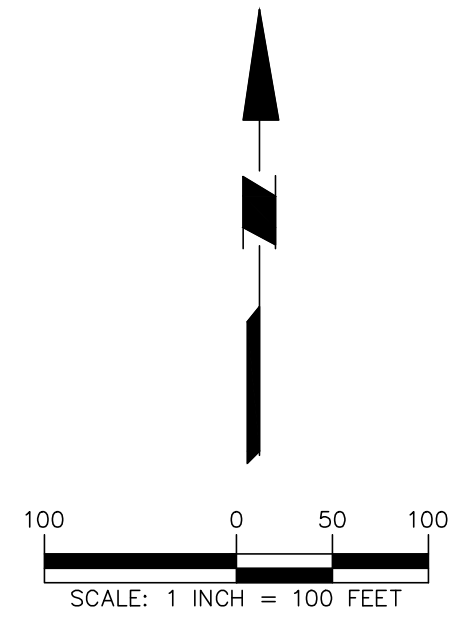
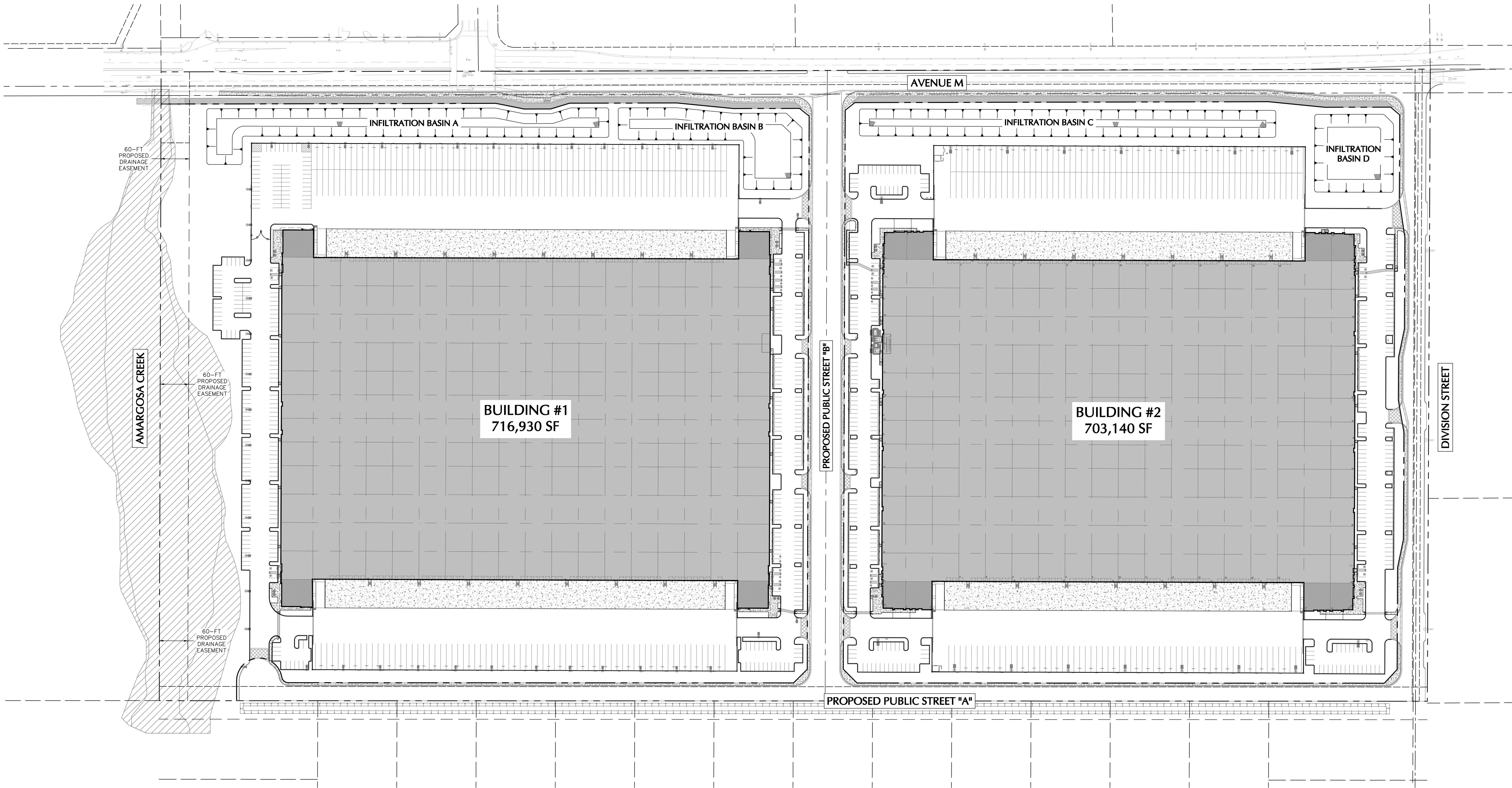
722010501
03/28/2023
DMB
MRG

Project
PALMDALE LOGISTICS PARK
CITY OF PALMDALE
LOS ANGELES COUNTY CALIFORNIA

Drawing Title
SITE VICINITY MAP

Project No.
722010501
Date
03/28/2023
Drawn By
DMB
Checked By
MRG

Figure No.
1
Sheet **1** of **1**



Date	Description	No.
Revisions		

Signature _____ Date _____

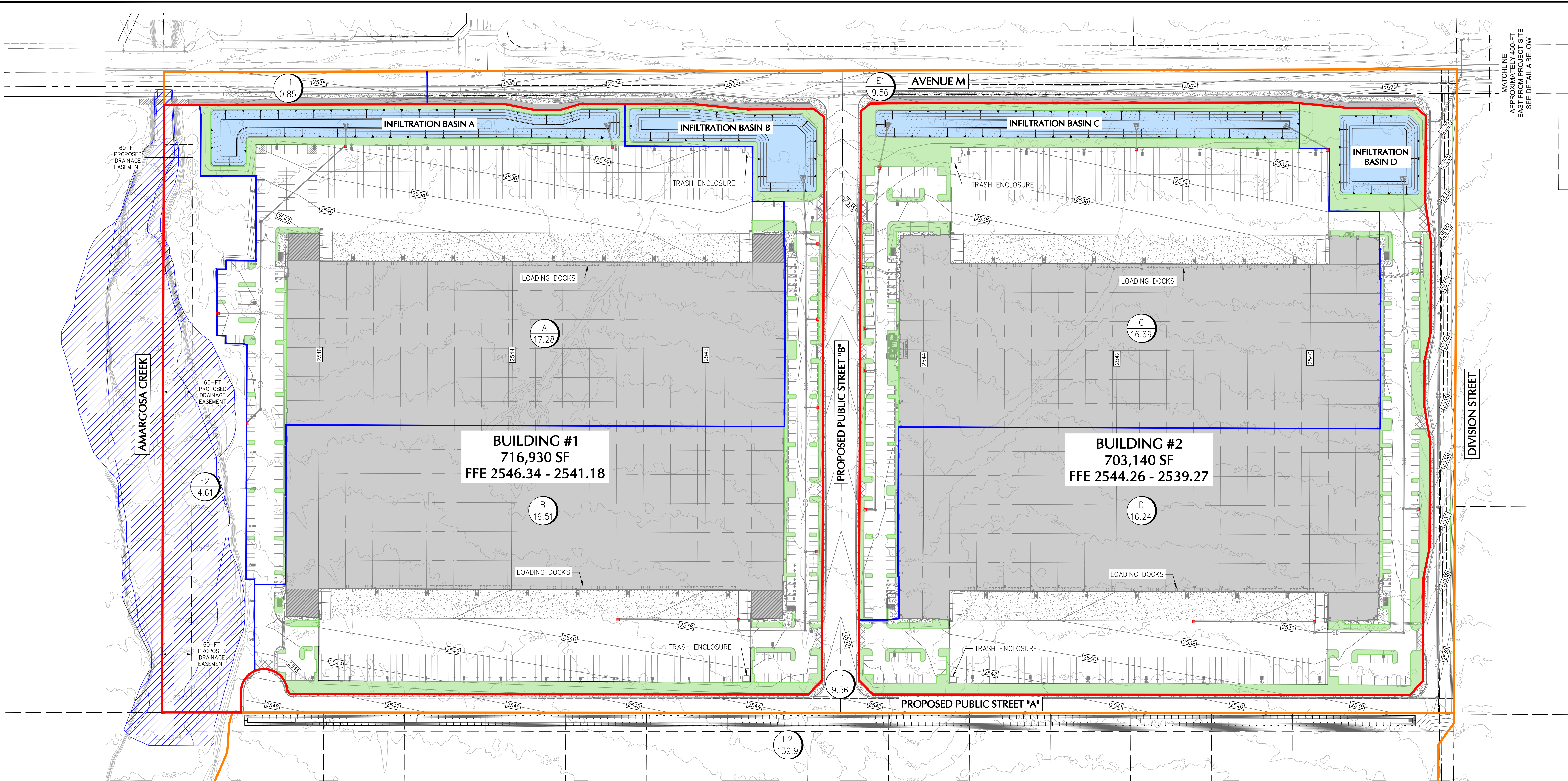
LANGAN
 Langan Engineering and
 Environmental Services, Inc.
 515 Flower Street, Suite 1060
 Los Angeles, CA 90071
 T: 213.314.8100 www.langan.com

Project
**PALMDALE LOGISTICS
 PARK**
 CITY OF PALMDALE
 LOS ANGELES COUNTY CALIFORNIA

Drawing Title
**PROPOSED
 SITE PLAN**

Project No.
722010501
 Date
09/08/2023
 Drawn By
DMB
 Checked By
MRG

Figure No.
2
 Sheet **1** of **1**



GENERAL NOTES

- SEE PRELIMINARY LID REPORT, PREPARED BY LANGAN, FOR COMPLETE POST-DEVELOPMENT LID CALCULATIONS.
- CALCULATIONS WERE BASED ON THE REQUIREMENTS ON THE LOS ANGELES COUNTY LID MANUAL FOR THE 0.75-INCH RAINFALL DEPTH.
- PROPOSED ON-SITE DRAINAGE SYSTEM LAYOUT IS PRELIMINARY.
- ALL EXISTING ELEVATIONS AND INVERT ELEVATIONS ARE APPROXIMATE.

PROJECT SITE SUMMARY

SITE AREA (GROSS): 81.75 ACRES
SITE AREA (NET): 71.33 ACRES
IMPERVIOUS COVERAGE: 81% (POST-DEVELOPMENT)
SOIL GROUP: 124
85TH PERCENTILE ISOHYETALS: 0.61 INCHES (FROM MAP)
0.75 INCHES (MINIMUM)
METHOD: LOS ANGELES COUNTY LID MANUAL

LEGEND

- PROJECT AREA BOUNDARY
- OFF-SITE TRIBUTARY DRAINAGE BOUNDARY
- BASIN DRAINAGE AREA BOUNDARY
- PROPOSED CATCH BASIN WITH CATCH BASIN INSERT AND "NO DUMPING" STENCIL MARKING
- DRAINAGE SUB-AREA ID
- DRAINAGE SUB-AREA (ACRE)
- AMARGOSA CREEK FLOODPLAIN
- M-RR APPROXIMATE BASIN AREA
- PROPOSED INFILTRATION BASIN AREA
- PROPOSED BUILDING AREA
- PROPOSED LANDSCAPE AREA

Hydrology Summary Table						
Drainage Area ID	Drainage Area (acres)	Impervious Ratio	LID Peak Flow (cfs)	SWQDv (cf)	Basin Volume Provided (cf)	Basin Designation
A	17.28	0.88	2.18	37,633	189,429	Basin A
B	16.51	0.86	1.62	35,009	158,014	Basin B
C	16.69	0.84	2.06	34,921	169,568	Basin C
D	16.24	0.85	1.61	34,497	147,289	Basin D
E1	9.56	0.94	-	-	-	Off-Site Drainage
E2	139.93	0.00	-	-	-	
F1	0.85	0.90	-	-	-	Amargosa Creek
F2	4.61	0.00	-	-	-	

LANGAN

Langan Engineering and Environmental Services, Inc.
515 Flower Street, Suite 1060
Los Angeles, CA 90071

T: 213.314.8100

www.langan.com

Project
PALMDALE LOGISTICS PARK
CITY OF PALMDALE
LOS ANGELES COUNTY CALIFORNIA

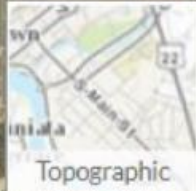
Drawing Title
POST-DEVELOPMENT LID EXHIBIT

Project No.
722010501
Date
09/11/2023
Drawn By
DMB
Checked By
MRG

Figure No.
3
Sheet **1** of **1**

APPENDIX A

LA COUNTY HYDROLOGY MAP – 85TH PERCENTILE, 24-HOUR STORM

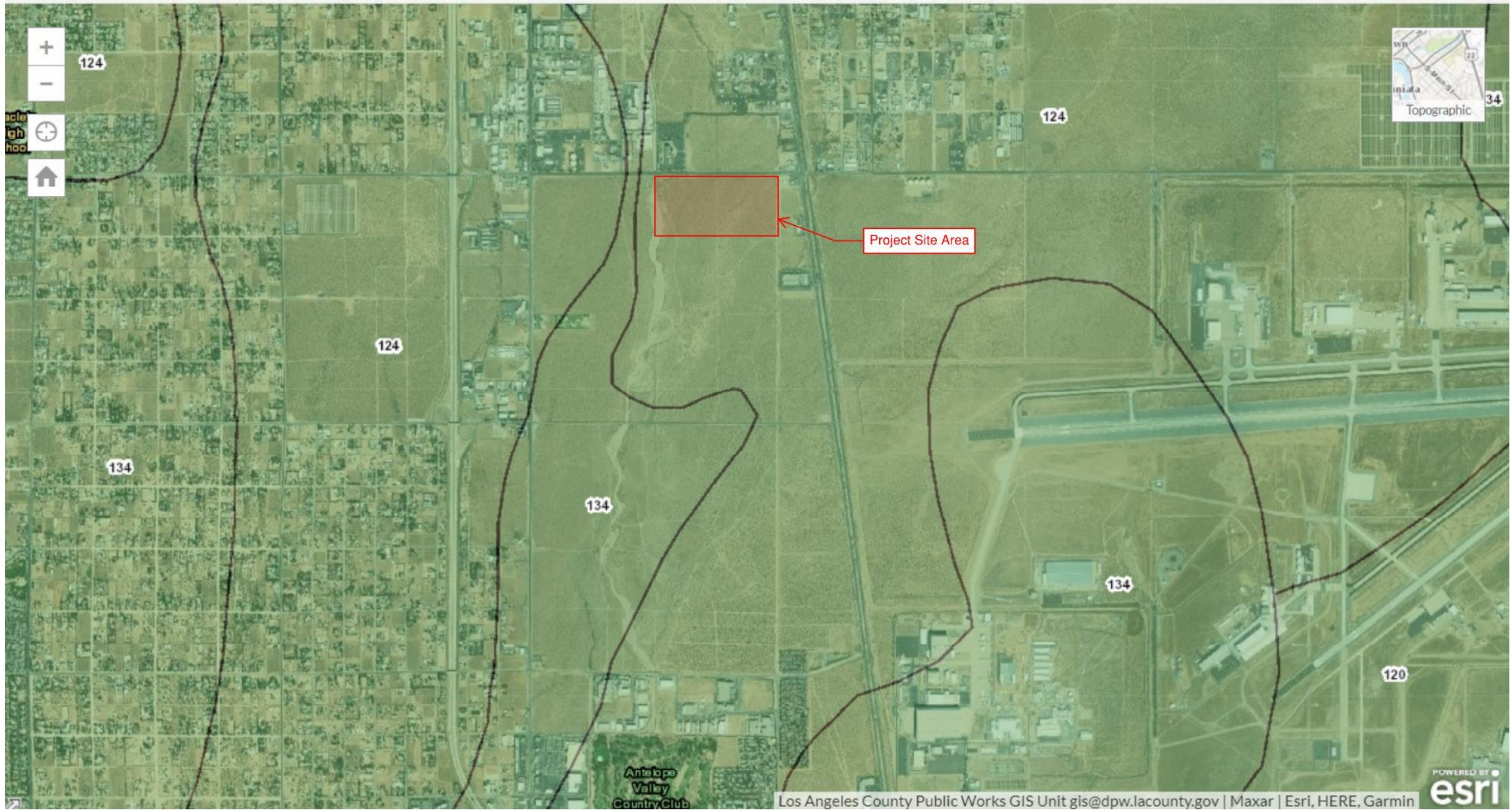
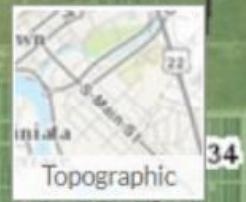


Project Site Area



APPENDIX B

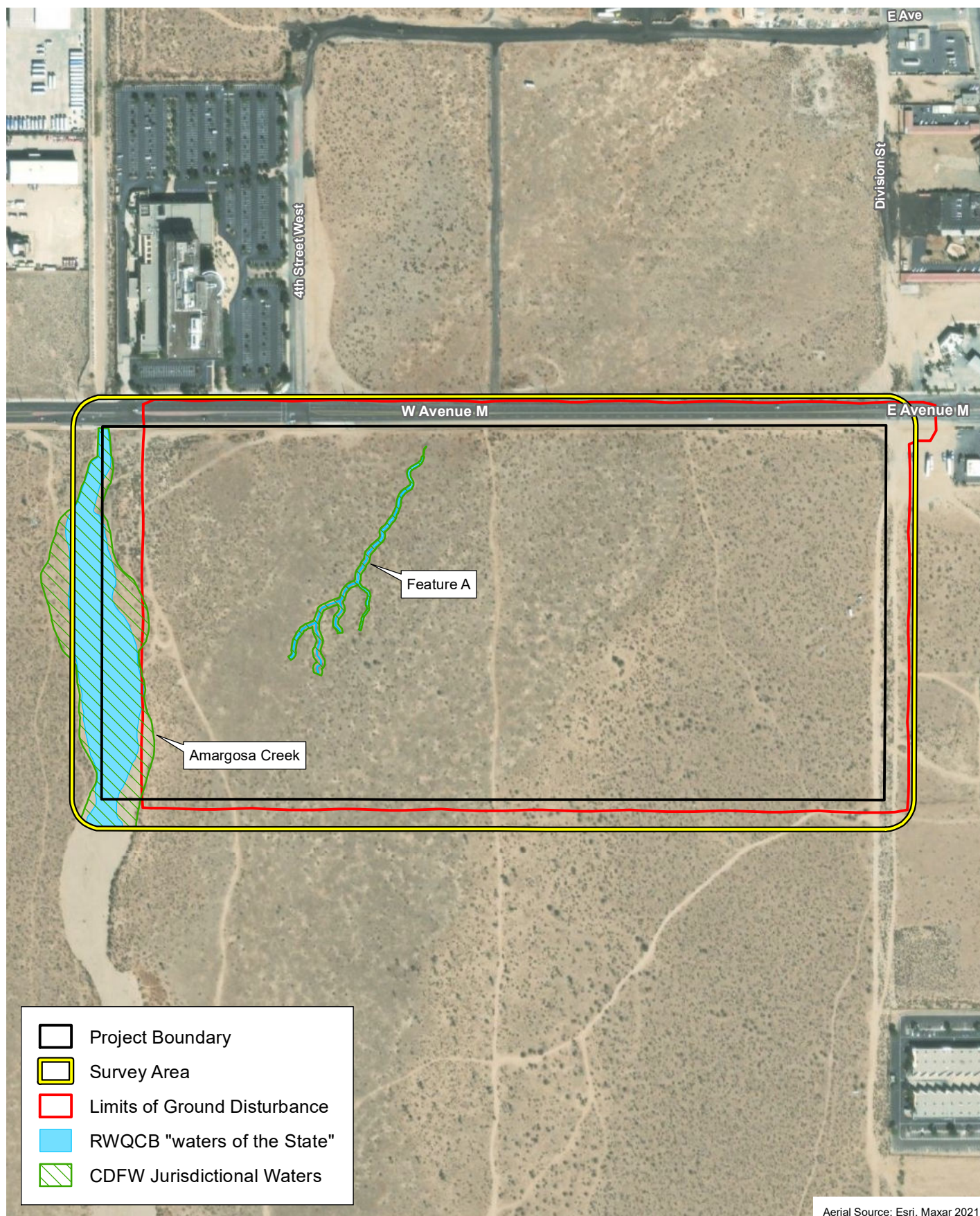
LA COUNTY HYDROLOGY MAP – SOILS MAP



Antelope Valley Country Club

APPENDIX C

IMPACTS TO JURISDICTIONAL RESOURCES



Impacts to Jurisdictional Resources

Exhibit 7

Jurisdictional Delineation Report for the Palmdale Logistics Park Project



450 225 0 450
Feet



APPENDIX D

POST-DEVELOPMENT 0.75-INCH HYDROCALC CALCULATIONS

Hydrology Summary Table				
Drainage Area ID	Drainage Area (acres)	Impervious Ratio	LID Peak Flow (cfs)	SWQDv (cf)
A1	3.16	0.95	0.42	7,338
A2	12.24	1.00	1.70	29,744
A3	1.89	0.00	0.05	551
Total A	17.28	0.88	2.18	37,633
B1	15.36	0.92	1.59	34,673
B2	1.15	0.00	0.03	335
Total B	16.51	0.86	1.62	35,009
C1	3.03	0.84	0.35	6,342
C2	4.48	1.00	0.66	10,887
C3	7.05	1.00	1.00	17,071
C4	2.13	0.00	0.05	621
Total C	16.69	0.84	2.06	34,921
D1	15.14	0.92	1.59	34,177
D2	1.10	0.00	0.02	321
Total D	16.24	-	1.61	34,497

NOTE:

- Area E and F2 is off-site drainage. No retention is needed for the off-site improvements.
- Area F1 is 100% pervious and area and will not be disturbed unless it is for grading tie-in purposes.

