PRELIMINARY LID REPORT

for

PALMDALE INDUSTRIAL PARK

South of East Avenue P
Between Sierra Highway and 8th Street East
City of Palmdale, CA 93550

Prepared For:

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Prepared: March 2023
Langan Project No. 722010601

LANGAN

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1.0 INTRODUCTION

The purpose of this preliminary Low Impact Development (LID) report is to show that the proposed development will conform to water quality requirements per the National Pollution Discharge Elimination System (NDPES) MS4 Permit of Los Angeles County. Since the project proposes an industrial park that is greater than one acre and adds more than 10,000 sq. ft. of impervious surface, it is considered a Designated Project. As a Designated Project, it is subject to Los Angeles County LID standards and the City of Palmdale regional standards for water quality requirements. This report will provide preliminary design and analyses of the Storm Water Quality Design Volume (SQWDv) from the 0.75-inch, 24-hour storm event and demonstrate how it will be properly captured and treated on-site through the proposed mitigation strategies.

2.0 PROJECT DESCRIPTION

2.1 Existing Site Description

The Site is located within the City of Palmdale, Los Angeles County in the State of California (see Figure 1 for reference). It is located south of East Avenue P, and is bounded by an existing railroad to the north, Sierra Highway to the west, 8th Street to the east and an existing, private drainage channel to the south. The Site is approximately 18.11 acres and is currently undeveloped. This site has been previously graded, but no development currently exists. The Site is generally flat, flowing from the western edge towards several low points along the eastern boundary. The existing channel running along the southern boundary captures off-site runoff from the west and flows through the site towards the east where it conveys to an existing channel across 8th Street. No groundwater wells exist on site. Per the Geotechnical Report provided, groundwater was not found within 25’ of existing grade.

2.2 Proposed Site Description

The proposed development consists of a 380,000 square foot industrial warehouse facility with loading docks, trailer and car parking, and landscaped areas. See Figure 2 for the proposed site plan. On-site stormwater will be captured through a series of catch basins and storm drains which are routed to various underground infiltration chambers located along the eastern and southern areas of the Site. The captured stormwater will be pre-treated through a hydrodynamic separator prior to entering the chambers. During significant rain events, stormwater will by-pass the hydrodynamic separator and flow directly into the chambers. The underground infiltration chambers will discharge directly into the proposed culverts beneath 8th Street. The existing drainage channel running along the southern border of the site will be redesigned to an earthen channel. It will maintain its existing flow path, which flows from west to east. The earthen channel will collect off-site flows west of the site and flow through the site where it will discharge into the proposed culverts.

3.0 POLLUTANTS OF CONCERN

Since the proposed project is listed as an industrial use, certain pollutants are anticipated to be generated based on the LA County LID Manual. Per Table 7-3 within the LID manual, the development would potentially produce the following pollutants: suspended solids, phosphorus, nitrogen, kjeldahl nitrogen, copper, lead, and zinc. The proposed chambers are designed to fully retain the 25-year storm event and treat pollutants via a proposed pre-treatment device and infiltration.

4.0 BEST MANAGEMENT PRACTICES

4.1 Source Control BMP's

The LA County LID Manual lists Source Control BMP's that are designed to prevent pollutants from contaminating stormwater runoff and discharging contaminated runoff into storm drain systems and receiving bodies of water. To the most practicable extent, Source Control BMP's should be implemented to help mitigate pollutant mobilization from the proposed development. Per Table 5-1 within the LA County LID Manual, the following source control measures are recommended for the project.

- **Storm Drain Message and Signage (S-1)**
- **Outdoor Trash Storage/Waste Handling Areas (S-3)**
- **Outdoor Loading/Unloading Dock Area (S-4)**
- **Landscape Irrigation Practices (S-8)**

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

4.2 Treatment Control BMP's

Based on the Los Angeles County LID Manual, the stormwater quality design volume (SWQDv) is required to be calculated based on whichever is greater between the 85th percentile, 24-hour storm or the 0.75-inch, 24-hour storm. The 85th percentile, 24-hour rainfall depth taken from the LA County Hydrology Map (see Appendix A) is 0.54-inches. Therefore the 0.75-inch rain depth was utilized to calculate the SWQDv. Based on the LA County Hydrology Map, the soil type for the site is 134 (see Appendix B). The SWQDv was then calculated by using the HydroCalc software, and is provided in Appendix C.

The infiltration report prepared by Southern California Geotechnical, dated on March 9th, 2022, recorded two design infiltration rates of 0.2 inches/hour and 0.4 inches/hour. The 0.2 inches/hour and 0.4 inches/hour rates were located in the southeastern and northeastern area of the site, respectively (see Appendix G). Because the minimum feasible infiltration rate per LA County is 0.3 inches/hour, additional tests should be explored to confirm rates and explore other areas where infiltration may be feasible.

The project proposes 2 underground infiltration chambers that are designed to capture the SQWDv and fully retain the 25-year storm for hydrology requirements. The stormwater will be treated to remove partial sediments, trash and debris prior to entering the chambers. The chambers were designed taking into account a drawdown of 96 hours. Chamber A was designed with an infiltration rate of 0.4 inches/hr, and Chamber B used a rate of 0.2 inches/hr. The SQWDv from Areas A1-A4 was approximately 22,863 cubic feet, and Chamber A allows a storage of 23,274 cubic feet before outflowing through an orifice. Areas B1-B3 generated roughly 12,423 cubic feet of SQWDv, which will be adequately stored in the 12,672 cubic feet of storage Chambers B1 and B2 provide. The combined peak flows from the chambers, Area C, and Area D resulted in a flow of 1.25 cubic feet/second, which does not exceed 1.31 cubic feet/second (85% of the pre-development flows for the 25-year storm). Refer to the tables below and Appendix D for calculations and details.

Table 4.2.1 Chamber Analysis Summary

AREA ID	DRAINAGE AREA (AC)	IMPERVIOUS RATIO	LID PEAK FLOW (CFS)	SWQDv (CF)	BASIN DEPTH (FT)	BASIN VOLUME PROVIDED (CF)	CHAMBER DESIGNATION
A1	4.13	0.83	0.44	8,520	5	23,274	A
A2	0.89	0.84	0.16	1,855			A
A3	0.37	0.51	0.05	507			A
A4	4.93	1.00	0.71	11,980			A
B1	1.20	0.93	0.17	2,735	10	12,672	B
B2	0.18	0.98	0.04	430			B
B3	3.81	1	0.56	9,259			B
C	1.58	0.00	0.01	461		-	OFFSITE
D	1.02	0.14	0.04	584		-	OFFSITE

Table 4.2.2 Chamber A Drawdown/Outlet Summary

DRAWDOWN/OUTLET VOLUME CALCULATIONS	
DESIGN INFILTRATION RATE (IN/HR)	0.4
DRAWDOWN TIME (HR)	96
DRAWDOWN IN 96 HRS (FT)	1.6
CMP TOTAL FOOTPRINT (SF)	37,500
DRAWDOWN VOLUME IN 96 HR	120,000
VOLUME TO OUTLET (CF)	0
AVERAGE DISCHARGE PER ELEVATION (CFS)	0.30
AVERAGE DISCHARGE PER ELEVATION (CF/HR)	1,076
DESIGN OUTLET VOLUME (CF IN 24 HR)	25,816
OUTLET PIPE CENTROID ELEVATION	1.17
PIPE DIAMETER (IN)	3
PEAK OUTFLOW (CFS)	0.43

Table 4.2.3 Chamber B Drawdown/Outlet Summary

DRAWDOWN/OUTLET VOLUME CALCULATIONS	
DESIGN INFILTRATION RATE (IN/HR)	0.2
DRAWDOWN TIME (HR)	96
DRAWDOWN IN 96 HRS (FT)	1.6
CMP TOTAL FOOTPRINT (SF)	8568
DRAWDOWN VOLUME IN 96 HR	13709
VOLUME TO OUTLET (CF)	38127
AVERAGE DISCHARGE PER ELEVATION (CFS)	0.31
AVERAGE DISCHARGE PER ELEVATION (CF/HR)	1104
DESIGN OUTLET VOLUME (CF IN 24 HR)	26497
OUTLET PIPE CENTROID ELEVATION	2.5
PIPE DIAMETER (IN)	3
PEAK OUTFLOW (CFS)	0.45

5.0 MAINTENANCE AND INSPECTION

All proposed BMP's must undergo regularly scheduled inspections and maintenance. The property owner holds responsibility for maintaining all BMP's on-site. The table below outlines proposed BMP's and their maintenance requirements and frequency schedules. Additional education materials and inspection activities are provided in Appendix F.