Peak Flow Hydrologic Analysis

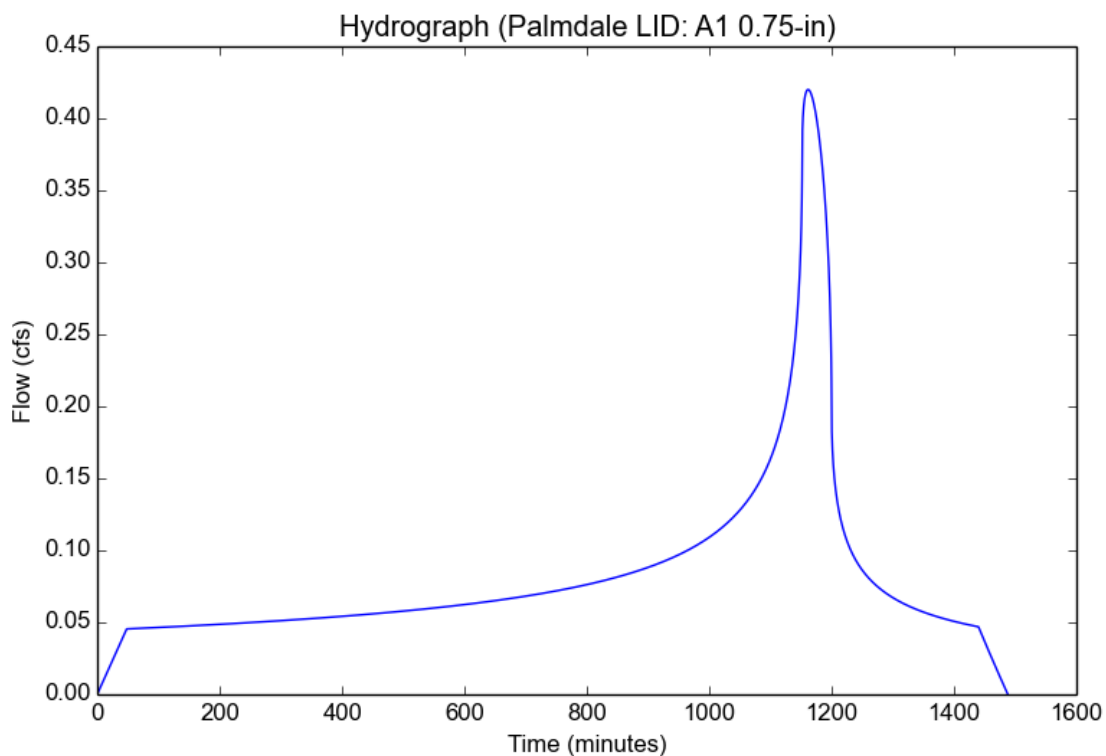
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	A1 0.75-in
Area (ac)	3.16
Flow Path Length (ft)	1085.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.95
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1546
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.86
Time of Concentration (min)	48.0
Clear Peak Flow Rate (cfs)	0.42
Burned Peak Flow Rate (cfs)	0.42
24-Hr Clear Runoff Volume (ac-ft)	0.1685
24-Hr Clear Runoff Volume (cu-ft)	7337.7382



Peak Flow Hydrologic Analysis

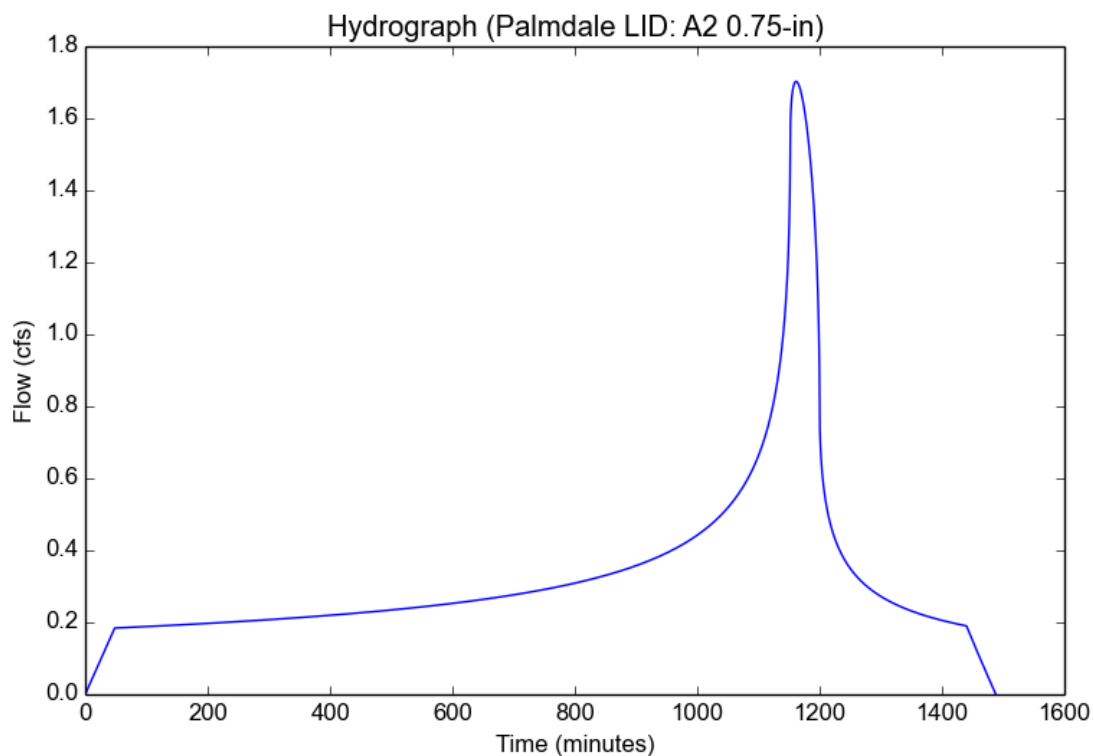
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	A2 0.75-in
Area (ac)	12.24
Flow Path Length (ft)	1144.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	1.0
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1546
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	48.0
Clear Peak Flow Rate (cfs)	1.7026
Burned Peak Flow Rate (cfs)	1.7026
24-Hr Clear Runoff Volume (ac-ft)	0.6828
24-Hr Clear Runoff Volume (cu-ft)	29744.0846



Peak Flow Hydrologic Analysis

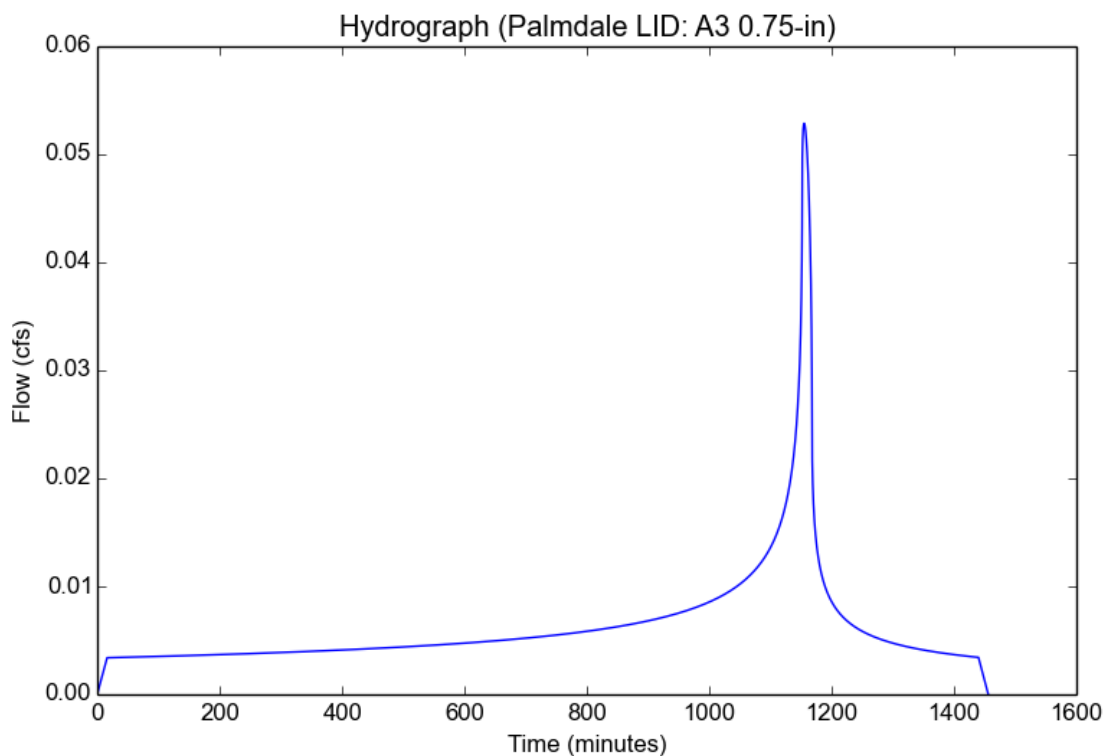
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	A3 0.75-in
Area (ac)	1.89
Flow Path Length (ft)	20.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.259
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	16.0
Clear Peak Flow Rate (cfs)	0.0529
Burned Peak Flow Rate (cfs)	0.0529
24-Hr Clear Runoff Volume (ac-ft)	0.0127
24-Hr Clear Runoff Volume (cu-ft)	551.1258



Peak Flow Hydrologic Analysis

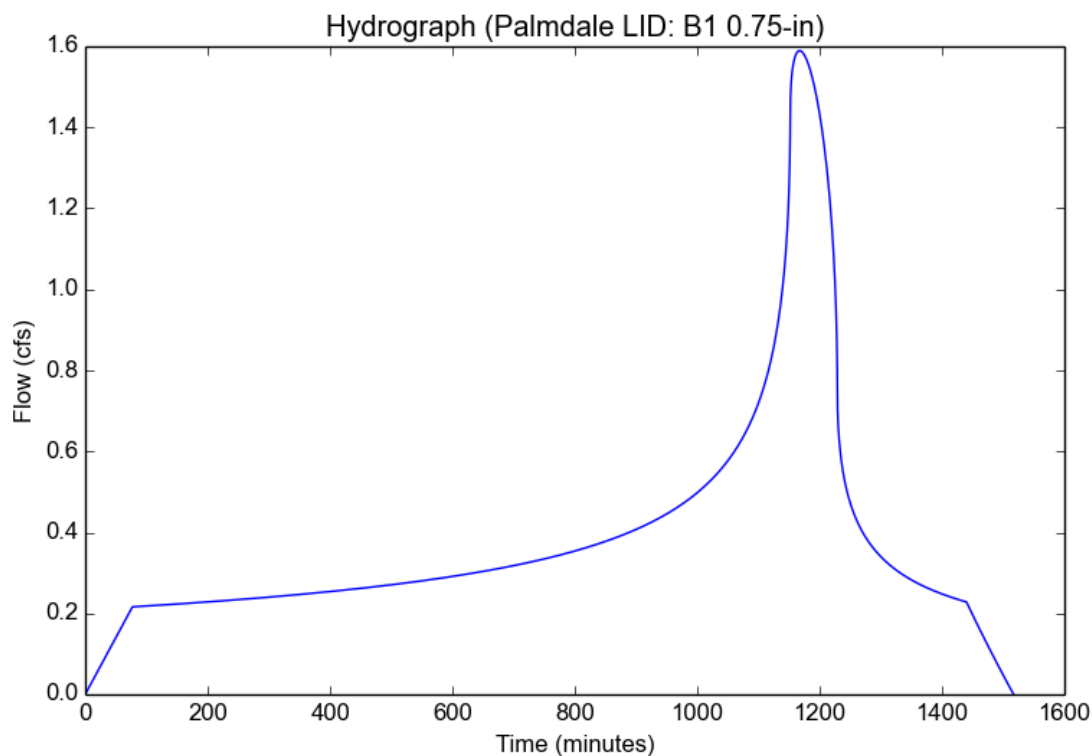
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	B1 0.75-in
Area (ac)	15.36
Flow Path Length (ft)	2183.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.92
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1238
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.836
Time of Concentration (min)	77.0
Clear Peak Flow Rate (cfs)	1.5894
Burned Peak Flow Rate (cfs)	1.5894
24-Hr Clear Runoff Volume (ac-ft)	0.796
24-Hr Clear Runoff Volume (cu-ft)	34673.2972



Peak Flow Hydrologic Analysis

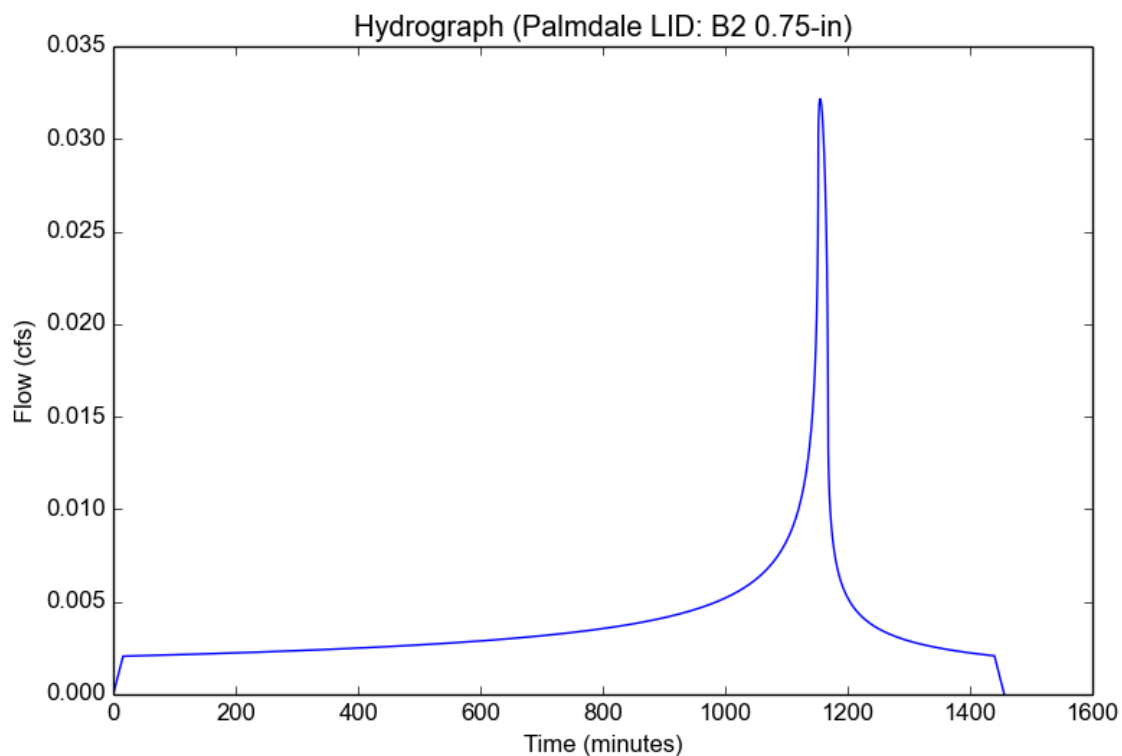
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	B2 0.75-in
Area (ac)	1.15
Flow Path Length (ft)	20.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.259
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	16.0
Clear Peak Flow Rate (cfs)	0.0322
Burned Peak Flow Rate (cfs)	0.0322
24-Hr Clear Runoff Volume (ac-ft)	0.0077
24-Hr Clear Runoff Volume (cu-ft)	335.3411