Table 5.0.1 BMP Inspection and Maintenance

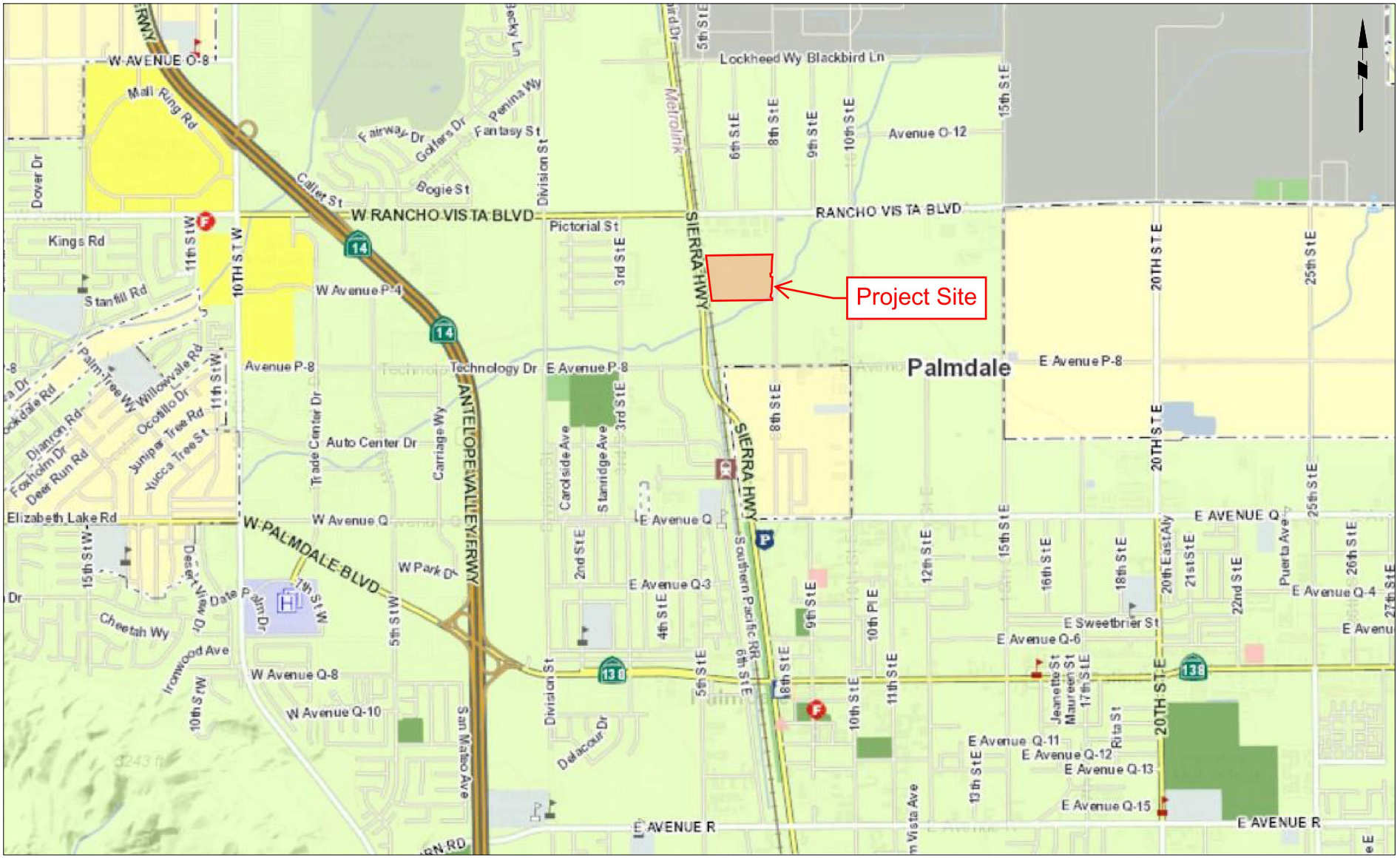
BMP	INSPECTION/MAINTENANCE ACTIVITIES REQUIRED	MINIMUM FREQUENCY OF ACTIVITIES
Catch Basin Inserts	Cleaning if accumulated trash and debris.	Every 3 months and/or after a rain event
Storm Drain Message and Signage (S-1)	Clean the stencil/signage surfaces to remove any excess dirt. Re-paint if necessary.	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

6.0 REFERENCES

1. Los Angeles County Low Impact Development (LID) Manual, February 2014.

2. Los Angeles County Department of Public Works Stormwater Best Management Practice Design and Maintenance Manual, August 2010.

Figure 1
Site Vicinity Map



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Project	PALMDALE INDUSTRIAL PARK 8TH ST CITY OF PALMDALE LOS ANGELES COUNTY CALIFORNIA
Drawing Title	SITE VICINITY MAP
Project No.	722010601
Date	03/24/2023
Drawn By	DB
Checked By	KK/MG
FIGURE	1