Peak Flow Hydrologic Analysis

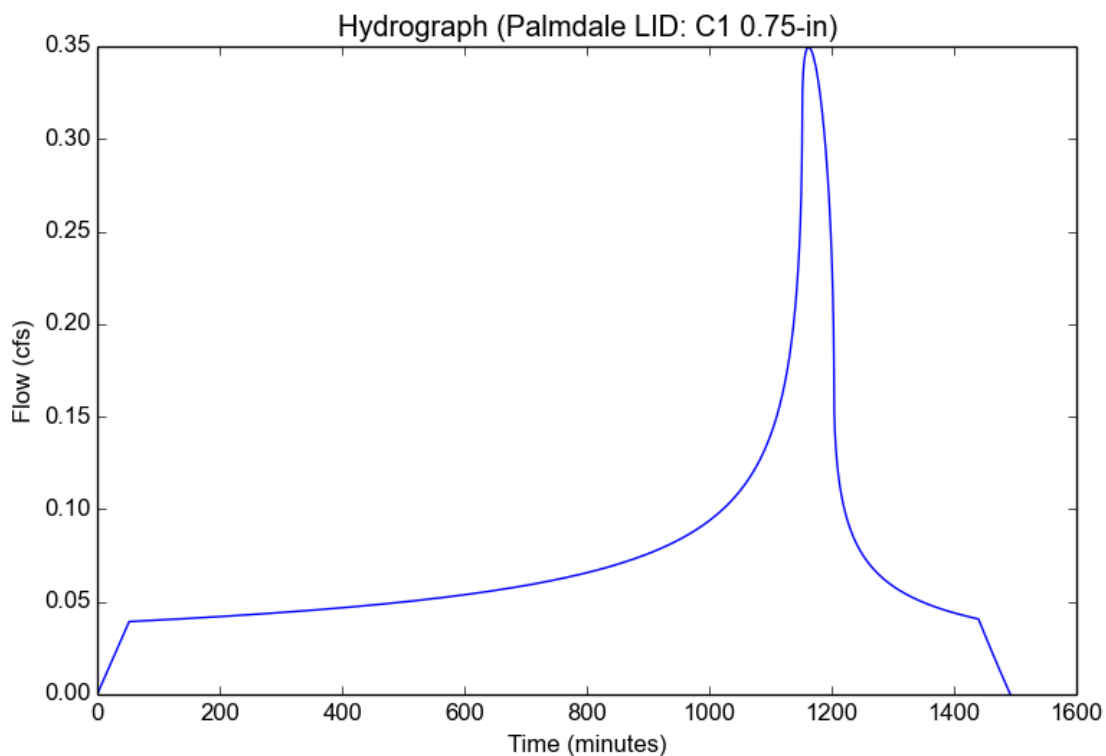
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	C1 0.75-in
Area (ac)	3.03
Flow Path Length (ft)	1092.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.844
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1489
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.7752
Time of Concentration (min)	52.0
Clear Peak Flow Rate (cfs)	0.3496
Burned Peak Flow Rate (cfs)	0.3496
24-Hr Clear Runoff Volume (ac-ft)	0.1456
24-Hr Clear Runoff Volume (cu-ft)	6342.1332



Peak Flow Hydrologic Analysis

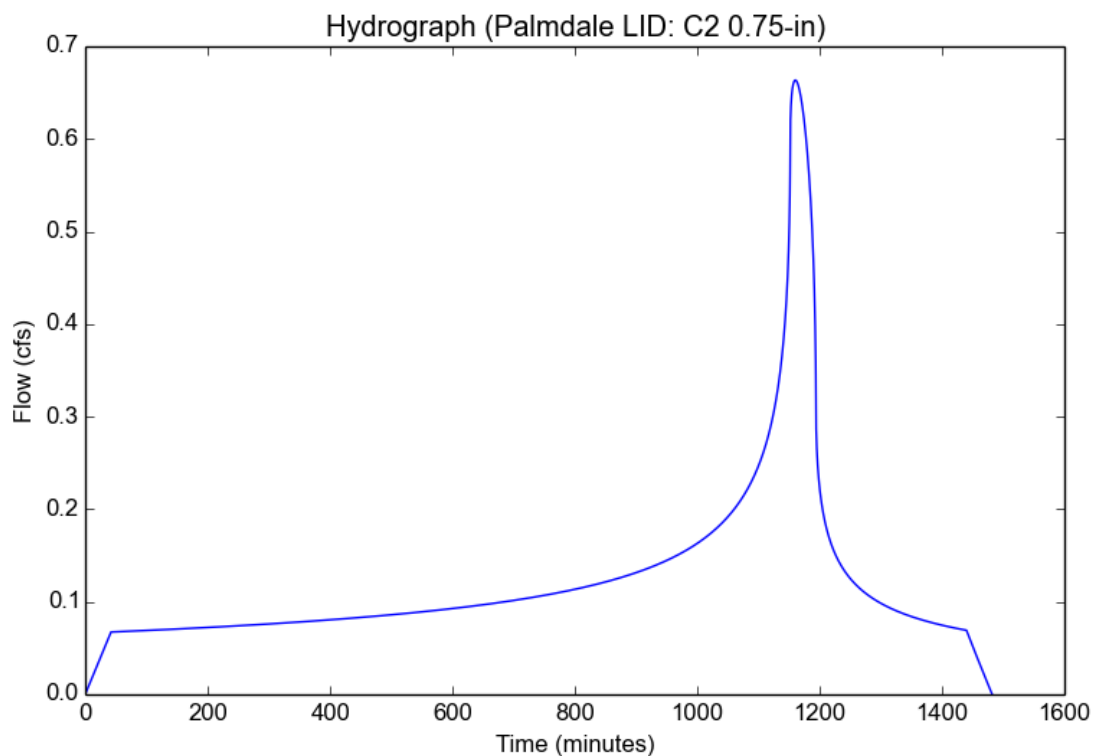
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	C2 0.75-in
Area (ac)	4.48
Flow Path Length (ft)	916.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	1.0
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1646
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	42.0
Clear Peak Flow Rate (cfs)	0.6636
Burned Peak Flow Rate (cfs)	0.6636
24-Hr Clear Runoff Volume (ac-ft)	0.2499
24-Hr Clear Runoff Volume (cu-ft)	10886.6469



Peak Flow Hydrologic Analysis

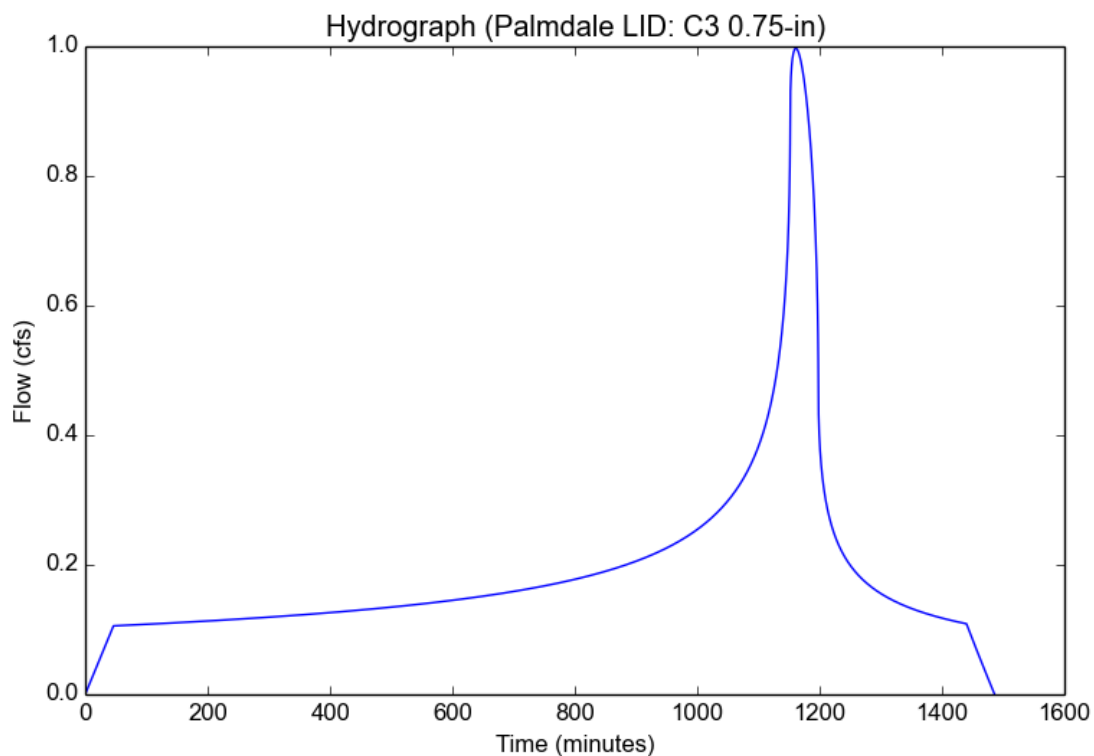
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	C3 0.75-in
Area (ac)	7.05
Flow Path Length (ft)	1058.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.996
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1577
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.8968
Time of Concentration (min)	46.0
Clear Peak Flow Rate (cfs)	0.9969
Burned Peak Flow Rate (cfs)	0.9969
24-Hr Clear Runoff Volume (ac-ft)	0.3919
24-Hr Clear Runoff Volume (cu-ft)	17071.0537



Peak Flow Hydrologic Analysis

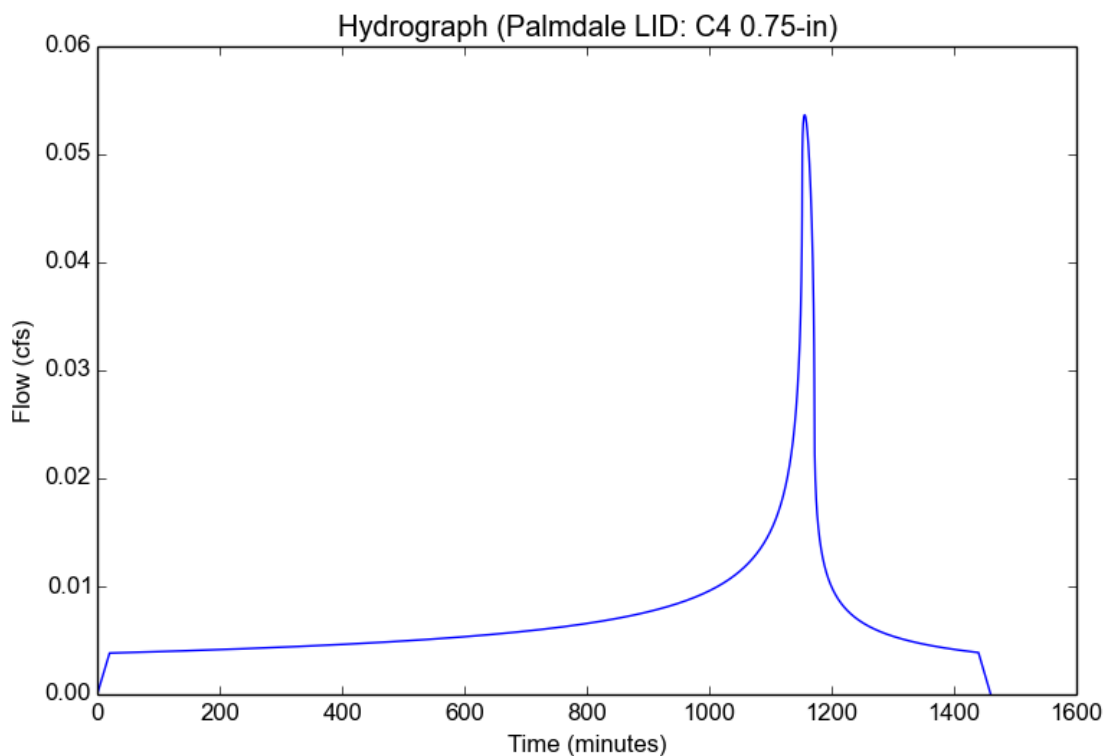
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	C4 0.75-in
Area (ac)	2.13
Flow Path Length (ft)	30.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.2332
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	20.0
Clear Peak Flow Rate (cfs)	0.0537
Burned Peak Flow Rate (cfs)	0.0537
24-Hr Clear Runoff Volume (ac-ft)	0.0143
24-Hr Clear Runoff Volume (cu-ft)	621.1111



Peak Flow Hydrologic Analysis

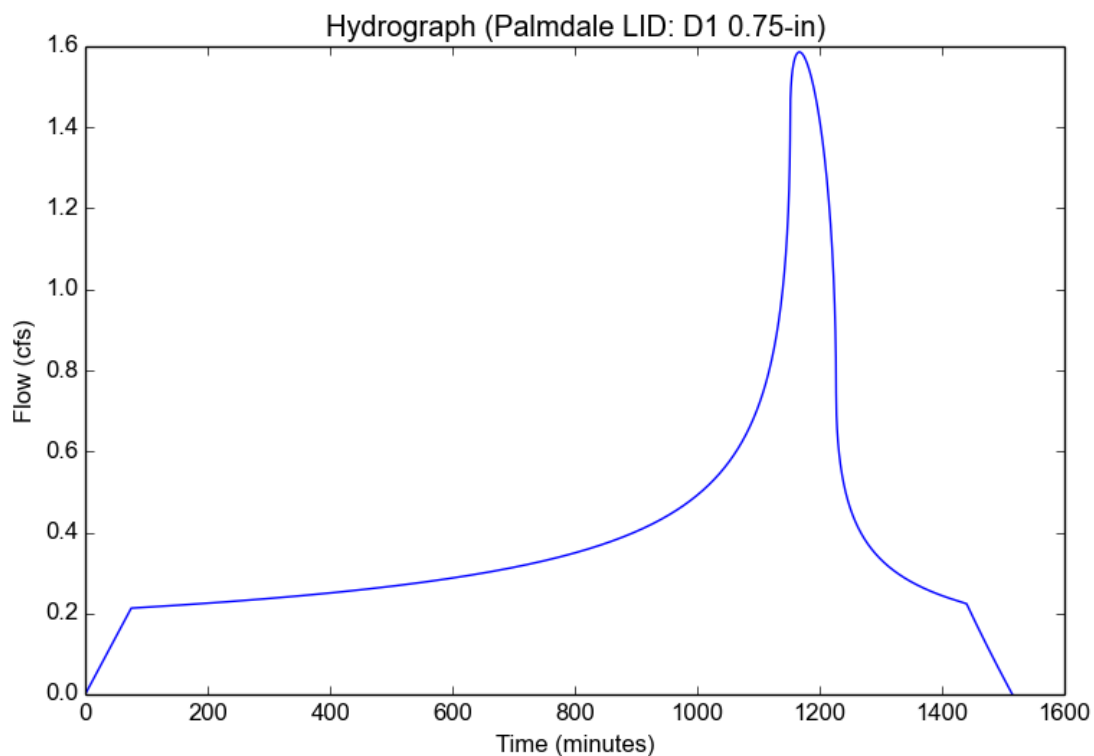
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	D1 0.75-in
Area (ac)	15.14
Flow Path Length (ft)	2111.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.92
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1253
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.836
Time of Concentration (min)	75.0
Clear Peak Flow Rate (cfs)	1.5861
Burned Peak Flow Rate (cfs)	1.5861
24-Hr Clear Runoff Volume (ac-ft)	0.7846
24-Hr Clear Runoff Volume (cu-ft)	34176.5344



Peak Flow Hydrologic Analysis

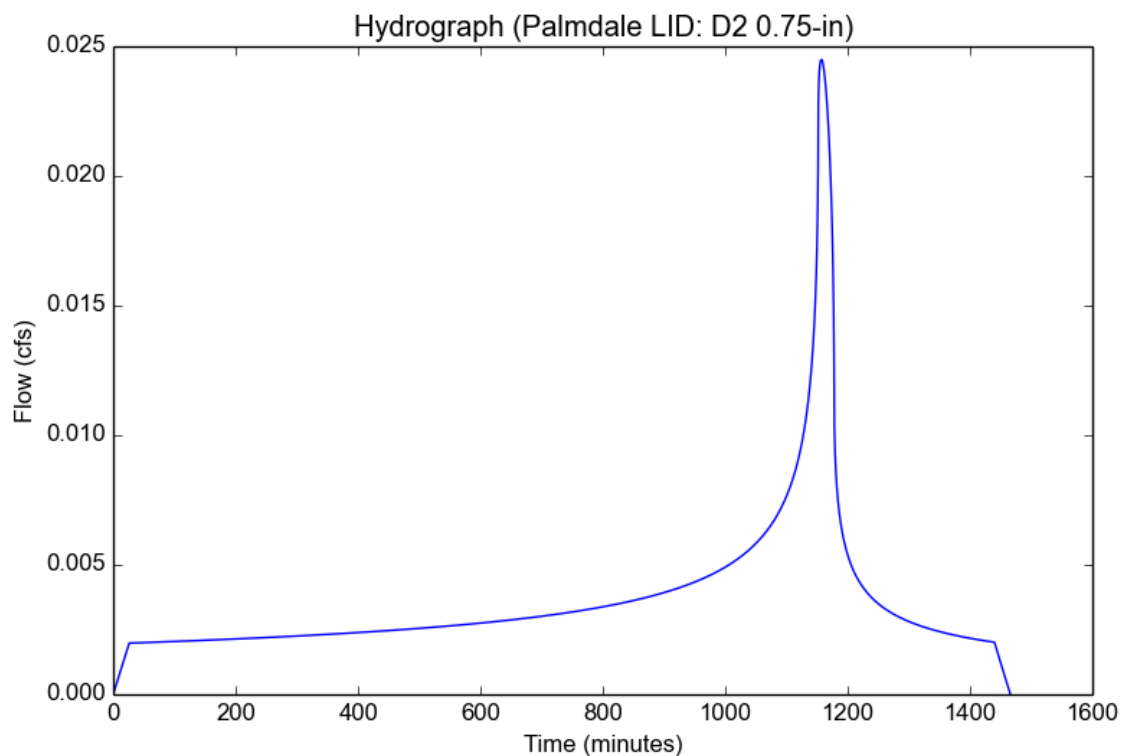
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	D2 0.75-in
Area (ac)	1.1
Flow Path Length (ft)	83.0
Flow Path Slope (vft/hft)	0.1
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.2062
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	0.0245
Burned Peak Flow Rate (cfs)	0.0245
24-Hr Clear Runoff Volume (ac-ft)	0.0074
24-Hr Clear Runoff Volume (cu-ft)	320.7628



Peak Flow Hydrologic Analysis

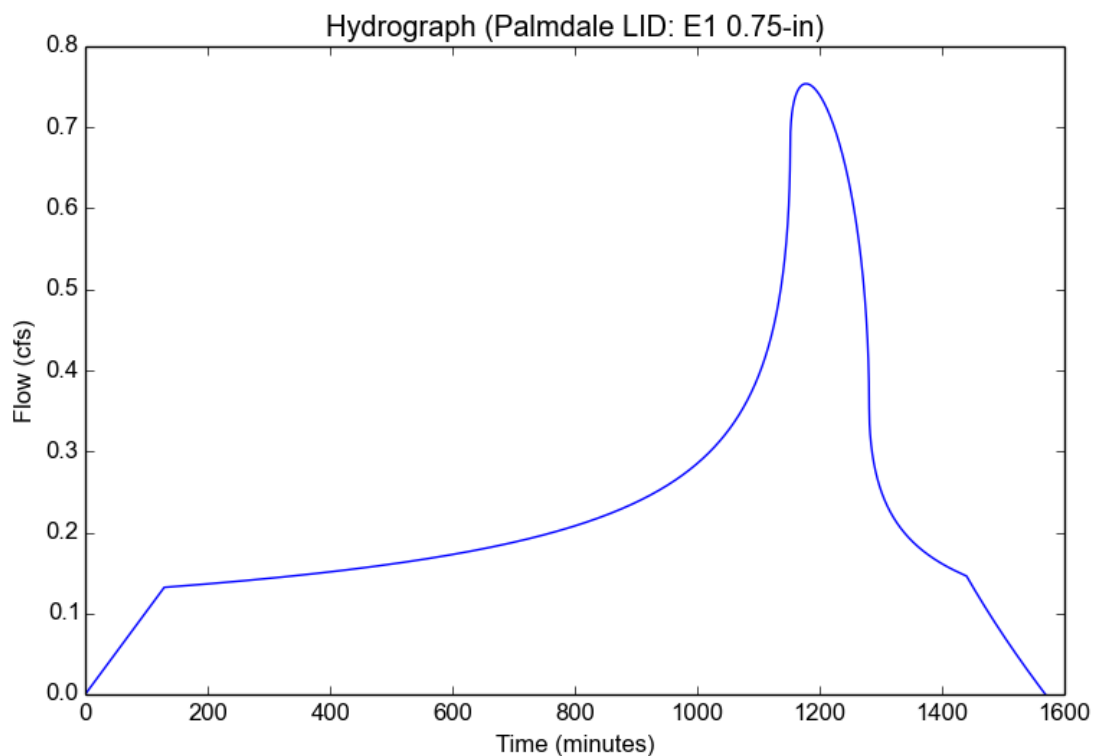
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	E1 0.75-in
Area (ac)	9.56
Flow Path Length (ft)	3679.0
Flow Path Slope (vft/hft)	0.004
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.89
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.0971
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.812
Time of Concentration (min)	129.0
Clear Peak Flow Rate (cfs)	0.7539
Burned Peak Flow Rate (cfs)	0.7539
24-Hr Clear Runoff Volume (ac-ft)	0.4813
24-Hr Clear Runoff Volume (cu-ft)	20964.1003