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Project No. 722010601

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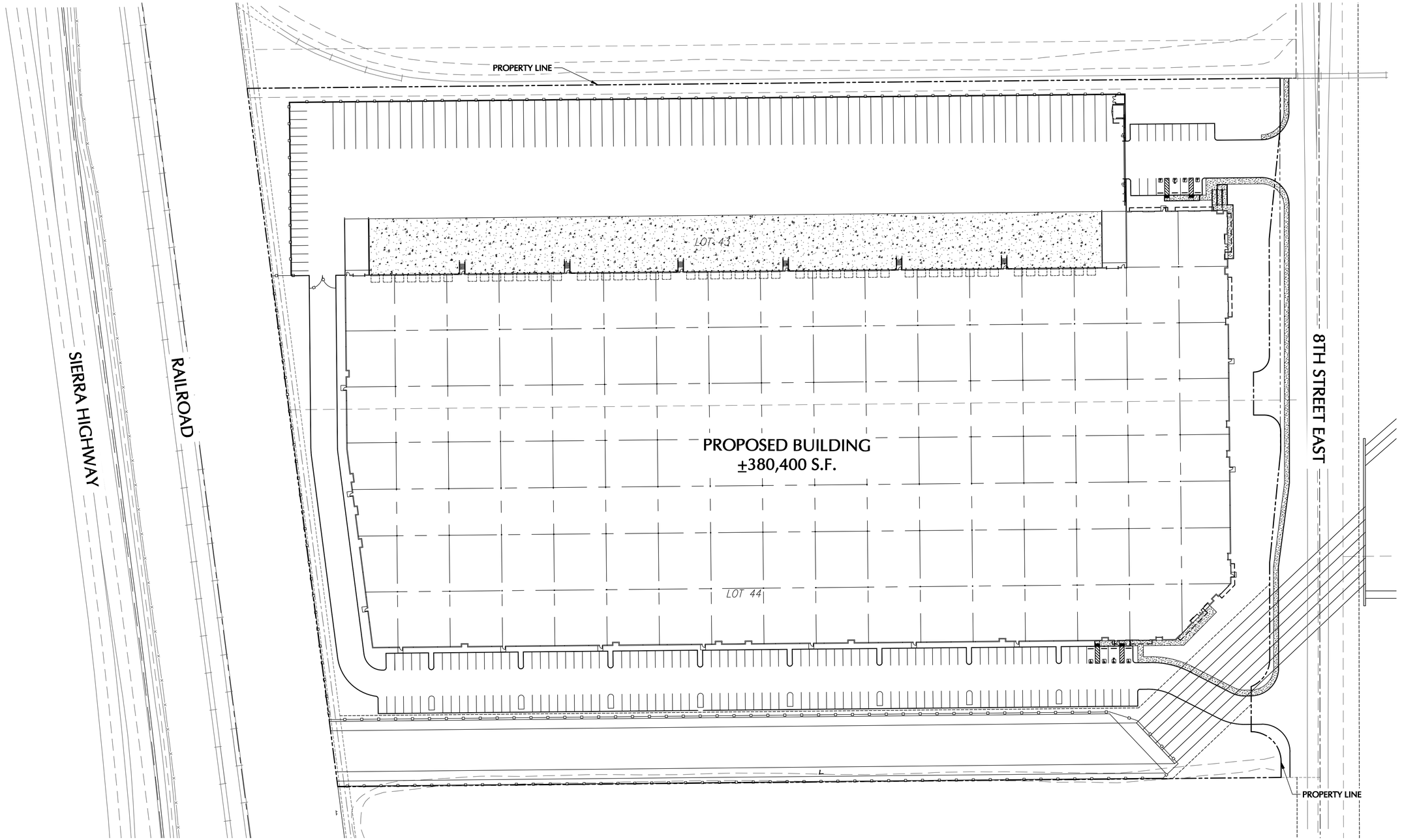
Figure 2
Proposed Site Plan



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SCALE: 1 INCH = 50 FEET

Date	Description	No.
Revisions		

SIGNATURE DATE
MICHAEL GOLIAS
PROFESSIONAL ENGINEER CA LICENSE NO. C91029

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Project
PALMDALE INDUSTRIAL PARK 8TH ST
CITY OF PALMDALE
LOS ANGELES COUNTY CALIFORNIA

Drawing Title
PROPOSED SITE PLAN

Project No.	Figure No.
722010601	2
Date: 03/28/2023	
Drawn By: DB	
Checked By: KK/MG	

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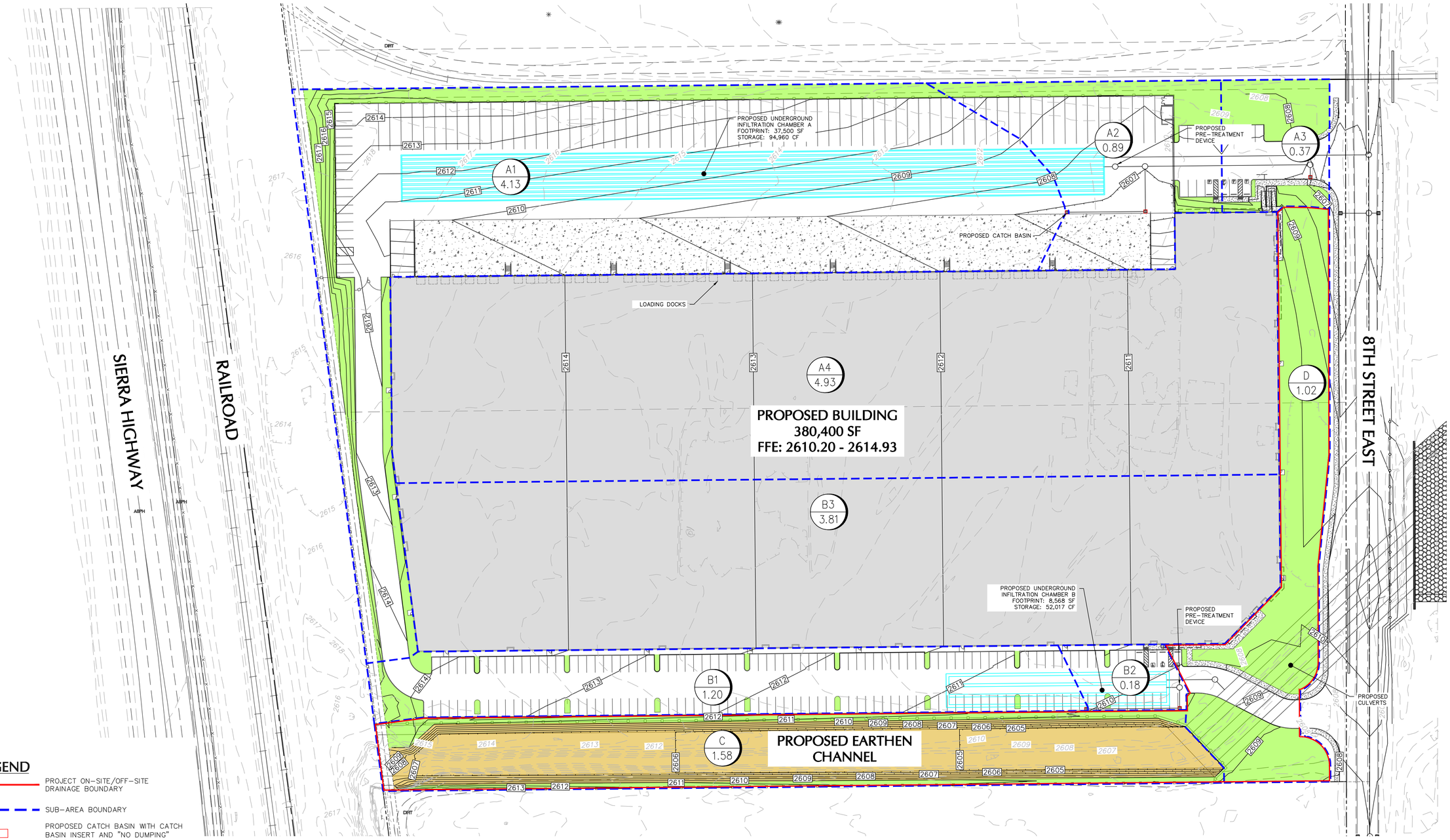
Project No. 722010601

Date: 3/24/2023 Time: 15:30 User: byamase Style Table: Langan.stb Layout: Fig. 3 Document Code: 722010601-0201-CA104-0105

Figure 3
Post-Development LID Exhibit



LEGEND

- PROJECT ON-SITE/OFF-SITE DRAINAGE BOUNDARY
- SUB-AREA BOUNDARY
- PROPOSED CATCH BASIN WITH CATCH BASIN INSERT AND "NO DUMPING" STENCIL MARKING
- X / X — SUB-DRAINAGE AREA ID / SUB-DRAINAGE AREA IDENTIFIER / SUB-DRAINAGE SURFACE AREA (ACRE)
- PROPOSED UNDERGROUND INFILTRATION CHAMBERS
- PROPOSED BUILDING AREA
- PROPOSED LANDSCAPE AREA
- PROPOSED EARTHEN CHANNEL

PROJECT SUMMARY

SITE AREA (GROSS):	18.11 ACRES
SITE AREA (NET):	17.90 ACRES
IMPERVIOUS COVERAGE:	80% (POST-DEVELOPMENT)
SOIL GROUP:	134
ISOHYETALS:	0.75-INCHES, 24-HOUR
FREQUENCY:	25-YEAR (FOR STORM DRAIN ANALYSIS)
METHOD:	LOS ANGELES COUNTY HYDROLOGY MANUAL

GENERAL NOTES:

1. SEE PRELIMINARY LID REPORT PREPARED BY LANGAN ENGINEERING FOR THE COMPLETE POST DEVELOPMENT LID CALCULATIONS.
2. CALCULATIONS WERE BASED ON THE REQUIREMENTS OF THE LOS ANGELES COUNTY LID MANUAL FOR THE 0.75-INCH, 24-HOUR RAINFALL DEPTH.
3. PROPOSED ON-SITE DRAINAGE SYSTEM LAYOUT IS PRELIMINARY.
4. ALL EXISTING ELEVATIONS ARE APPROXIMATE.

ABBREVIATIONS:

EG – EXISTING GRADE

FS – FINISHED SURFACE

L – LENGTH OF FLOW

HYDROLOGY SUMMARY

AREA ID	DRAINAGE AREA (AC)	IMPERVIOUS RATIO	LID PEAK FLOW (CFS)	SWQDv (CF)	BASIN VOLUME PROVIDED (CF)	CHAMBER DESIGNATION
A1	4.13	0.83	0.44	8,520	23,274	A
A2	0.89	0.84	0.16	1,855		
A3	0.37	0.51	0.05	507		
A4	4.93	1.00	0.71	11,980		
B1	1.20	0.93	0.17	2,735	12,672	B
B2	0.18	0.98	0.04	430		
B3	3.81	1.00	0.56	9,259		
C	1.58	0.00	0.01	461	-	OFFSITE
D	1.02	0.14	0.04	584	-	OFFSITE

50 0 25 50
SCALE: 1 INCH = 50 FEET

Date	Description	No.
Revisions		

Signature Date

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Project
PALMDALE INDUSTRIAL PARK 8TH ST
CITY OF PALMDALE
LOS ANGELES COUNTY CALIFORNIA

Drawing Title
POST-DEVELOPMENT LID EXHIBIT

Project No. 722010601
Date 03/28/2023
Drawn By DB
Checked By KK/MG
Figure No. 3

Date: 3/29/2023 Time: 14:17 User: byamase Style Table: Langan.stb Layout: CA104 Document Code: 722010601-0201-CA104-0107

LANGAN Project No. 722010601

Appendix A
LA County Hydrology Map – 85th Percentile, 24-Hour Storm

About | Legend | Layers

Layers

- [x] Hydrology GIS
  - [ ] 50yr Two Tenths (Rainfall)
  - [ ] DPA Zones
  - [ ] Soils 2004
  - [x] Final 85th Percentile, 24-hr Rainfall
  - [ ] 1-year, 1-hour Rainfall Intensity
  - [ ] Final 95th Percentile, 24-hr Rainfall
- [x] LA County Parcels

LA County Hydrology Map

636 E Rancho Vista Blv

Appendix B
LA County Hydrology Map – 2004 Soils Map

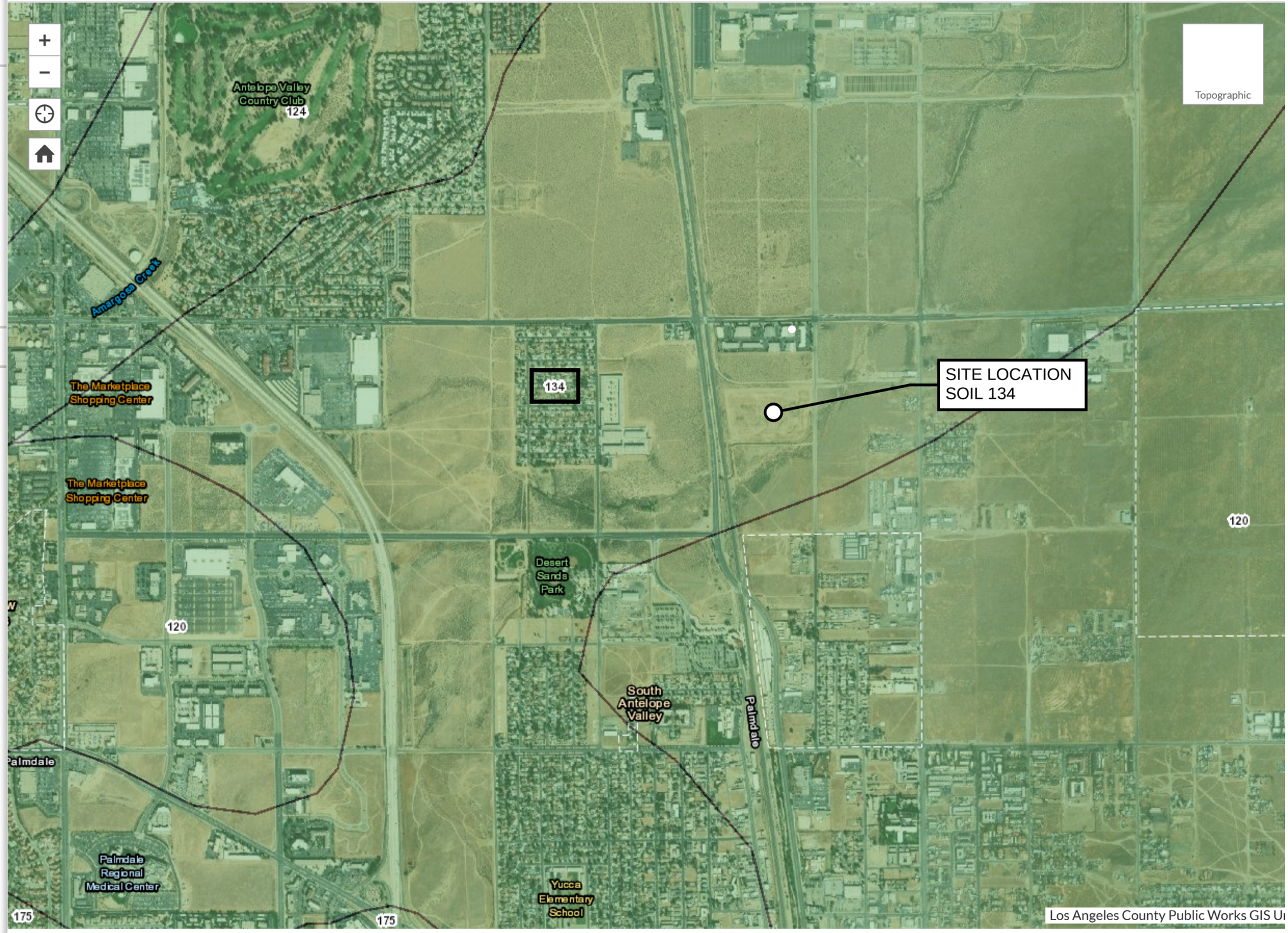
About | Legend | Layers

Layers

- [x] Hydrology GIS
  - [ ] 50yr Two Tenths (Rainfall)
  - [ ] DPA Zones
  - [x] Soils 2004
  - [ ] Final 85th Percentile, 24-hr Rainfall
  - [ ] 1-year, 1-hour Rainfall Intensity
  - [ ] Final 95th Percentile, 24-hr Rainfall
- [x] LA County Parcels