Peak Flow Hydrologic Analysis

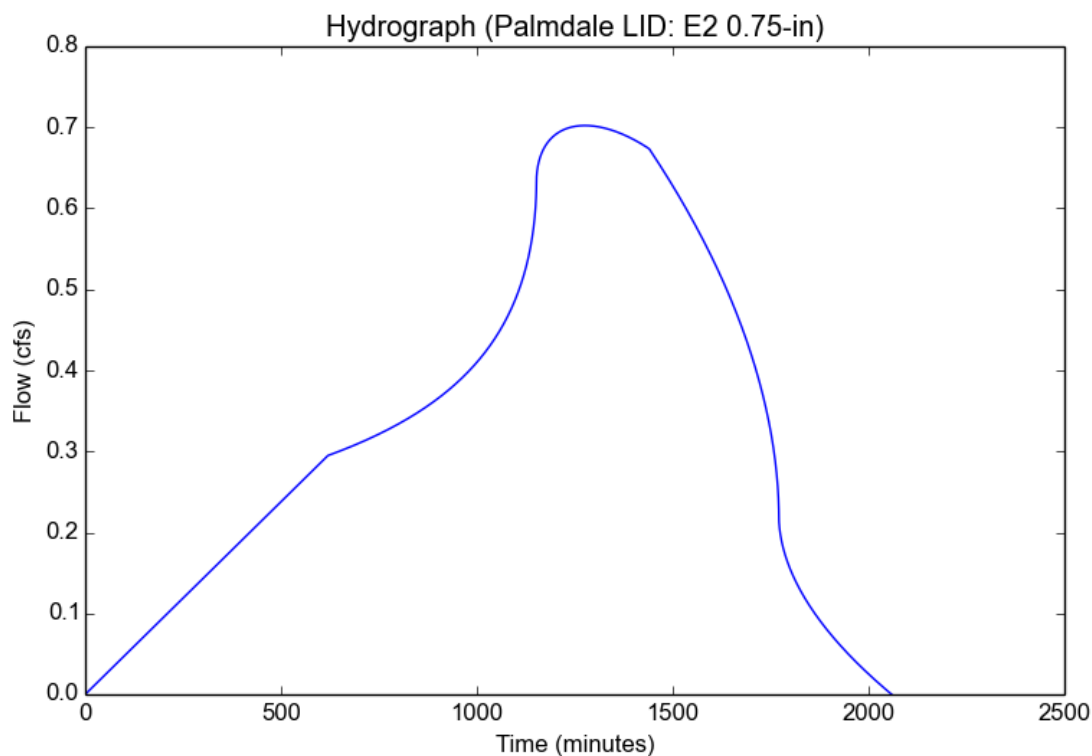
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	E2 0.75-in
Area (ac)	139.93
Flow Path Length (ft)	6173.0
Flow Path Slope (vft/hft)	0.009
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0.34
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.0465
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	619.0
Clear Peak Flow Rate (cfs)	0.7023
Burned Peak Flow Rate (cfs)	0.8486
24-Hr Clear Runoff Volume (ac-ft)	0.9442
24-Hr Clear Runoff Volume (cu-ft)	41129.9067



Peak Flow Hydrologic Analysis

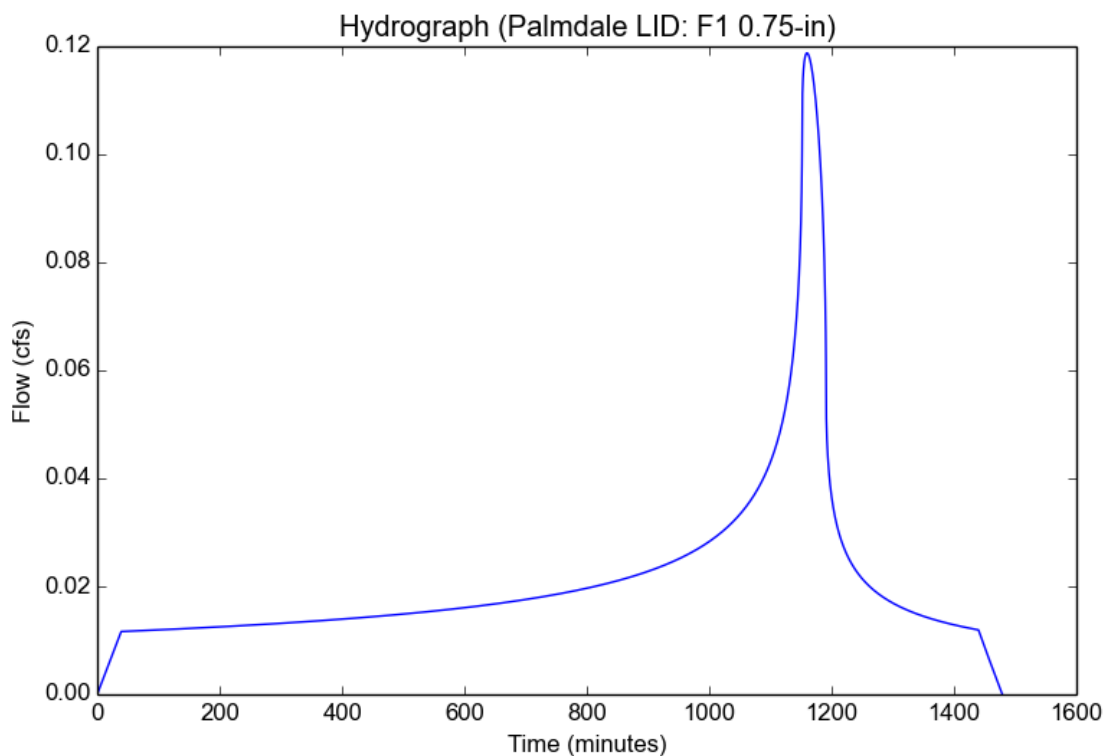
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	F1 0.75-in
Area (ac)	0.85
Flow Path Length (ft)	600.0
Flow Path Slope (vft/hft)	0.005
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.9
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1704
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.82
Time of Concentration (min)	39.0
Clear Peak Flow Rate (cfs)	0.1188
Burned Peak Flow Rate (cfs)	0.1188
24-Hr Clear Runoff Volume (ac-ft)	0.0432
24-Hr Clear Runoff Volume (cu-ft)	1881.9367



Peak Flow Hydrologic Analysis

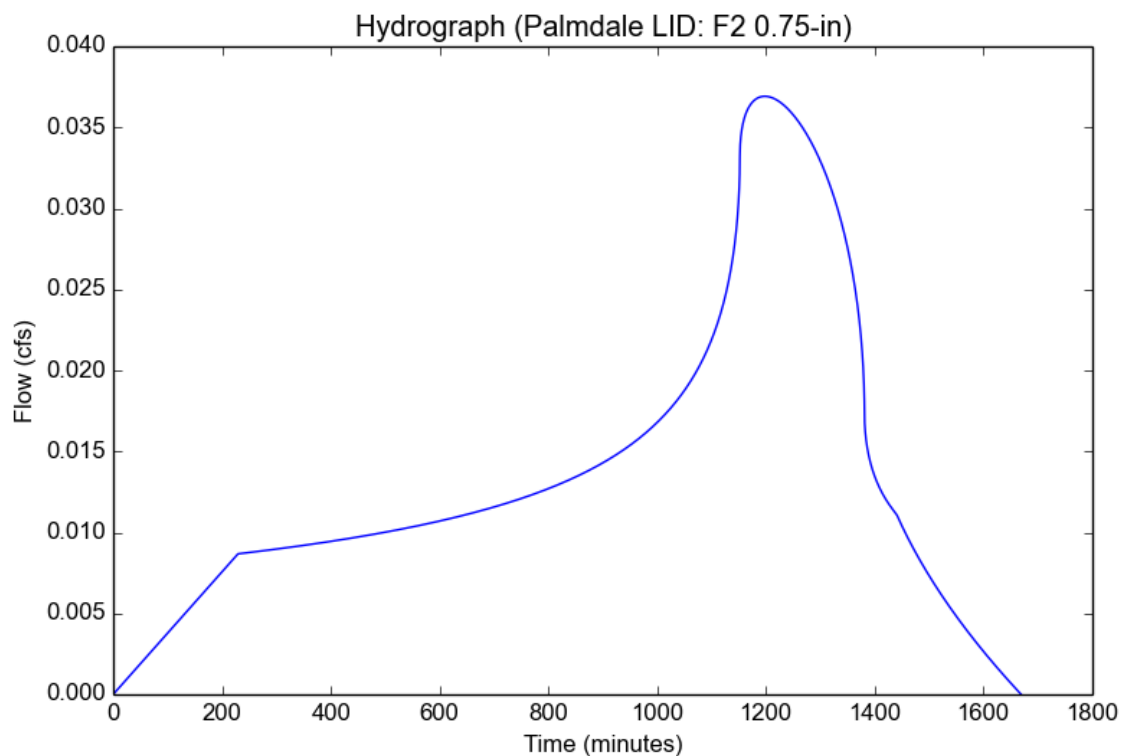
File location: //langan.com/data/IEM/data5/722010501/Project Data/_Discipline/Site Civil/Reports/Prelim LID Report/Calculations/HydroCalc/Palmdale LID
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Palmdale LID
Subarea ID	F2 0.75-in
Area (ac)	4.61
Flow Path Length (ft)	1343.0
Flow Path Slope (vft/hft)	0.01
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.0742
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	229.0
Clear Peak Flow Rate (cfs)	0.0369
Burned Peak Flow Rate (cfs)	0.0369
24-Hr Clear Runoff Volume (ac-ft)	0.0309
24-Hr Clear Runoff Volume (cu-ft)	1345.3095



APPENDIX E

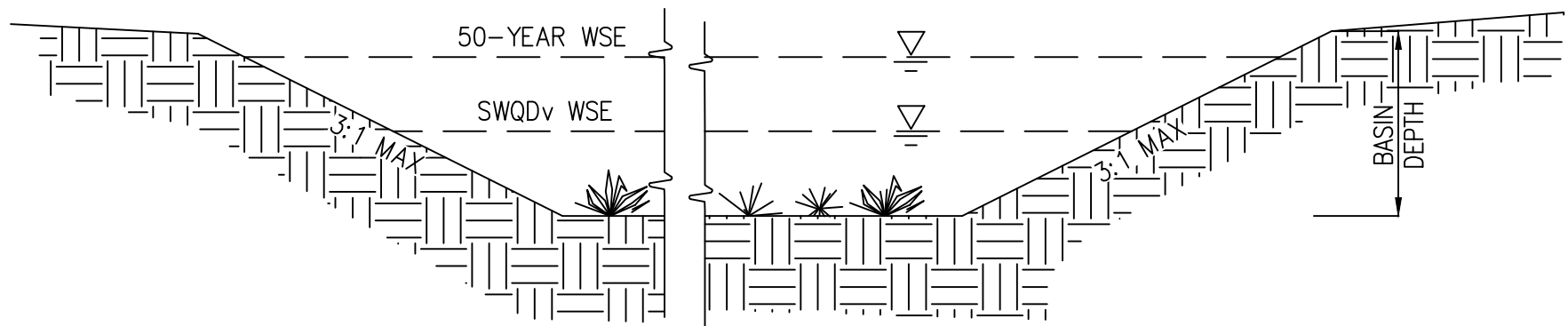
INFILTRATION BASIN SIZING

Infiltration Basin Sizing Summary									
Drainage Area ID	Drainage Area (acres)	SWQDv (cf)	50-Year Storm Volume (cf)	Basin Volume Provided (cf)	Basin Bottom Area (sf)	Basin Depth (ft)	Infiltration Rate (in/hr)	Drawdown Time (hours)	Basin Designation
A	17.28	37,701	155,882	189,429	15,319	6.0	1.7	42.4	Basin A
B	16.51	36,004	148,839	158,014	12,610	7.0	1.7	49.4	Basin B
C	16.69	34,921	144,397	169,568	12,547	6.0	1.7	42.4	Basin C
D	16.24	34,497	142,580	147,289	12,369	8.0	1.7	56.5	Basin D
Total	66.73	143,123	591,698	664,300					

Infiltration Basin WSE Summary					
Drainage Area ID	Basin Bottom Elevation (ft)	Basin Top Elevation (ft)	SWQDv WSE (ft)	50-Year Storm WSE (ft)	Basin Designation
A	2,527.50	2,533.50	2529.30	2532.70	Basin A
B	2,526.20	2,533.20	2528.60	2533.00	Basin B
C	2,525.40	2,531.40	2528.30	2531.90	Basin C
D	2,522.20	2,530.20	2524.30	2530.10	Basin D

NOTE:

- Area E and F2 is off-site drainage. No retention is needed for the off-site improvements.
- Area F1 is 100% pervious and area and will not be disturbed unless it is for grading tie-in purposes.
- Water Surface Elevation was obtained from the Stage-Storage Tables by corresponding to the volume of each storm event.
- See Hydrology Report for the 50-year storm volume for each sub-area.



Pond Report

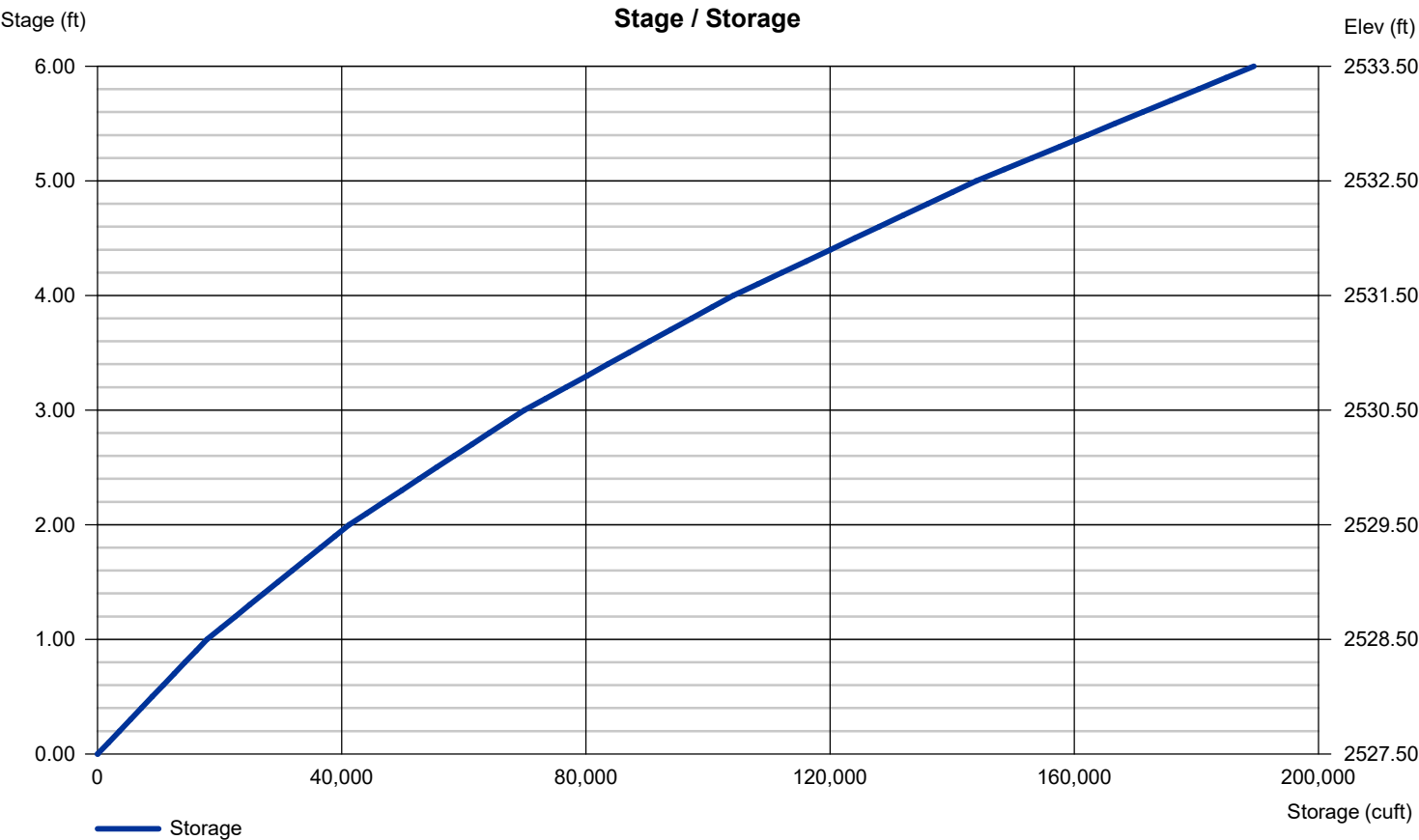
Pond No. 1 - Basin A

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 2527.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	2527.50	15,319	0	0
1.00	2528.50	20,636	17,910	17,910
2.00	2529.50	26,029	23,278	41,188
3.00	2530.50	31,498	28,717	69,905
4.00	2531.50	37,043	34,230	104,135
5.00	2532.50	42,664	39,817	143,951
6.00	2533.50	48,360	45,478	189,429