LA County Hydrology Map

636 E Rancho Vista Blv



Appendix C
Post-Development 0.75-inch, 24-Hour HydroCalc Calculations

Peak Flow Hydrologic Analysis

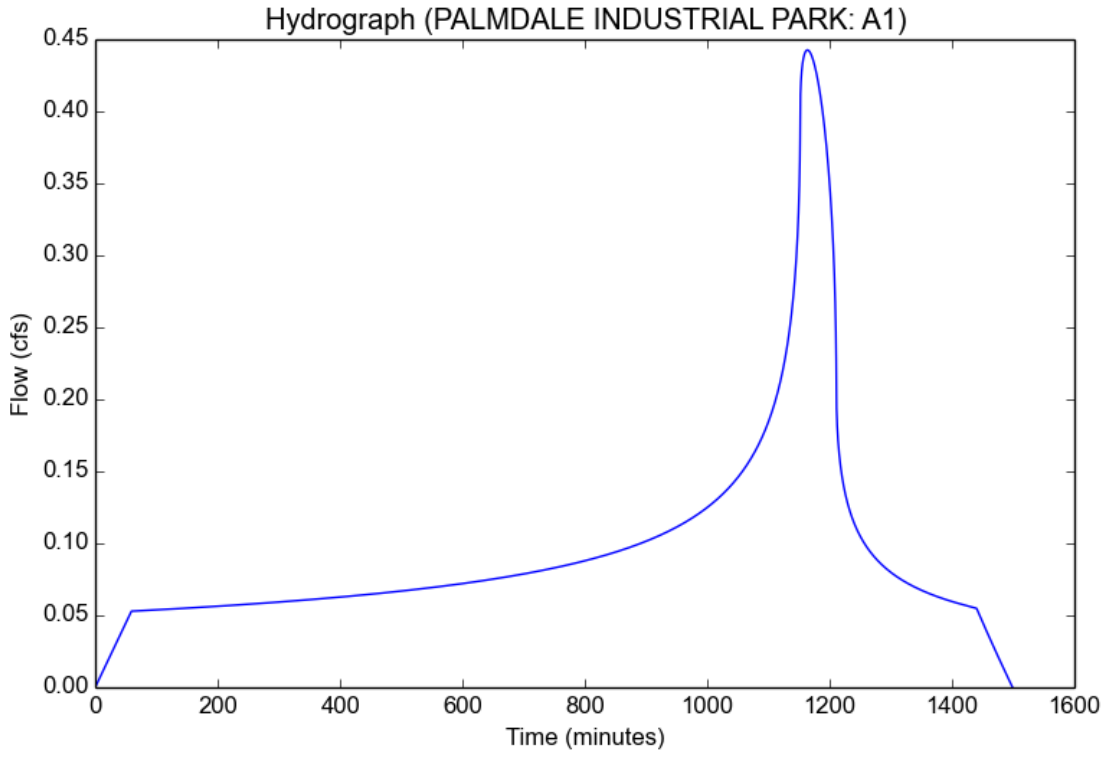
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	A1
Area (ac)	4.13
Flow Path Length (ft)	1226.18
Flow Path Slope (vft/hft)	0.0075
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.83
Soil Type	134
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)	0.1403
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.764
Time of Concentration (min)	59.0
Clear Peak Flow Rate (cfs)	0.4426
Burned Peak Flow Rate (cfs)	0.4426
24-Hr Clear Runoff Volume (ac-ft)	0.1956
24-Hr Clear Runoff Volume (cu-ft)	8519.7496



Peak Flow Hydrologic Analysis

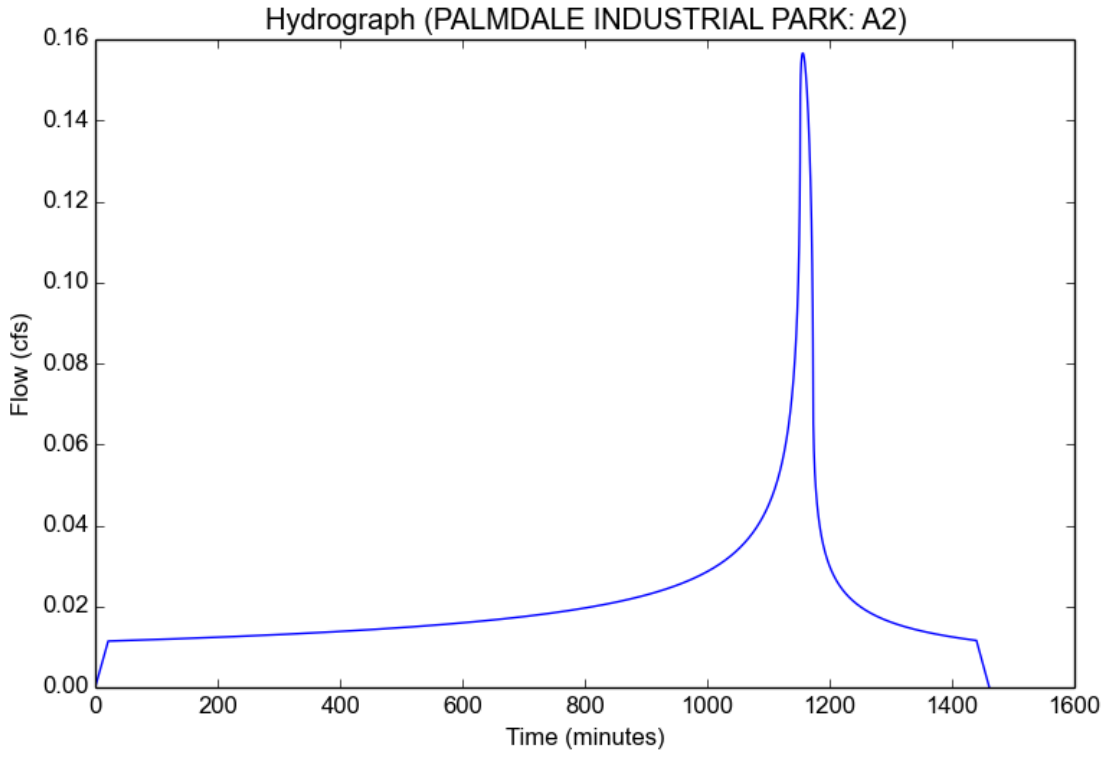
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	A2
Area (ac)	0.89
Flow Path Length (ft)	293.67
Flow Path Slope (vft/hft)	0.0168
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.84
Soil Type	134
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)	0.2279
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.772
Time of Concentration (min)	21.0
Clear Peak Flow Rate (cfs)	0.1566
Burned Peak Flow Rate (cfs)	0.1566
24-Hr Clear Runoff Volume (ac-ft)	0.0426
24-Hr Clear Runoff Volume (cu-ft)	1855.1264



Peak Flow Hydrologic Analysis

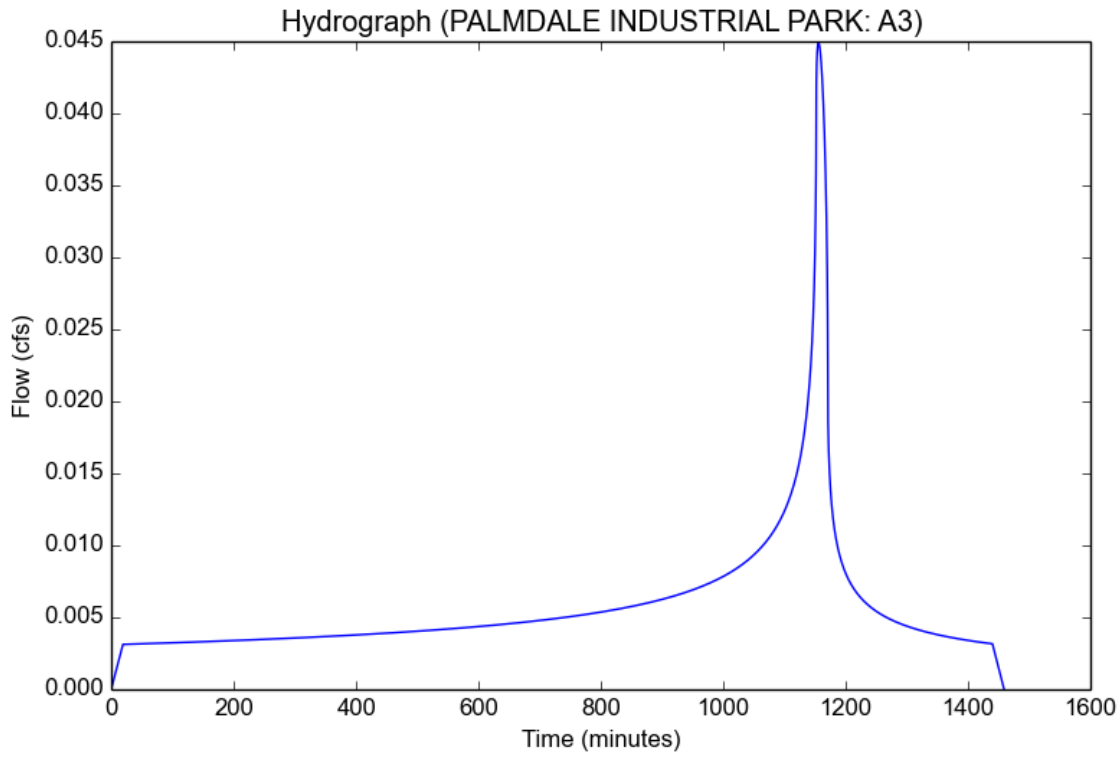
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	A3
Area (ac)	0.37
Flow Path Length (ft)	150.86
Flow Path Slope (vft/hft)	0.0107
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.51
Soil Type	134
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)	0.2389
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.508
Time of Concentration (min)	19.0
Clear Peak Flow Rate (cfs)	0.0449
Burned Peak Flow Rate (cfs)	0.0449
24-Hr Clear Runoff Volume (ac-ft)	0.0117
24-Hr Clear Runoff Volume (cu-ft)	507.4943



Peak Flow Hydrologic Analysis

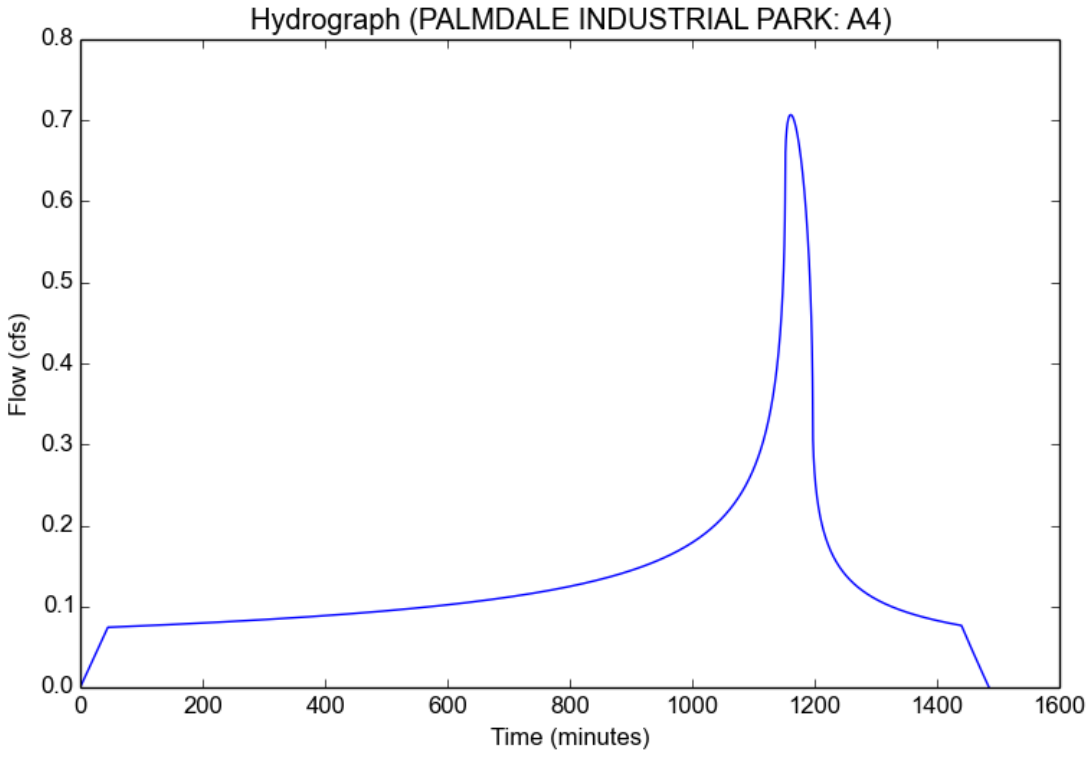
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	A4
Area (ac)	4.93
Flow Path Length (ft)	857.05
Flow Path Slope (vft/hft)	0.005
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	1.0
Soil Type	134
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)	0.1593
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	45.0
Clear Peak Flow Rate (cfs)	0.7069
Burned Peak Flow Rate (cfs)	0.7069
24-Hr Clear Runoff Volume (ac-ft)	0.275
24-Hr Clear Runoff Volume (cu-ft)	11980.2125



Peak Flow Hydrologic Analysis

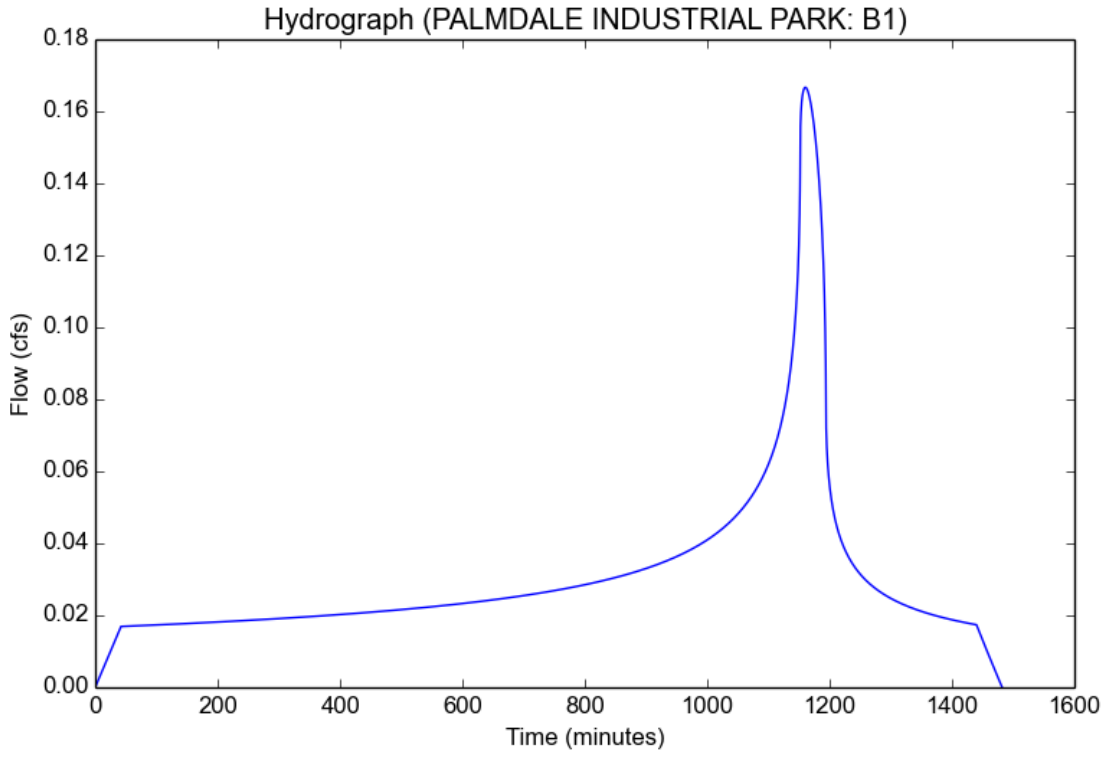
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	B1
Area (ac)	1.2
Flow Path Length (ft)	787.18
Flow Path Slope (vft/hft)	0.0075
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.93
Soil Type	134
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)	0.844
Time of Concentration (min)	42.0
Clear Peak Flow Rate (cfs)	0.1667
Burned Peak Flow Rate (cfs)	0.1667
24-Hr Clear Runoff Volume (ac-ft)	0.0628
24-Hr Clear Runoff Volume (cu-ft)	2734.622