Pond Report

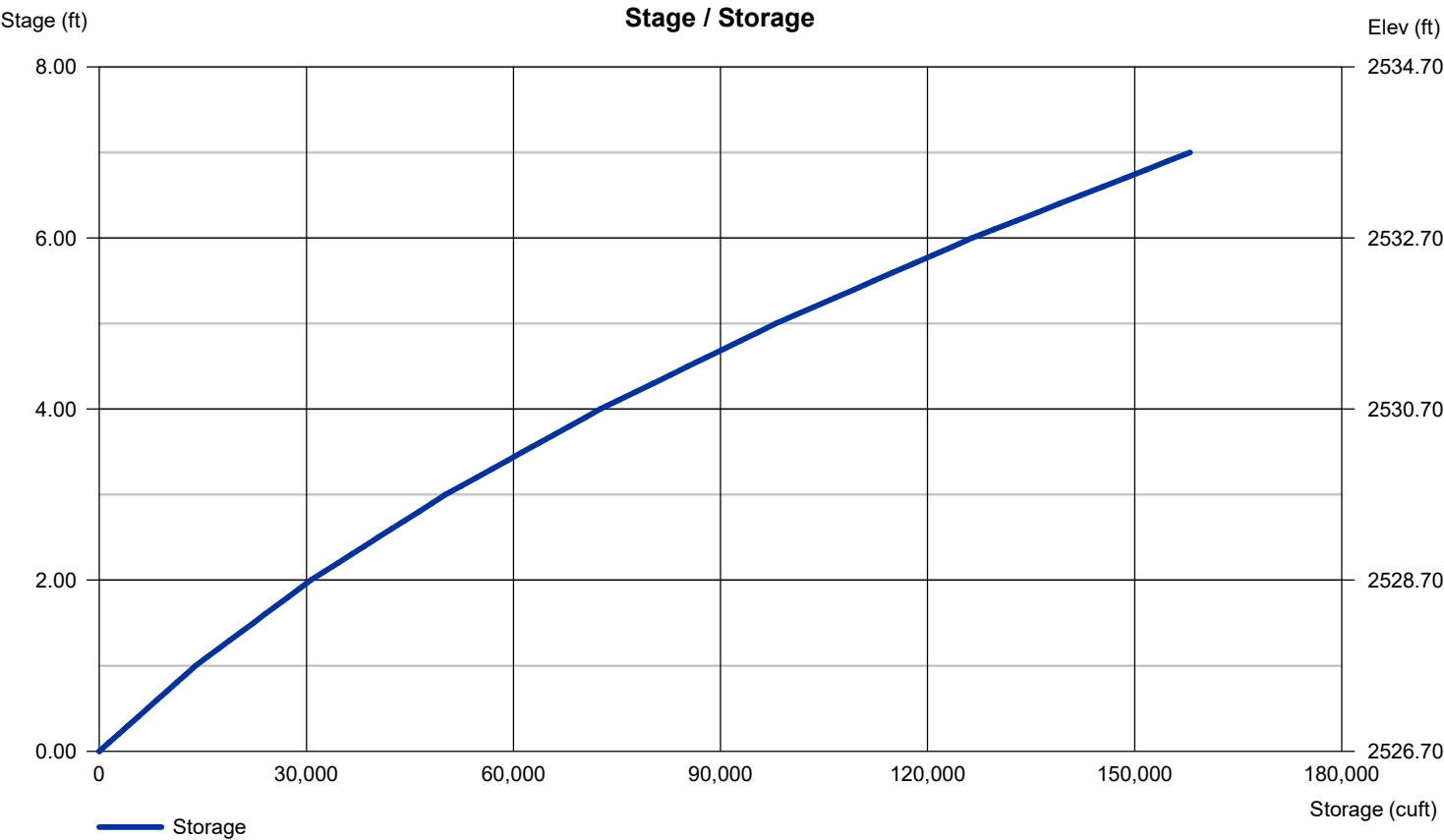
Pond No. 2 - Basin B

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 2526.70 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	2526.70	12,609	0	0
1.00	2527.70	15,327	13,945	13,945
2.00	2528.70	18,116	16,700	30,645
3.00	2529.70	20,979	19,528	50,173
4.00	2530.70	23,915	22,429	72,602
5.00	2531.70	26,923	25,402	98,003
6.00	2532.70	30,004	28,447	126,450
7.00	2533.70	33,157	31,564	158,014



Pond Report

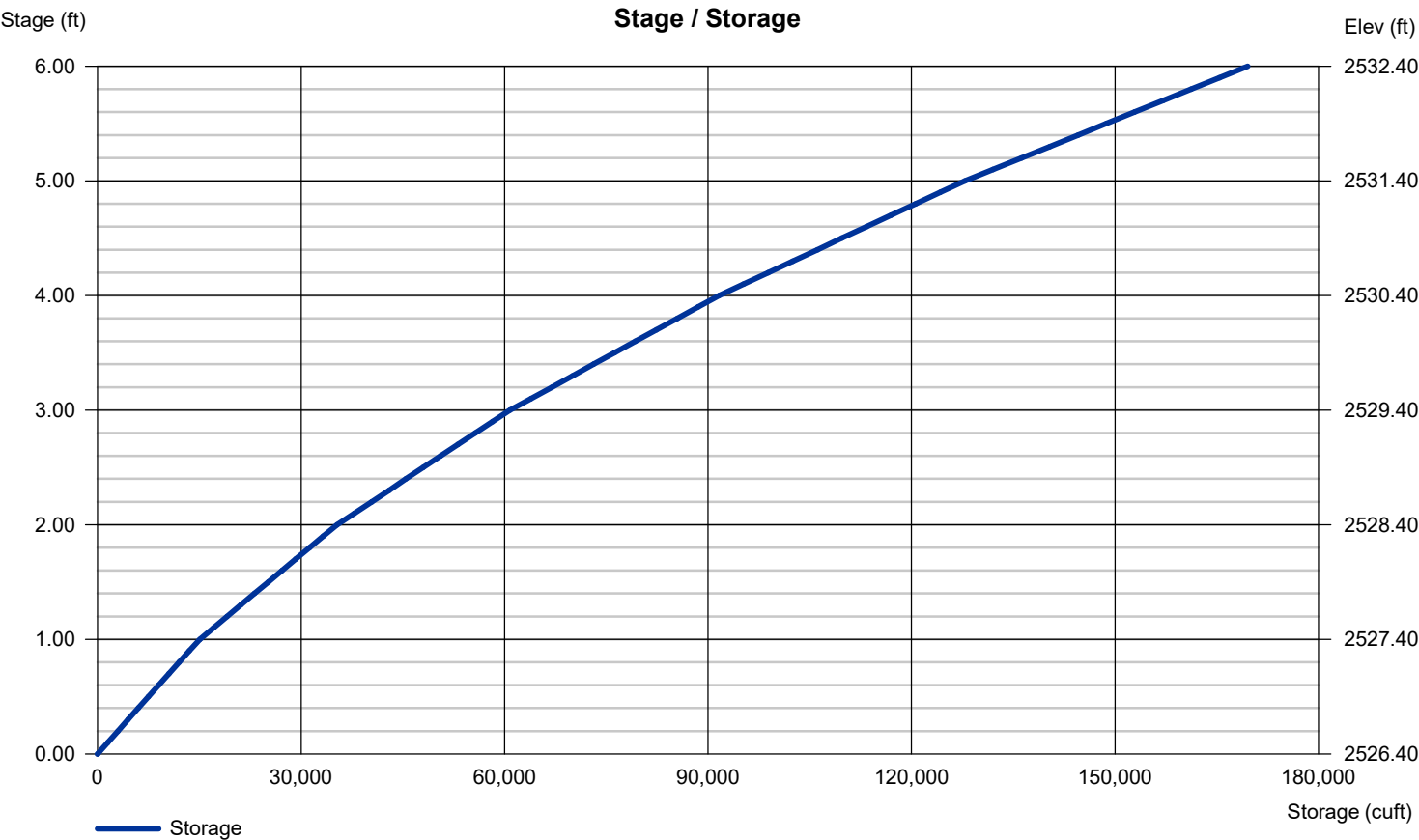
Pond No. 3 - Basin C

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 2526.40 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	2526.40	12,546	0	0
1.00	2527.40	17,691	15,044	15,044
2.00	2528.40	22,908	20,241	35,285
3.00	2529.40	28,197	25,504	60,789
4.00	2530.40	33,557	30,835	91,624
5.00	2531.40	38,990	36,236	127,860
6.00	2532.40	44,495	41,708	169,568



Pond Report

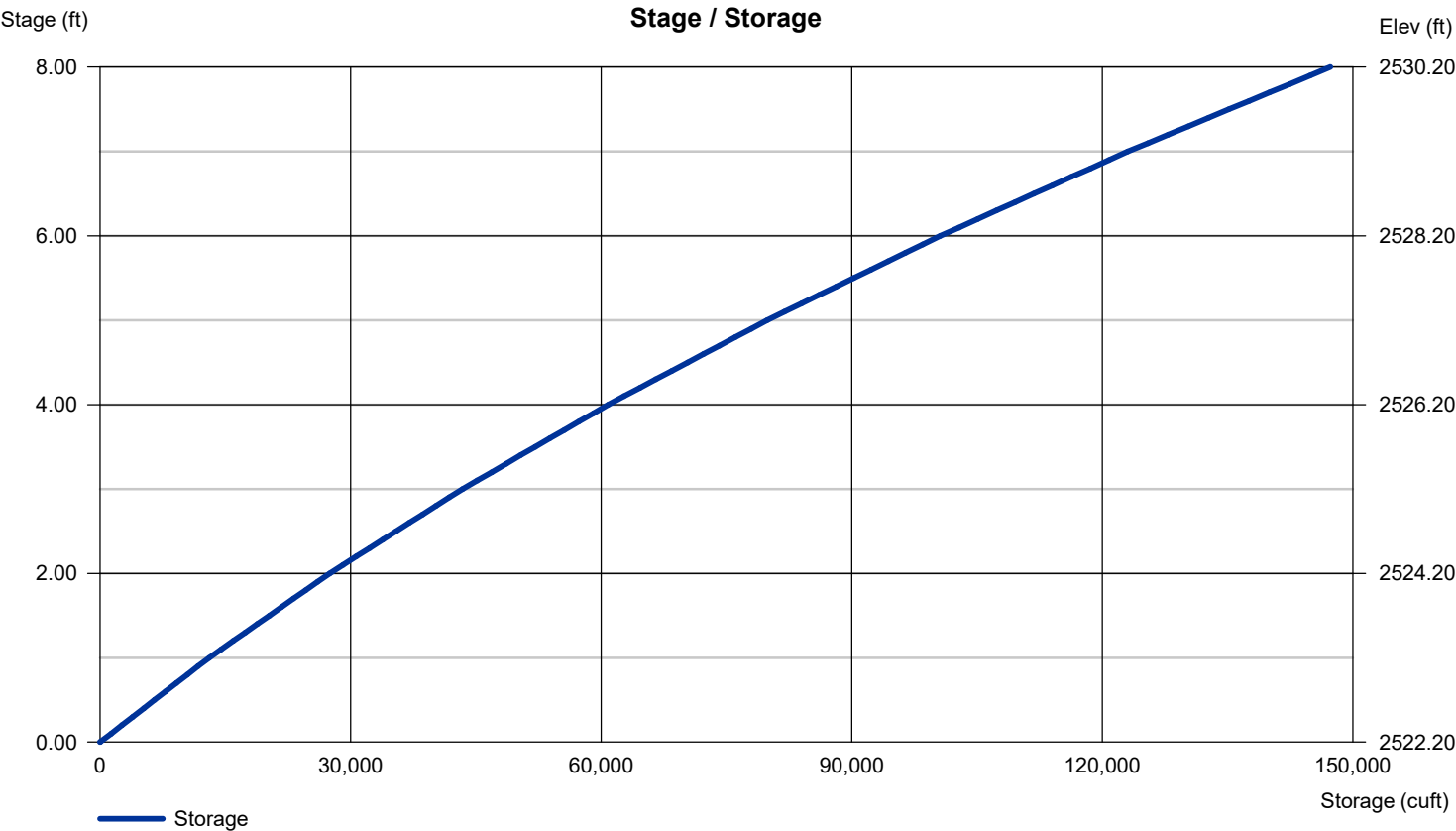
Pond No. 4 - Basin D

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 2522.20 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	2522.20	12,369	0	0
1.00	2523.20	13,731	13,043	13,043
2.00	2524.20	15,161	14,439	27,481
3.00	2525.20	16,661	15,904	43,385
4.00	2526.20	18,229	17,437	60,822
5.00	2527.20	19,867	19,040	79,863
6.00	2528.20	21,573	20,712	100,575
7.00	2529.20	23,348	22,452	123,027
8.00	2530.20	25,192	24,262	147,289



APPENDIX F

SOURCE CONTROL BMP FACT SHEETS

S-1: Storm Drain Message and Signage

Purpose

Waste material dumped into storm drain inlets can adversely impact surface and ground waters. In fact, any material discharged into the storm drain system has the potential to significantly impact downstream receiving waters. Storm drain messages have become a popular method of alerting and reminding the public about the effects of and the prohibitions against waste disposal into the storm drain system. The signs are typically stenciled or affixed near the storm drain inlet or catch basin. The message simply informs the public that dumping of wastes into storm drain inlets is prohibited and/or that the drain ultimately discharges into receiving waters.

General Guidance

- The signs must be placed so they are easily visible to the public.
- Be aware that signs placed on sidewalk will be worn by foot traffic.

Design Specifications

- Signs with language and/or graphical icons that prohibit illegal dumping, must be posted at designated public access points along channels and streams within the project area. Consult with Los Angeles County Department of Public Works (LACDPW) staff to determine specific signage requirements for channels and streams.
- Storm drain message markers, placards, concrete stamps, or stenciled language/icons (e.g., “No Dumping – Drains to the Ocean”) are required at all storm drain inlets and catch basins within the project area to discourage illegal or inadvertent dumping. Signs should be placed in clear sight facing anyone approaching the storm drain inlet or catch basin from either side (see Figure D-1 and Figure D-2). LACDPW staff should be contacted to determine specific requirements for types of signs and methods of application. A stencil can be purchased for a nominal fee from LACDPW Building and Safety Office by calling (626) 458-3171. All storm drain inlet and catch basin locations must be identified on the project site map.

Maintenance Requirements

Legibility and visibility of markers and signs should be maintained (e.g., signs should be repainted or replaced as necessary). If required by LACDPW, the owner/operator or homeowner’s association shall enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards and signs.

S-1: Storm Drain Message and Signage

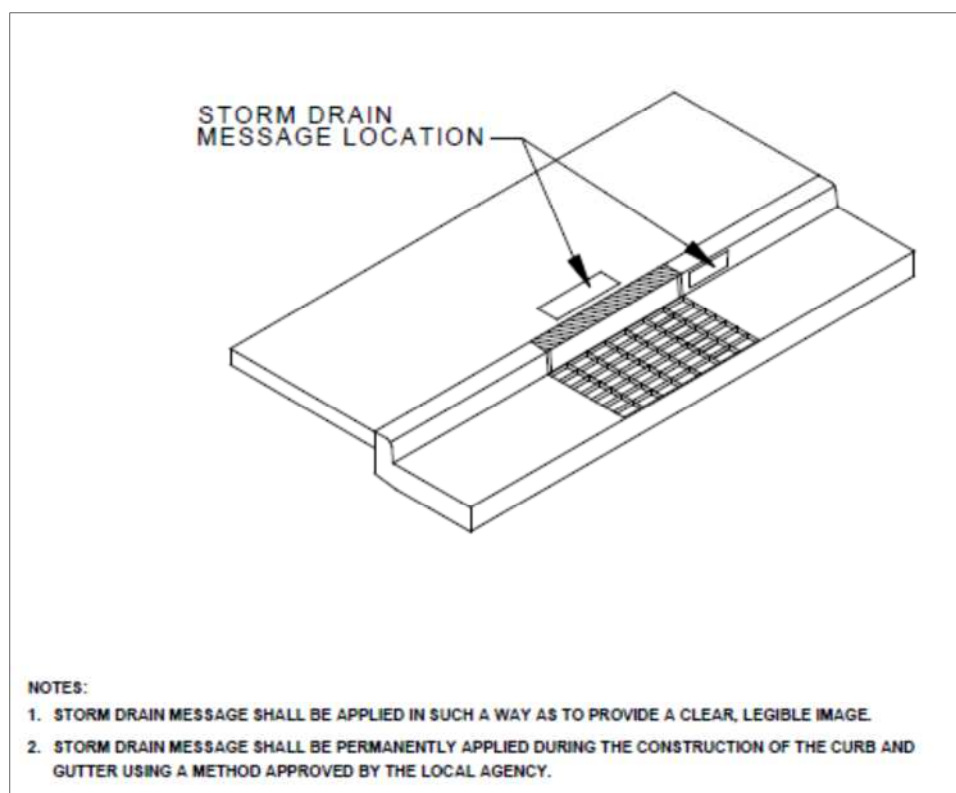


Figure D-1. Storm Drain Message Location – Curb Type Inlet

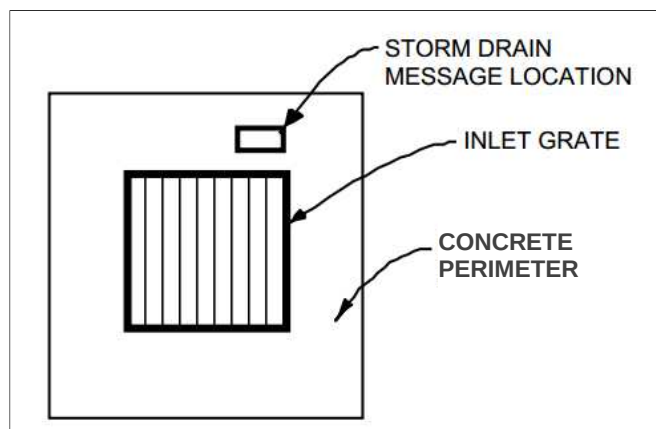


Figure D-2. Storm Drain Message Location – Catch Basin/Area Type Inlet

S-3: Outdoor Trash Storage and Waste Handling Area

Purpose

Stormwater runoff from areas where trash is stored or handled can be polluted. Loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or receiving waters. Waste handling operations (i.e., dumpsters, litter control, waste piles) may be sources of stormwater pollution.

Design Specifications

Wastes from commercial and industrial sites are typically hauled away for disposal by either public or commercial carriers that may have design or access requirements for waste storage areas. Design specifications for waste handling areas are regulated by local building and fire codes and by current County ordinances and zoning requirements. The design specifications, listed below in Table D-3, are recommendations and are not intended to conflict with requirements established by the waste hauler. The design specifications are intended to enhance local codes and ordinances while addressing stormwater runoff concerns. The waste hauler should be contacted prior to the design of trash storage and collection areas to determine established and accepted guidelines for designing trash collection areas. All hazardous waste must be handled in accordance with the legal requirements established in Title 22 of the California Code of Regulations. Conflicts or issues should be discussed with LACDPW staff.

Table D-3. Design Specifications for Outdoor Trash Storage and Waste Handling Area

Design Feature	Design Specifications
Surfacing	Construct/pave outdoor trash storage and waste handling area with Portland cement concrete or an equivalent impervious surface.
Screens/Covers	- Install a screen or wall around trash storage area to prevent off-site transport of loose trash. - Use lined bins or dumpsters to reduce leaking of liquid wastes. - Use waterproof lids on bins/dumpsters or provide a roof to cover storage area enclosure (LACDPW discretion) to prevent precipitation from entering containers.
Grading/Drainage	- Berm and/or grade waste handling area to prevent stormwater run-on. - Locate waste handling area at least 35 feet from storm drains. - Divert drainage from adjoining roofs and pavement away from adjacent trash storage areas.
Signs	Post signs on all dumpsters and/or inside enclosures prohibiting disposal of liquids and hazardous materials in accordance with any waste disposal ordinance.

S-3: Outdoor Trash Storage and Waste Handling Area

Accumulated Water

Stormwater runoff, non-stormwater runoff, and spills will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and regulations, and cannot be discharged directly to the storm drain or sanitary sewer system without appropriate permitting. Contact LACDPW (1-888-CLEAN-LA) for information regarding discharge of contaminated accumulated water.