Peak Flow Hydrologic Analysis

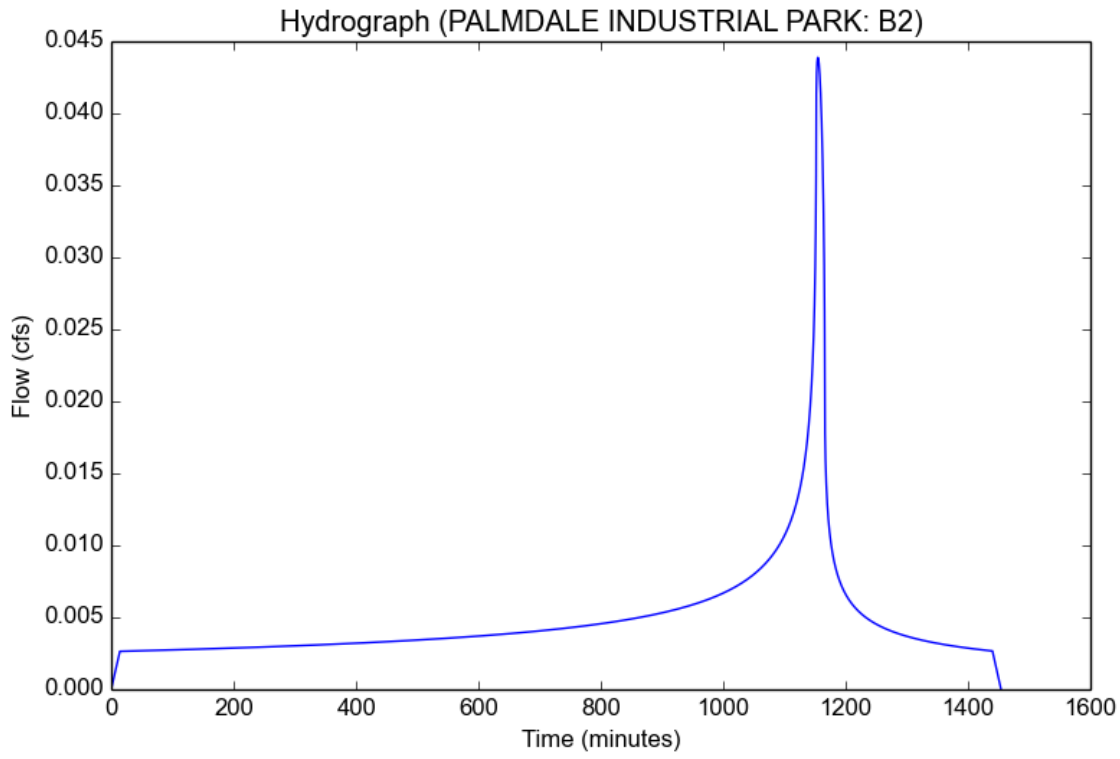
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	B2
Area (ac)	0.18
Flow Path Length (ft)	170.1
Flow Path Slope (vft/hft)	0.0109
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.98
Soil Type	134
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)	0.2758
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.884
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	0.0439
Burned Peak Flow Rate (cfs)	0.0439
24-Hr Clear Runoff Volume (ac-ft)	0.0099
24-Hr Clear Runoff Volume (cu-ft)	429.6251



Peak Flow Hydrologic Analysis

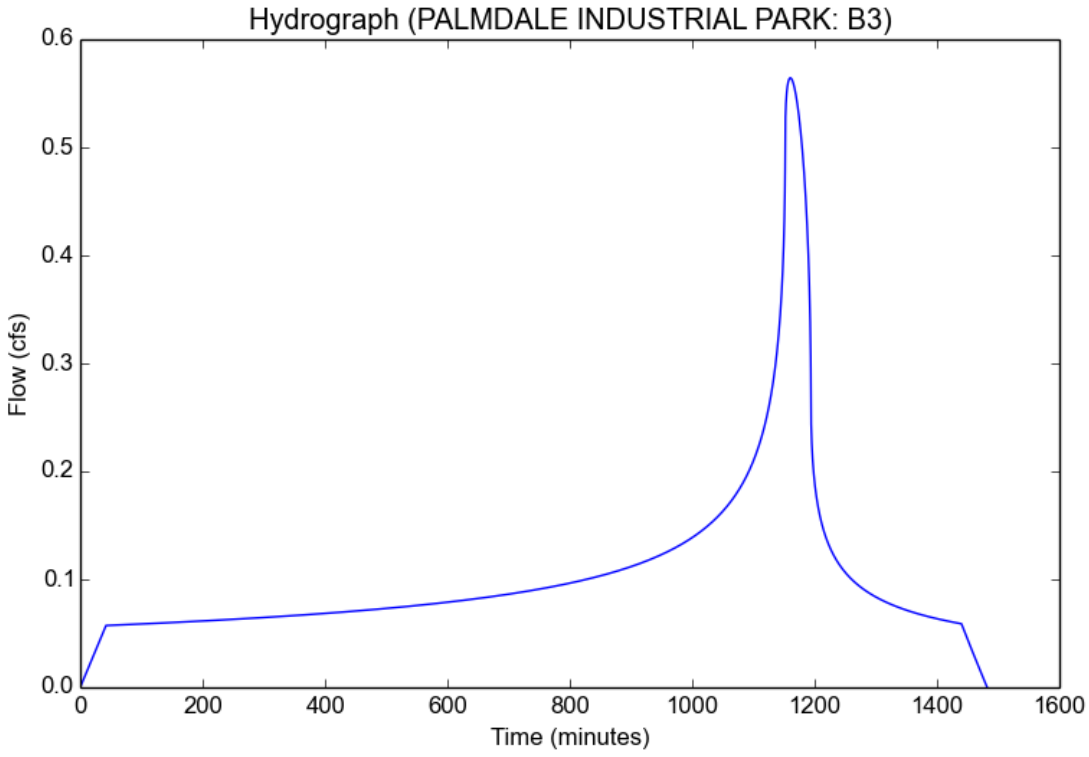
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	B3
Area (ac)	3.81
Flow Path Length (ft)	849.93
Flow Path Slope (vft/hft)	0.0075
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	1.0
Soil Type	134
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)	0.5643
Burned Peak Flow Rate (cfs)	0.5643
24-Hr Clear Runoff Volume (ac-ft)	0.2125
24-Hr Clear Runoff Volume (cu-ft)	9258.51