Maintenance Requirements

The integrity of structural elements that are subject to damage (e.g., screens, covers, signs) must be maintained by the owner/operator as required by local codes and ordinances. Outdoor trash storage and waste handling areas must be checked periodically to ensure containment of accumulated water and prevention of stormwater run-on. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

S-4: Outdoor Loading/Unloading Dock Area

Purpose

Materials spilled, leaked, or lost during loading or unloading may collect on impervious surfaces or in the soil and be carried away by stormwater runoff or when the area is cleaned. Precipitation may also wash pollutants from machinery used to load or unload materials. In particular, loading docks have the potential to contribute heavy metals, nutrients, suspended solids, oils, and grease to stormwater runoff due to the heavy truck traffic and loading and unloading activities. Depressed loading docks (e.g., truck wells) are contained areas that can also accumulate water.

Design Specifications

Design specifications for outdoor loading/unloading dock areas are regulated by local building and fire codes and by current County ordinances and zoning requirements. Additionally, individual businesses may have their own design or access requirements for loading docks. Design specifications presented in this fact sheet are intended to enhance and be consistent with these code and ordinance requirements while addressing stormwater runoff concerns. The design specifications presented in Table D-4 are not intended to conflict with requirements established by individual businesses, but should be followed to the maximum extent practicable.

Accumulated Water

Stormwater runoff, non-stormwater runoff, and spills will accumulate in containment areas and sumps with impervious surfaces, such as depressed loading docks. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without appropriate permitting. Contact LACDPW (1-888-CLEAN-LA) for information regarding discharge of contaminated accumulated water.

Maintenance Requirements

The integrity of structural elements that are subject to damage (e.g., covers, signs) must be maintained by the owner/operator as required by local codes and ordinances. If a water quality inlet or infiltration system is installed, it must be maintained as indicated by the manufacturer or installer. Outdoor loading/unloading dock areas must be checked periodically to ensure containment of accumulated water and prevention of stormwater run-on. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

S-4: Outdoor Loading/Unloading Dock Area

Table D-4. Design Specifications for Outdoor Loading/Unloading Dock Area

Design Feature	Design Specifications
Surfacing	Construct/pave outdoor loading/unloading dock areas with Portland cement concrete or an equivalent impervious surface. Ensure that the surfacing material is chemically-resistant to materials being handled in the loading/unloading dock area.
Covers	- Cover outdoor loading/unloading dock areas to a distance of at least 10 feet beyond the loading dock or building face if there is no raised dock. If the cover or roof structure does not include sidewalls, then the roof overhang must extend beyond the grade break. The overhang must extend a minimum of 20 percent of the roof height. - For interior transfer bays, provide a minimum 10-foot “No Obstruction Zone” to allow trucks or trailers to extend at least 5 feet inside the building. Identify “No Obstruction Zone” clearly on site plans and paint zone with high visibility floor paint. - If covers or interior transfer bays are not feasible, install a seal or door skirt and provide a cover to shield all material transfers between trailers and building. - LACDPW may grant waivers for covers on a case-by-case basis.
Hydraulic Isolation/Drainage	- For outdoor loading/unloading dock areas, hydraulically-isolate the first six feet of paved area measured from the building or dock face with grading, berms, or drains to prevent stormwater run-on from surrounding areas or roof drains. Direct stormwater runoff (e.g., from downspouts/roofs) and drainage from surrounding areas away from hydraulically-isolated areas to a stormwater runoff discharge point that meets all applicable LID Standards Manual requirements. - For interior transfer bays or bay doors, prevent stormwater runoff from surrounding areas from entering the building with grading or drains. Do not install interior floor drains in the “No Obstruction Zone”. Hydraulically-isolate the “No Obstruction Zone” from any interior floor drains. - Do not install direct connections to storm drains from depressed loading docks. Connect drains or direct drainage from hydraulically-isolated loading/unloading dock area to an approved sediment/oil/water separator system connected a discharge location as determined by LACDPW. Provide a manual emergency spill diversion valve upstream of separator system to direct flow, in the event of a spill, to an approved spill containment vault sized to contain a volume equal to 125% of largest container handled at the facility. Provide additional emergency means, such as drain plugs or drain covers, to prevent spills or contaminated stormwater runoff from entering the storm drain system.

S-8: Landscape Irrigation Practices

Purpose

Irrigation runoff provides a pathway for pollutants (i.e., nutrients, bacteria, organics, sediment) to enter the storm drain system. By effectively irrigating, less runoff is produced resulting in less potential for pollutants to enter the storm drain system.

General Guidance

- Do not allow irrigation runoff from the landscaped area to drain directly to storm drain system.
- Minimize use of fertilizer, pesticides, and herbicides on landscaped areas.
- Plan sites with sufficient landscaped area and dispersal capacity (e.g., ability to receive irrigation water without generating runoff).
- Consult a landscape professional regarding appropriate plants, fertilizer, mulching applications, and irrigation requirements (if any) to ensure healthy vegetation growth.

Design Specifications

- Choose plants that minimize the need for fertilizer and pesticides.
- Group plants with similar water requirements and water accordingly.
- Use mulch to minimize evaporation and erosion.
- Include a vegetative boundary around project site to act as a filter.
- Design the irrigation system to only water areas that need it.
- Install an approved subsurface drip, pop-up, or other irrigation system.¹ The irrigation system should employ effective energy dissipation and uniform flow spreading methods to prevent erosion and facilitate efficient dispersion.
- Install rain sensors to shut off the irrigation system during and after storm events.
- Include pressure sensors to shut off flow-through system in case of sudden pressure drop. A sudden pressure drop may indicate a broken irrigation head or water line.
- If the hydraulic conductivity in the soil is not sufficient for the necessary water application rate, implement soil amendments to avoid potential geotechnical hazards (i.e., liquefaction, landslide, collapsible soils, and expansive soils).

¹ If alternative distribution systems (e.g., spray irrigation) are approved, the County will establish guidelines to implement these new systems.

S-8: Landscape Irrigation Practices

- For sites located on or within 50 feet of a steep slope (15% or greater), do not irrigate landscape within three days of a storm event to avoid potential geotechnical instability.²
- Implement Integrated Pest Management practices.

For additional guidelines and requirements, refer to the Los Angeles County Department of Health Services.

Maintenance Requirements

Maintain irrigation areas to remove trash and debris and loose vegetation. Rehabilitate areas of bare soil. If a rain or pressure sensor is installed, it should be checked periodically to ensure proper function. Inspect and maintain irrigation equipment and components to ensure proper functionality. Clean equipment as necessary to prevent algae growth and vector breeding. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

² As determined by the City of Los Angeles, Building and Safety Division

APPENDIX G

MAINTENANCE AND INSPECTION FACT SHEETS

Infiltration Facility Operations and Maintenance

General Requirements

Infiltration facility maintenance should include frequent inspections to ensure that water infiltrates into the subsurface completely within the recommended infiltration time of 72 hours or less after a storm (see Appendix E for guidance on facility inspection and Appendix F for an infiltration inspection and maintenance checklist).

Maintenance and regular inspections are of primary importance if infiltration basins and trenches are to continue to function as originally designed. A specific maintenance plan shall be developed specific to each facility outlining the schedule and scope of maintenance operations, as well as the documentation and reporting requirements. The following are general maintenance requirements:

1. Regular inspection should determine if the sediment pretreatment structures require routine maintenance.
2. If water is noticed in the basin more than 72 hours after a major storm or in the observation well of the infiltration trench more than 48 hours after a major storm, the infiltration facility may be clogged. Maintenance activities triggered by a potentially clogged facility include:
 - Check for debris/sediment accumulation, rake surface and remove sediment (if any) and evaluate potential sources of sediment and vegetative or other debris (e.g., embankment erosion, channel scour, overhanging trees, etc). If suspected upland sources are outside of the County's jurisdiction, additional pretreatment operations (e.g., trash racks, vegetated swales, etc.) may be necessary.
 - For basins, removal of the top layer of native soil may be required to restore infiltrative capacity.
 - For trenches, assess the condition of the top aggregate layer for sediment buildup and crusting. Remove top layer of pea gravel and replace. If slow draining conditions persist, entire trench may need to be excavated and replaced.
3. Any debris or algae growth located on top of the infiltration facility should be removed and disposed of properly.
4. Facilities should be inspected annually. Trash and debris should be removed as needed, but at least annually prior to the beginning of the wet season.
5. Site vegetation should be maintained as frequently as necessary to maintain the aesthetic appearance of the site, and as follows:
 - Vegetation, large shrubs, or trees that limit access or interfere with basin operation should be pruned or removed.

- Slope areas that have become bare should be revegetated and eroded areas should be regraded prior to being revegetated.
 - Grass should be mowed to 4"-9" high and grass clippings should be removed.
 - Fallen leaves and debris from deciduous plant foliage should be raked and removed.
 - Invasive vegetation, such as Alligatorweed (*Alternanthera philoxeroides*), Halogeton (*Halogeton glomeratus*), Spotted Knapweed (*Centaurea maculosa*), Giant Reed (*Arundo donax*), Castor Bean (*Ricinus communis*), Perennial Pepperweed (*Lepidium latifolium*), and Yellow Starthistle (*Centaurea solstitialis*) must be removed and replaced with non-invasive species. Invasive species should never contribute more than 25% of the vegetated area. For more information on invasive weeds, including biology and control of listed weeds, look at the "encycloweedia" located at the California Department of Food and Agriculture website at <http://www.cdfa.ca.gov/wma> or the California Invasive Plant Council website at <http://portal.cal-ipc.org/weedlist>.
 - Dead vegetation should be removed if it exceeds 10% of area coverage. Vegetation should be replaced immediately to maintain cover density and control erosion where soils are exposed.
6. For infiltration basins, sediment buildup exceeding 50% of the forebay sediment storage capacity, as indicated by the steel markers, should be removed. Sediment from the remainder of the basin should be removed when 6 inches of sediment accumulates. Sediments should be tested for toxic substance accumulation in compliance with current disposal requirements if visual or olfactory indications of pollution are noticed. If toxic substances are encountered at concentrations exceeding thresholds of Title 22, Section 66261 of the California Code of Regulations, the sediment must be disposed of in a hazardous waste landfill and the source of the contaminated sediments should be investigated and mitigated to the extent possible.
7. Following sediment removal activities, replanting and/or reseedling of vegetation may be required for reestablishment.

Maintenance Standards

A summary of the routine and major maintenance activities recommended for infiltration facilities is shown in Table 6-1. Detailed routine and major maintenance standards are listed in Tables 6-2 and 6-3.

Table 6-1: Infiltration Facility Routine and Major Maintenance Quick Guide

Inspection and Maintenance Activities Summary	
Routine Maintenance	• Remove trash and debris as required • Repair and reseed erosion near inlet if necessary • Remove any visual evidence of contamination from floatables such as oil and grease • Clean under-drain (if present) and outlet piping to alleviate ponding and restore infiltrative capacity. • Remove minor sediment accumulation, debris and obstructions near inlet and outlet structures as needed • Mow routinely to maintain ideal grass height and to suppress weeds • Periodically observe function under wet weather conditions • Take photographs before and after maintenance (encouraged)
Major Maintenance	• Clean out under-drains if present to alleviate ponding. Replace media if ponding or loss of infiltrative capacity persists and revegetate • Repair structural damage to flow control structures including inlet, outlet and overflow structures • De-thatch grass to remove accumulated sediment and aerate compacted areas to promote infiltration

APPENDIX H

INFILTRATION REPORT

August 23, 2022

Covington Development Group, Inc.
3 Corporate Plaza, Suite 230
Newport Beach, California 92660



**SOUTHERN
CALIFORNIA
GEOTECHNICAL**
A California Corporation

Attention: Mr. Michael Di Sano
Sr. Director - Entitlements

Project No.: **22G164-2**

Subject: **Results of Infiltration Testing**
Proposed Warehouse Development
SWC West Avenue M and Division Street
Palmdale, California

Reference: Geotechnical Investigation, Proposed Warehouse Development, SWC West Avenue M and Division Street, Palmdale, California, Prepared by Southern California Geotechnical, Inc. (SCG) for Covington Development Group, Inc., SCG Project No. 22G164-1, dated August 22, 2022.

Mr. Di Sano:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in accordance with our Proposal No. 22P122, dated January 11, 2022. The scope of the infiltration testing consisted of site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published by the County of Los Angeles – Department of Public Works Geotechnical and Materials Engineering Division. These guidelines are dated June 30, 2021 and titled Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration, GS200.1.

Site Description

The subject site is located at the southwest corner of West Avenue M and Division Street in Palmdale, California. The site is bounded to the north by West Avenue M, to the east by a dirt road (the future continuation of Division Street), to the south by a vacant lot, and to the west by portions of the Amargosa Creek. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The site consists of a rectangular-shaped property 78.68± acres in size. The site is currently vacant and undeveloped. The ground surface consists of exposed soil with sparse native vegetation, including minor shrubs and few Joshua trees spread throughout the site. A few dirt

roads are present on the site, trending north to south, and along the eastern boundary of the site.

Detailed topographic information was not available at the time of this report. Based on the elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the overall site topography slopes downward to the north at a gradient of $1\pm$ percent. It should be noted that portions of the existing Amargosa Creek are within the project boundary. However, the proposed development will exclude any construction within these areas.

Proposed Development

A conceptual site plan prepared by HPA, Inc., has been provided to our office by the client. Based on this plan, the subject site will be developed with two (2) warehouses (identified as Building 1 and Building 2). Building 1 will be $716,930\pm$ ft² in size and will be located in the western region of the site. Building 2 will be $712,770\pm$ ft² in size and will be located in the eastern region of the site. Dock-high doors will be constructed on the south and north sides of the buildings. The proposed buildings are expected to be surrounded by asphaltic concrete pavements in the parking and drive areas, Portland cement concrete pavements in the loading dock areas, and concrete flatwork and landscaped planters throughout the site.

We understand that this project may include on-site storm water infiltration. The conceptual site plan indicates that two (2) detention basins will be included with the proposed development. The proposed basins will be located north of the proposed buildings. The depths of the proposed basins were unknown at the time of this report. Based on our experience with similar projects, the bottom of each basin is expected to be $15\pm$ feet below the existing site grades.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site, referenced above. As a part of this study, twelve (12) borings (identified as Boring Nos. B-1 through B-12) were advanced to depths of 15 to $25\pm$ feet below the existing site grades.

Native alluvium was encountered at the ground surface at all of the boring locations, extending to at least the maximum depth explored of $25\pm$ feet. Most of the borings encountered loose sands and silty sands with varying clay content, extending to depths of 3 to $5\frac{1}{2}\pm$ feet, and occasional loose sands between $5\frac{1}{2}$ to $10\frac{1}{2}\pm$ feet. At greater depths and extending to at least the maximum depth explored of $25\pm$ feet, the alluvium generally consists of medium dense to dense sands and silty sands with varying fine to coarse gravel and clay content, and occasional medium dense gravelly sands. Boring No. B-8 encountered a stratum consisting of medium dense silty sands to sandy silts at a depth of $5\frac{1}{2}$ to $8\pm$ feet. Boring No. B-11 encountered a stratum consisting of medium dense clayey sands at a depth of 12 to $20\pm$ feet.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a greater depth than $25\pm$ feet below existing site grades.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the historic groundwater depths in this area is the California Geological Survey (CGS) Seismic Hazard Zone Report 095, Seismic Hazard Zone Report for the Lancaster West 7.5-Minute Quadrangle, which indicates that the historic high groundwater level for the site is approximately 400 feet below the ground surface.

As a part of our research, we reviewed available groundwater data in order to determine groundwater levels for the site. Water level data was obtained from the California Department of Water Resources website, <https://wdl.water.ca.gov/waterdatalibrary/>. Several monitoring wells are located within 1 mile radius of the site. Water level readings within these monitoring wells indicate a high groundwater level of 121± feet below the ground surface in February 1922. medium

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of four (4) infiltration test borings advanced to a depth of 15± feet below the existing site grades. The borings were logged during drilling by a member of our staff and were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-1 through I-4) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native alluvium was encountered at the ground surface at all of the infiltration test locations, extending to at least the maximum depth explored of 15± feet below the existing site grades. The alluvium generally consists of loose to medium dense fine to coarse sands and silty sands with varying fine to coarse gravel and clay content, and occasional dense silty sands with trace clay. Infiltration Test No. I-3 encountered a stratum consisting of gravelly sands at a depth of 8 to 15± feet. The Boring Logs, which illustrate the conditions encountered at each test location are included within this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration systems that will be used at the subject site. The infiltration testing was performed in general accordance with the guidelines published by the County of Los Angeles – Department of Public Works Geotechnical and Materials Engineering Division. These guidelines are dated June 30, 2021 and titled Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration, GS200.1.

Pre-soaking

The infiltration test boring was pre-soaked for at least 1 hour to ensure the sand around the annulus of the perforated pipe was fully saturated. The pre-soaking procedure consisted of filling each test boring with clean potable water to an elevation of at least 12± inches above the bottom of each test boring. In accordance with the Los Angeles County guidelines, since the water in the infiltration test borings did not completely infiltrate within a 30-minute time period after filling each boring, a falling head test was the appropriate test method. Based on the conditions encountered at each of the infiltration test borings, 14-minute measurement intervals were assigned at Infiltration Test No. I-1, and 30-minute measurement intervals were assigned at Infiltration Test Nos. I-2, I-3 and I-4.

Infiltration Testing Procedure

After the completion of the pre-soaking process, SCG performed the infiltration testing. A sufficient amount of water was added to the test borings so that the water level was approximately 3± feet higher than the bottom of the borings and less than or equal to the water level used during the pre-soaking process. As indicated above, 14-minute measurement intervals were assigned at Infiltration Test No. I-1, and 30-minute measurement intervals were assigned at Infiltration Test Nos. I-2, I-3 and I-4. A stabilized rate of drop, where the highest and lowest readings from three consecutive readings are within 10 percent of each other, was obtained for each of the test borings. These water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates for the tests are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used for design. These rates are summarized below:

<u>Infiltration Test No.</u>	<u>Depth (feet)</u>	<u>Soil Description</u>	<u>Measured Infiltration Rate (inches/hour)</u>
I-1	15	Light Gray Brown to Gray Brown fine to coarse Sand, trace to little Silt	15.0
I-2	15	Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel, trace Clay	6.6
I-3	15	Light Gray Brown Gravelly fine to coarse Sand, trace Silt	5.1
I-4	15	Brown Silty fine to coarse Sand, trace Clay	5.8

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-4 of this report.

Design Recommendations

Four (4) infiltration tests were performed in the northwestern, north of Building 1, and northeastern, north of Building 2, areas of the site. The measured infiltration rates at these infiltration test locations ranged from 5.1 to 15.0 inches per hour. The Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration, GS200.1 prepared by the County of Los Angeles, Department of Public Works, Geotechnical and Materials Division (GMED) on June 30, 2021 dictate that a reduction factor be utilized in the design infiltration rate. The following reduction factors are considered in the design infiltration rate (DIR):

Reduction Factors	
Small Diameter Boring	$RF_t = 1$
Site Variability, number of tests, and thoroughness of subsurface investigation	$RF_v = 1$
Long-term siltation plugging and maintenance	$RF_s = 1$
Total Reduction Factor, $RF = RF_t + RF_v + RF_s$	$RF = 3$
Design Infiltration Rate (DIR) = Measured Percolation Rate/ RF	DIR = See Below

Based on the results of the infiltration testing, the following infiltration rates should be used in the design of the infiltration systems in their respective locations and depths:

<u>Infiltration System</u>	<u>Design Infiltration Rate (inches/hour)</u>
Detention Basin "A"	2.2
Detention Basin "B"	1.7

The design of the proposed storm water infiltration systems should be performed by the project civil engineer, in accordance with the City of Palmdale and/or County of Los Angeles guidelines. However, it is recommended that the systems be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rate recommended above is based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at four (4) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein were determined in accordance with the Los Angeles County guidelines and are considered valid only for the time and place of the actual tests. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grain size distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration systems can significantly reduce the infiltration ability of the systems. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each infiltration system. The infiltration rate of the system will likely vary significantly if the composition of the soil located beneath the system is not consistent with the tested soils.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the system bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Basin Maintenance

The proposed project will include infiltration basins. Water flowing into these basins will carry some level of sediment. Wind-blown sediments and erosion of the basin side walls will also contribute to sediment deposition at the bottom of the basin. This layer has the potential to significantly reduce the infiltration rate of the basin subgrade soils. Therefore, a formal basin maintenance program should be established to ensure that these silt and clay deposits are

removed from the basin on a regular basis. Appropriate vegetation on the basin sidewalls and bottom may reduce erosion and sediment deposition.

Basin maintenance should also include measures to prevent animal burrows, and to repair any burrows or damage caused by such. Animal burrows in the basin sidewalls can significantly increase the risk of erosion and piping failures.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration systems.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

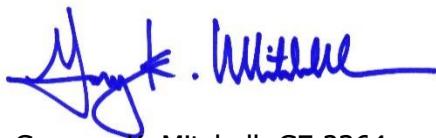
We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.



Joseph Lozano Leon
Staff Engineer

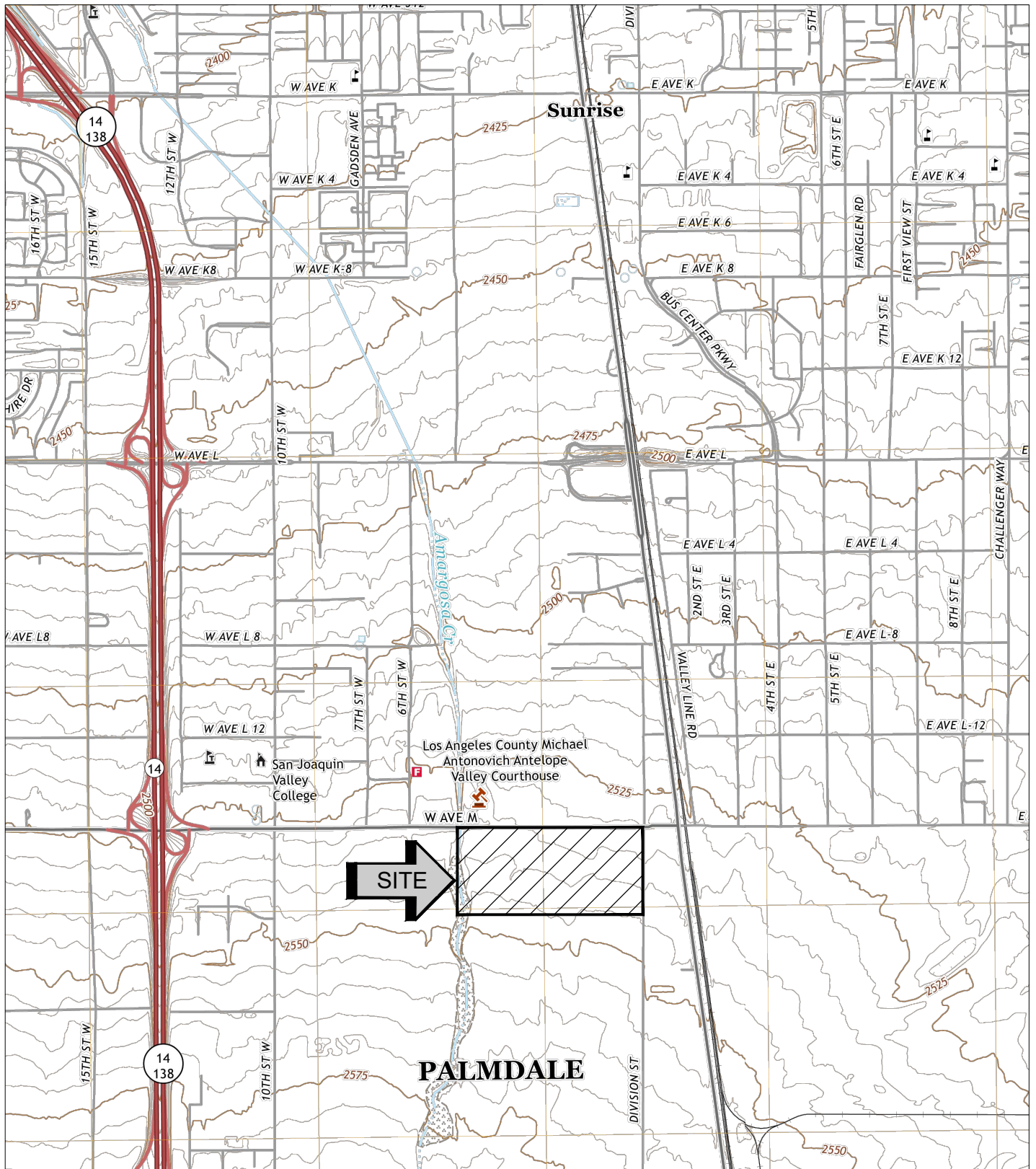


Gregory K. Mitchell, GE 2364
Principal Engineer



Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (6 pages)
Infiltration Test Results Spreadsheets (4 pages)
Grain Size Distribution Graphs (4 pages)



SOURCE: USGS TOPOGRAPHIC MAPS OF THE LANCASTER
EAST QUADRANGLE AND LANCASTER WEST QUADRANGLE,
LOS ANGELES COUNTY, CALIFORNIA, 2021.



SITE LOCATION MAP

PROPOSED WAREHOUSE DEVELOPMENT

PALMDALE, CALIFORNIA

SCALE: 1" = 2000'

DRAWN: JLL

CHKD: GKM

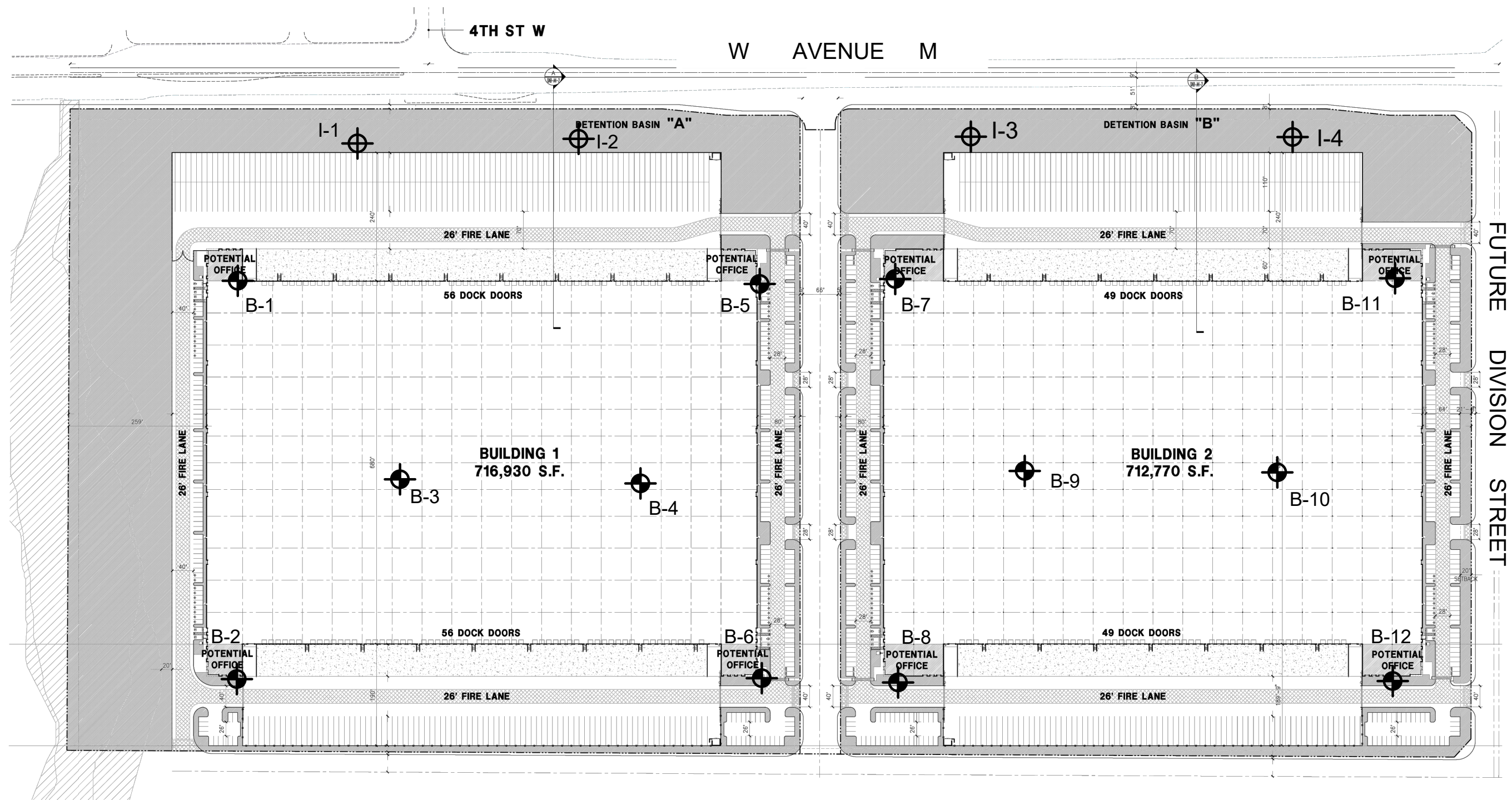
SCG PROJECT

22G164-2

PLATE 1



**SOUTHERN
CALIFORNIA
GEOTECHNICAL**



GEOTECHNICAL LEGEND

⊕ APPROXIMATE INFILTRATION TEST LOCATION

⊕ APPROXIMATE BORING LOCATION FROM CONCURRENT STUDY (SCG PROJECT NO. 22G164-1)



NOTE: CONCEPTUAL SITE PLAN PROVIDED BY HPA, INC.

INFILTRATION TEST LOCATION PLAN PROPOSED WAREHOUSE DEVELOPMENT PALMDALE, CALIFORNIA

SCALE: 1" = 200'

DRAWN: JLL

CHKD: GKM

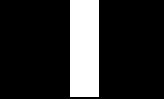
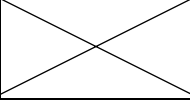
SCG PROJECT
22G164-2

PLATE 2



SOUTHERN
CALIFORNIA
GEOTECHNICAL

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH:

Distance in feet below the ground surface.

SAMPLE:

Sample Type as depicted above.

BLOW COUNT:

Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.:

Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG:

Graphic Soil Symbol as depicted on the following page.

DRY DENSITY:

Dry density of an undisturbed or relatively undisturbed sample in lbs/ft³.

MOISTURE CONTENT:

Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT:

The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT:

The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE:

The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR:

The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
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 (LITTLE OR NO FINES)		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 (APPRECIABLE AMOUNT OF 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 ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS 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 OR 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
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



JOB NO.: 22G164-2	DRILLING DATE: 7/19/22	WATER DEPTH: Dry
PROJECT: Proposed Warehouse Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: ---
LOCATION: Palmdale, California	LOGGED BY: Michelle Krizek	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: --- MSL							
5 <												

TBL 22G164-2.GPJ SoCALGEO.GDT 8/23/22



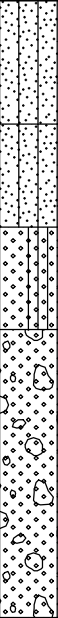
JOB NO.: 22G164-2	DRILLING DATE: 7/19/22	WATER DEPTH: Dry
PROJECT: Proposed Warehouse Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: ---
LOCATION: Palmdale, California	LOGGED BY: Michelle Krizek	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS					COMMENTS	
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)		ORGANIC CONTENT (%)
SURFACE ELEVATION: --- MSL												
5		6			ALLUVIUM: Light Brown to Brown Silty fine Sand, trace medium to coarse Sand, trace fine Gravel, trace fine root fibers, medium dense-dry		1					
		6			Light Brown to Brown fine to coarse Sand, little Silt, trace fine to coarse Gravel, loose-dry		1					
		43			Light Gray Brown fine to coarse Sand, little Silt, little fine Gravel, medium dense to dense-dry		2					
		22					2					
10												
15		30			Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel, trace Clay, dense-damp		4			29		
	Boring Terminated at 15'											

TBL 22G164-2.GPJ SOCALGEO.GDT 8/23/22



JOB NO.: 22G164-2	DRILLING DATE: 7/19/22	WATER DEPTH: Dry
PROJECT: Proposed Warehouse Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: ---
LOCATION: Palmdale, California	LOGGED BY: Michelle Krizek	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
SURFACE ELEVATION: --- MSL												
5		8			ALLUVIUM: Light Brown to Brown Silty fine Sand, trace medium Sand, loose-dry		2					
		11			Light Gray Brown Silty fine to coarse Sand, trace fine Gravel, medium dense-dry		1					
		14			Brown fine to coarse Sand, trace fine Gravel, little Silt, medium dense-dry		1					
		16			Light Gray Brown Gravelly fine to coarse Sand, trace Silt, medium dense-dry		1					
10												
		20					1			3		
15					Boring Terminated at 15'							

TBL 22G164-2.GPJ SOCALGEO.GDT 8/23/22



JOB NO.: 22G164-2	DRILLING DATE: 7/19/22	WATER DEPTH: Dry
PROJECT: Proposed Warehouse Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: ---
LOCATION: Palmdale, California	LOGGED BY: Michelle Krizek	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS					COMMENTS	
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)		ORGANIC CONTENT (%)
SURFACE ELEVATION: --- MSL												
		10			ALLUVIUM: Light Brown to Brown Silty fine to medium Sand, trace coarse sand, trace fine Gravel, medium dense-dry		2					
5		6			Brown fine to medium Sand, trace coarse Sand, trace fine Gravel, little Silt, loose to medium dense-dry		2					
		10					1					
10		29					2					
		30			Brown Silty fine to coarse Sand, trace Clay, dense-dry		1		28			
15					Boring Terminated at 15'							

TBL 22G164-2.GPJ SOCALGEO.GDT 8/23/22

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Palmdale, California
Project Number	22G164-2
Engineer	Michelle Krizek

Test Hole Radius	4.00 (in)
Test Depth	14.92 (ft)

Infiltration Test Hole	I-1
------------------------	-----

Start Time for Pre-Soak	8:48 AM	Water Remaining in Boring (Y/N)	N
Start Time for Standard	9:48 AM	Time Interval Between Readings	14

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	11:10 AM	14.0	11.92	2.99	1.5	15.3	3.0	5.1
	Final	11:24 AM		14.91					
2	Initial	11:24 AM	14.0	11.92	3.00	1.5	15.4	3.0	5.1
	Final	11:38 AM		14.92					
3	Initial	11:38 AM	14.0	11.92	2.98	1.5	15.2	3.0	5.1
	Final	11:52 AM		14.90					
4	Initial	11:52 AM	14.0	11.92	2.96	1.5	15.0	3.0	5.0
	Final	12:06 PM		14.88					
5	Initial	12:06 PM	14.0	11.92	2.96	1.5	15.0	3.0	5.0
	Final	12:20 PM		14.88					
6	Initial	12:20 PM	14.0	11.92	2.96	1.5	15.0	3.0	5.0
	Final	12:34 PM		14.88					

Design Infiltration Rate = (Measured Infiltration Rate)/(Reduction Factor)

Reduction Factor (RF) = $RF_t + RF_v + RF_s$

Reduction Factors	
Double-ring Infiltrometer	$RF_t = 1 \text{ to } 3$
Shallow Test Pit	
Small Diameter Boring	
Large Diameter Boring	
High Flow-rate	$RF_t = 3$
Grain Size Analysis Method	$RF_t = 2 \text{ to } 3$
Site variability, number of tests and	$RF_v = 1 \text{ to } 3$
Long-term siltation, plugging, and maintenance	$RF_s = 1 \text{ to } 3$

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

Where:

Q = Measured Infiltration Rate (in inches per hour)
 ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
 Δt = Time Interval
 H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Palmdale, California
Project Number	22G164-2
Engineer	Michelle Krizek

Test Hole Radius	4.00 (in)
Test Depth	14.85 (ft)

Infiltration Test Hole	I-2
------------------------	-----

Start Time for Pre-Soak	2:09 PM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	5:16 PM	Time Interval Between Readings	30

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	5:16 PM	30.0	11.85	2.91	1.5	6.8	3.0	2.3
	Final	5:46 PM		14.76					
2	Initial	5:49 PM	30.0	11.85	2.89	1.6	6.7	3.0	2.2
	Final	6:19 PM		14.74					
3	Initial	6:21 PM	30.0	11.85	2.88	1.6	6.7	3.0	2.2
	Final	6:51 PM		14.73					
4	Initial	6:54 PM	30.0	11.85	2.87	1.6	6.6	3.0	2.2
	Final	7:24 PM		14.72					
5	Initial	7:27 PM	30.0	11.85	2.87	1.6	6.6	3.0	2.2
	Final	7:57 PM		14.72					
6	Initial	8:00 PM	30.0	11.85	2.87	1.6	6.6	3.0	2.2
	Final	8:30 PM		14.72					

Design Infiltration Rate = (Measured Infiltration Rate)/(Reduction Factor)

Reduction Factor (RF) = $RF_t + RF_v + RF_s$

Reduction Factors	
Double-ring Infiltrometer	$RF_t = 1 \text{ to } 3$
Shallow Test Pit	
Small Diameter Boring	
Large Diameter Boring	
High Flow-rate	$RF_t = 3$
Grain Size Analysis Method	$RF_t = 2 \text{ to } 3$
Site variability, number of tests and	$RF_v = 1 \text{ to } 3$
Long-term siltation, plugging, and maintenance	$RF_s = 1 \text{ to } 3$

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

Where:

Q = Measured Infiltration Rate (in inches per hour)

ΔH = Change in Height (Water Level) over the time interval

r = Test Hole (Borehole) Radius

Δt = Time Interval

H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Palmdale, California
Project Number	22G164-2
Engineer	Michelle Krizek

Test Hole Radius	4.00 (in)
Test Depth	14.94 (ft)

Infiltration Test Hole	I-3
------------------------	-----

Start Time for Pre-Soak	2:09 PM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	5:16 PM	Time Interval Between Readings	30

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	5:16 PM	30.0	11.94	2.66	1.7	5.8	3.0	1.9
	Final	5:46 PM		14.60					
2	Initial	5:49 PM	30.0	11.94	2.60	1.7	5.6	3.0	1.9
	Final	6:19 PM		14.54					
3	Initial	6:21 PM	30.0	11.94	2.56	1.7	5.4	3.0	1.8
	Final	6:51 PM		14.50					
4	Initial	6:54 PM	30.0	11.94	2.49	1.8	5.2	3.0	1.7
	Final	7:24 PM		14.43					
5	Initial	7:27 PM	30.0	11.94	2.48	1.8	5.1	3.0	1.7
	Final	7:57 PM		14.42					
6	Initial	8:00 PM	30.0	11.94	2.48	1.8	5.1	3.0	1.7
	Final	8:30 PM		14.42					

Design Infiltration Rate = (Measured Infiltration Rate)/(Reduction Factor)

Reduction Factor (RF) = $RF_t + RF_v + RF_s$

Reduction Factors	
Double-ring Infiltrometer	$RF_t = 1 \text{ to } 3$
Shallow Test Pit	
Small Diameter Boring	
Large Diameter Boring	
High Flow-rate	$RF_t = 3$
Grain Size Analysis Method	$RF_t = 2 \text{ to } 3$
Site variability, number of tests and	$RF_v = 1 \text{ to } 3$
Long-term siltation, plugging, and maintenance	$RF_s = 1 \text{ to } 3$

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

Where:

Q = Measured Infiltration Rate (in inches per hour)

ΔH = Change in Height (Water Level) over the time interval

r = Test Hole (Borehole) Radius

Δt = Time Interval

H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse Development
Project Location	Palmdale, California
Project Number	22G164-2
Engineer	Michelle Krizek

Test Hole Radius	4.00 (in)
Test Depth	14.88 (ft)

Infiltration Test Hole	I-4
------------------------	-----

Start Time for Pre-Soak	2:09 PM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	5:16 PM	Time Interval Between Readings	30

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	5:16 PM	30.0	11.88	2.71	1.6	6.0	3.0	2.0
	Final	5:46 PM		14.59					
2	Initial	5:49 PM	30.0	11.88	2.69	1.7	5.9	3.0	2.0
	Final	6:19 PM		14.57					
3	Initial	6:21 PM	30.0	11.88	2.68	1.7	5.9	3.0	2.0
	Final	6:51 PM		14.56					
4	Initial	6:54 PM	30.0	11.88	2.67	1.7	5.8	3.0	1.9
	Final	7:24 PM		14.55					
5	Initial	7:27 PM	30.0	11.88	2.66	1.7	5.8	3.0	1.9
	Final	7:57 PM		14.54					
6	Initial	8:00 PM	30.0	11.88	2.66	1.7	5.8	3.0	1.9
	Final	8:30 PM		14.54					

Design Infiltration Rate = (Measured Infiltration Rate)/(Reduction Factor)

Reduction Factor (RF) = $RF_t + RF_v + RF_s$

Reduction Factors	
Double-ring Infiltrometer	$RF_t = 1 \text{ to } 3$
Shallow Test Pit	
Small Diameter Boring	
Large Diameter Boring	
High Flow-rate	$RF_t = 3$
Grain Size Analysis Method	$RF_t = 2 \text{ to } 3$
Site variability, number of tests and	$RF_v = 1 \text{ to } 3$
Long-term siltation, plugging, and maintenance	$RF_s = 1 \text{ to } 3$

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

Where:

Q = Measured Infiltration Rate (in inches per hour)

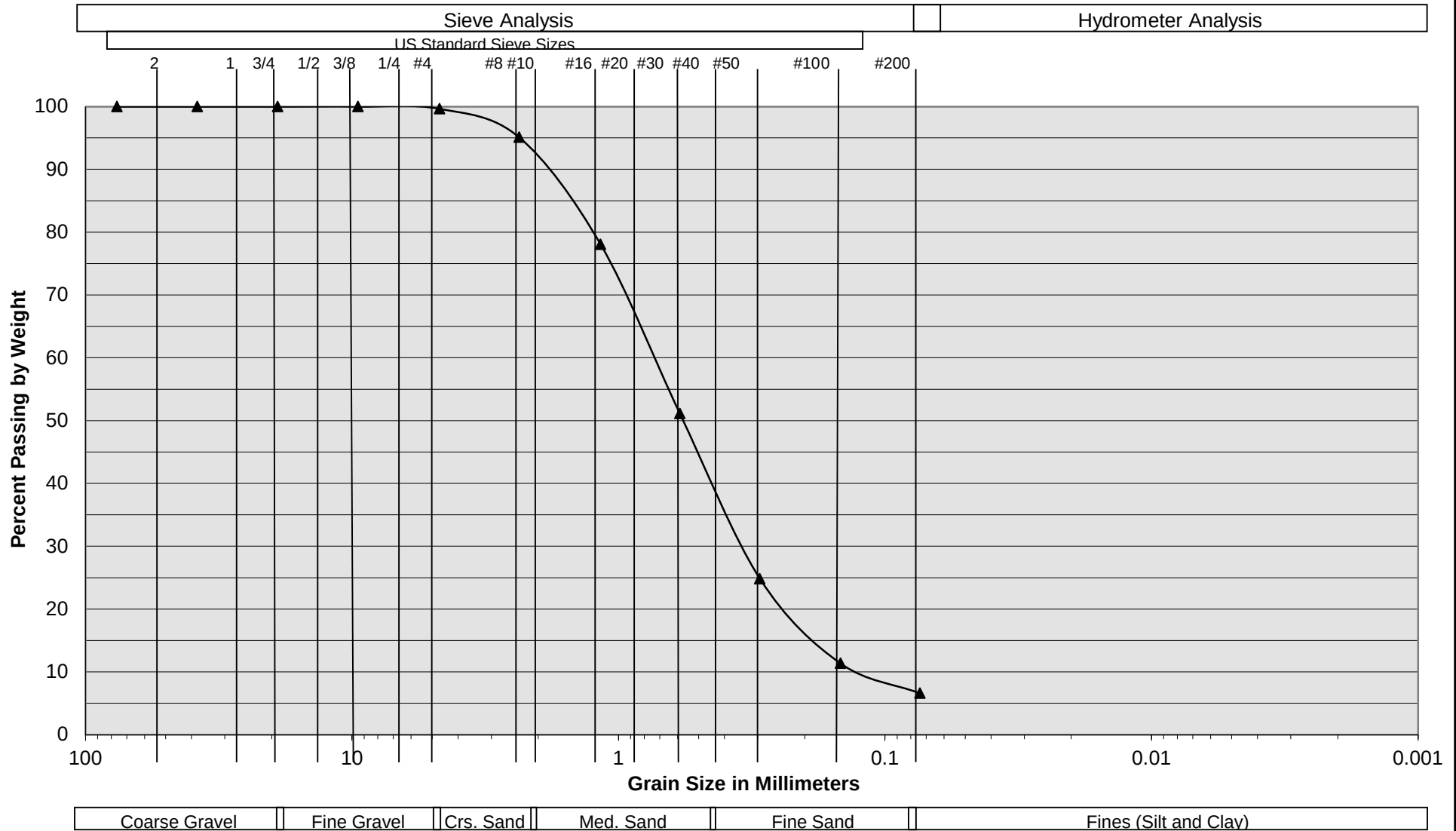
ΔH = Change in Height (Water Level) over the time interval

r = Test Hole (Borehole) Radius

Δt = Time Interval

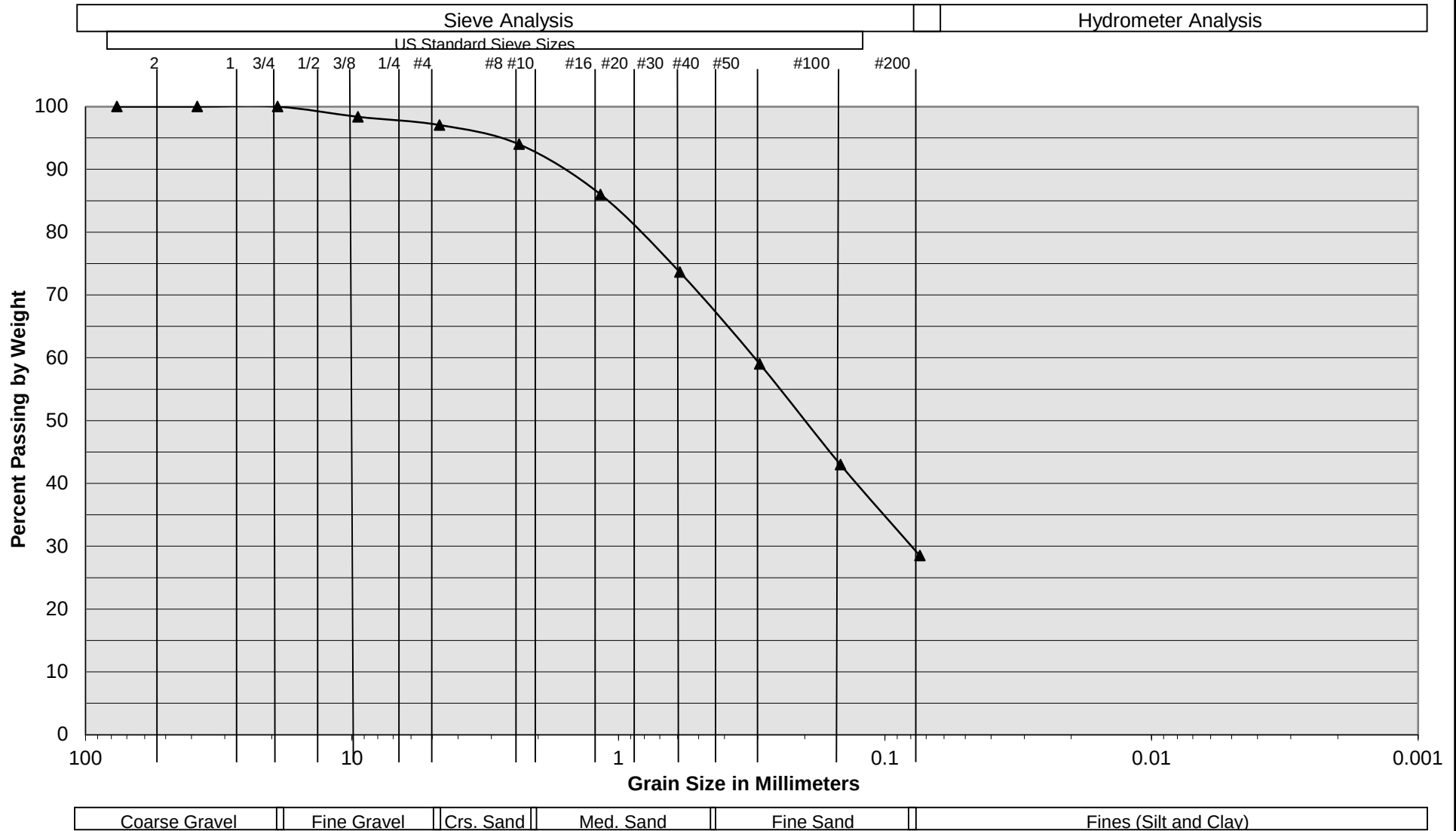
H_{avg} = Average Head Height over the time interval

Grain Size Distribution



Sample Description	I-1 @ 13½'
Soil Classification	Light Gray Brown to Gray Brown fine to coarse Sand, trace to little Silt
Proposed Warehouse Deveopment Palmdale, California Project No. 22G164-2 PLATE C- 1	 SOUTHERN CALIFORNIA GEOTECHNICAL A California Corporation

Grain Size Distribution



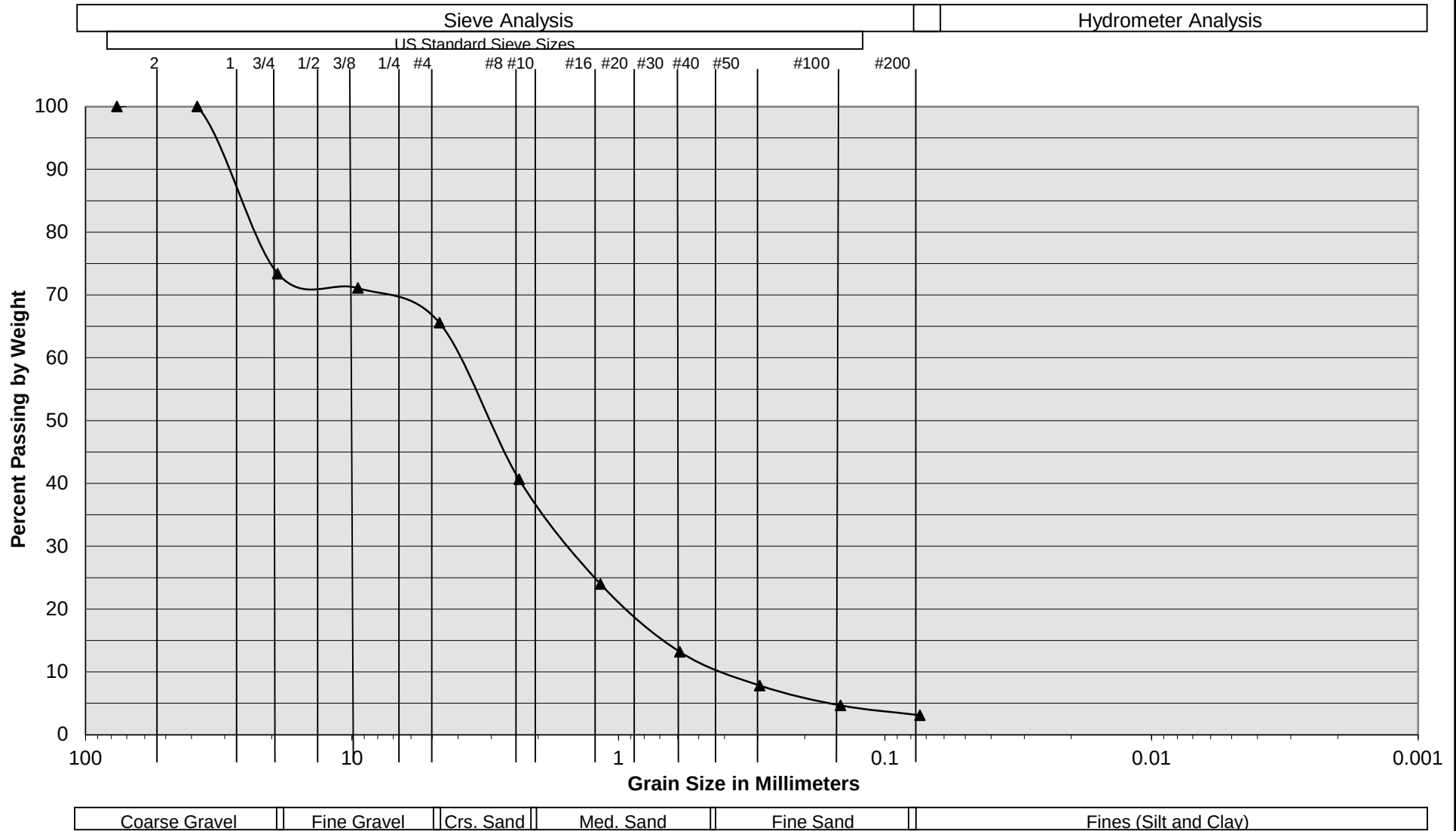
Sample Description	I-2 @ 13½'
Soil Classification	Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel, trace Clay

Proposed Warehouse Deveopment
 Palmdale, California
 Project No. 22G164-2
PLATE C- 2



**SOUTHERN
 CALIFORNIA
 GEOTECHNICAL**
 A California Corporation

Grain Size Distribution



Sample Description

I-3 @ 13½'

Soil Classification

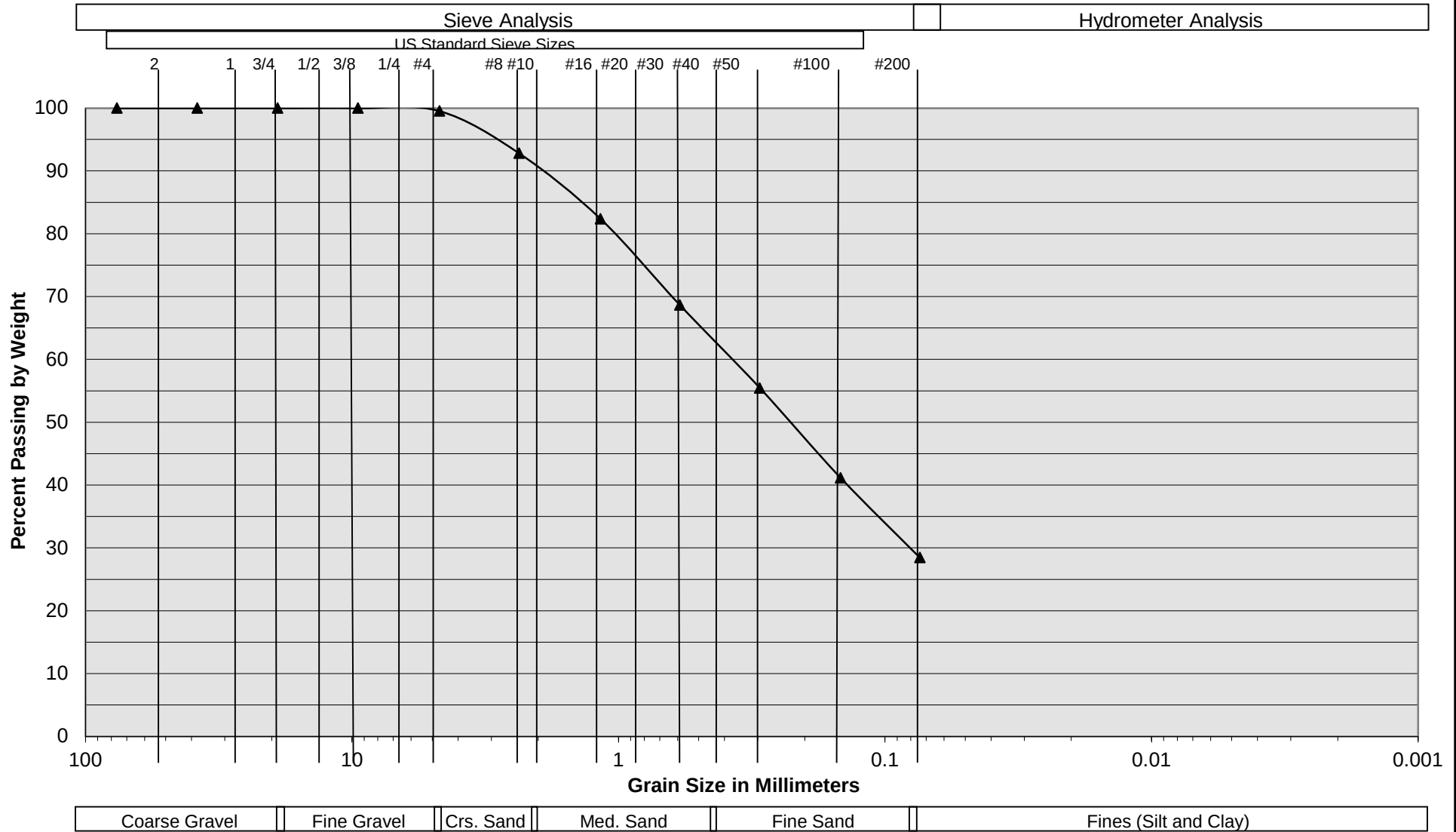
Light Gray Brown Gravelly fine to coarse Sand, trace Silt

Proposed Warehouse Deveopment
Palmdale, California
Project No. 22G164-2
PLATE C- 3



**SOUTHERN
CALIFORNIA
GEOTECHNICAL**
A California Corporation

Grain Size Distribution



Sample Description	I-4 @ 13½'
Soil Classification	Brown Silty fine to coarse Sand, trace Clay
Proposed Warehouse Deveopment Palmdale, California Project No. 22G164-2 PLATE C- 4	 SOUTHERN CALIFORNIA GEOTECHNICAL A California Corporation