Peak Flow Hydrologic Analysis

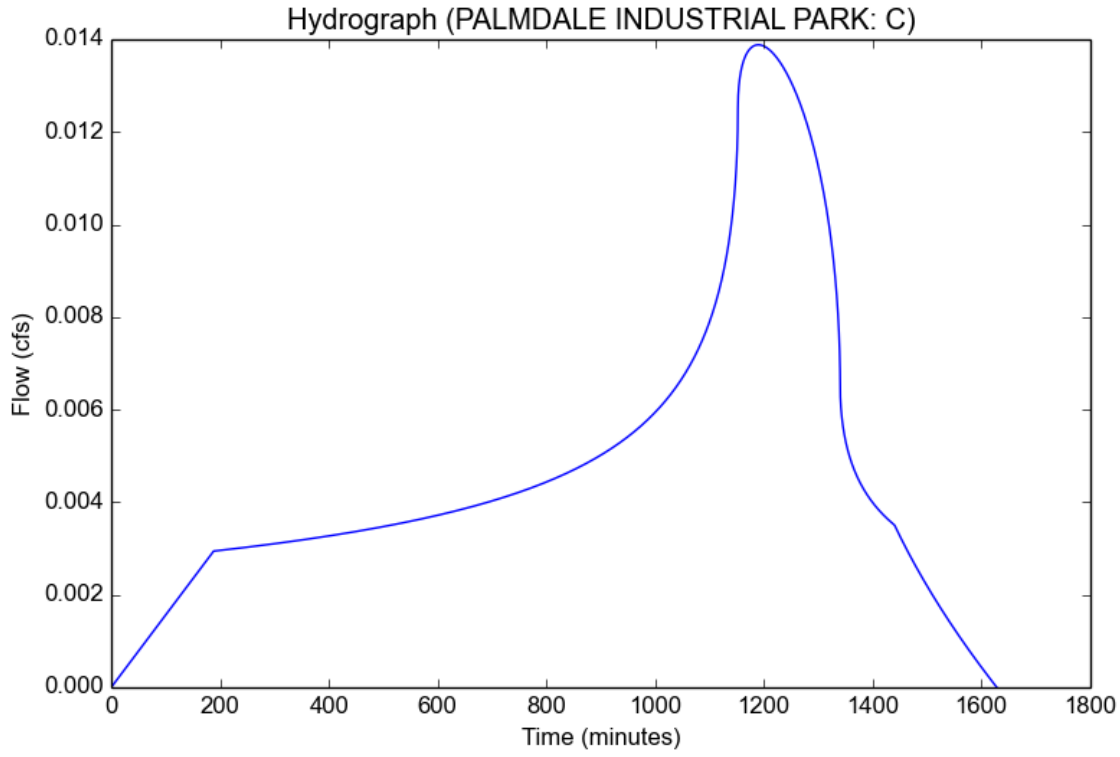
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	C
Area (ac)	1.58
Flow Path Length (ft)	881.01
Flow Path Slope (vft/hft)	0.0068
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.01
Soil Type	134
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)	0.0814
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	188.0
Clear Peak Flow Rate (cfs)	0.0139
Burned Peak Flow Rate (cfs)	0.0139
24-Hr Clear Runoff Volume (ac-ft)	0.0106
24-Hr Clear Runoff Volume (cu-ft)	460.9596



Peak Flow Hydrologic Analysis

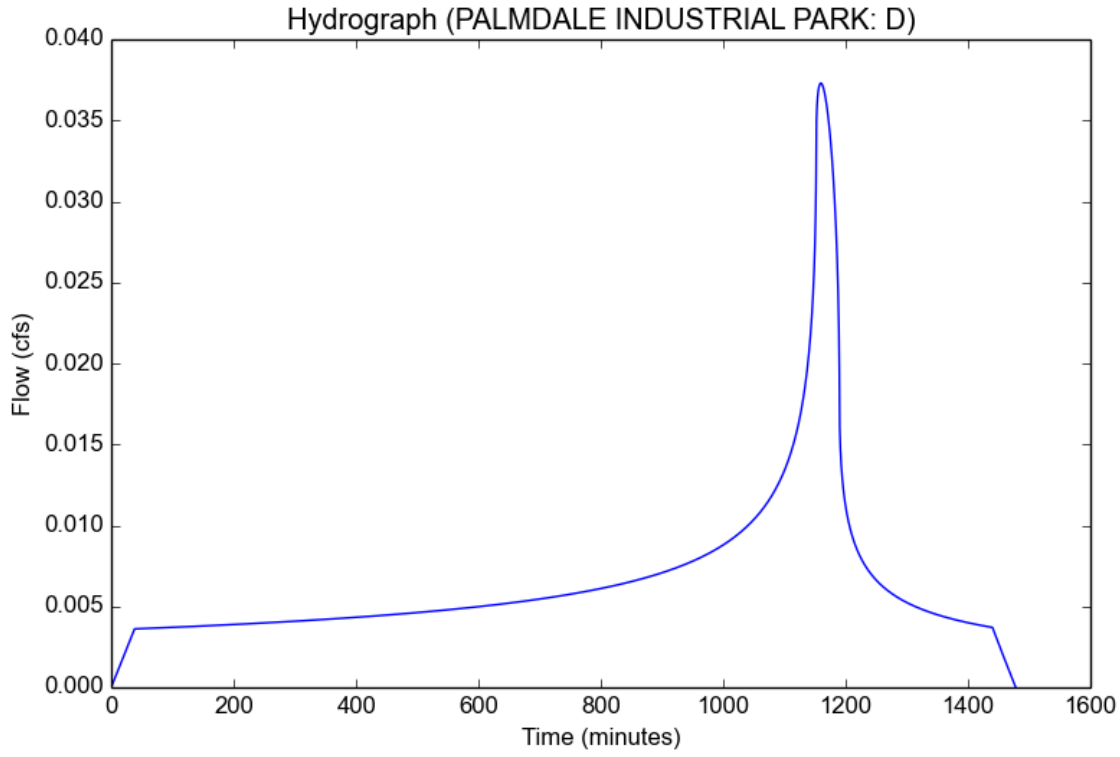
File location: //langan.com/data/IEM/data6/722010601/Project Data/_Discipline/Site Civil/Reports/Prelim Hydrology Report/Exhibits & Figures/Post-Devel
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PALMDALE INDUSTRIAL PARK
Subarea ID	D
Area (ac)	1.02
Flow Path Length (ft)	181.13
Flow Path Slope (vft/hft)	0.0136
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.14
Soil Type	134
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)	0.1725
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.212
Time of Concentration (min)	38.0
Clear Peak Flow Rate (cfs)	0.0373
Burned Peak Flow Rate (cfs)	0.0373
24-Hr Clear Runoff Volume (ac-ft)	0.0134
24-Hr Clear Runoff Volume (cu-ft)	583.8588



Appendix D
Infiltration Chamber Calculations and Details

CHAMBER A

CHAMBER A STORAGE			
ELEVATION (FT)	**STORAGE (CF)**	**CUMULATIVE STORAGE (CF)**	**DISCHARGE PER ELEVEATION (CFS)**
0.00	0	0	0
0.17	2,500	2,500	0
0.33	2,500	5,000	0
0.50	2,500	7,500	0
0.67	3,263	10,763	0
0.83	3,857	14,619	0
1.00	4,203	18,823	0
1.17	4,451	23,274	0
1.33	4,636	27,910	0.10
1.50	4,772	32,682	0.15
1.67	4,870	37,552	0.18
1.83	4,933	42,485	0.21
2.00	4,963	47,448	0.23
2.17	4,963	52,411	0.26
2.33	4,933	57,344	0.28
2.50	4,870	62,214	0.30
2.67	4,772	66,986	0.31
2.83	4,636	71,622	0.33
3.00	4,451	76,073	0.35
3.17	4,203	80,277	0.36
3.33	3,857	84,133	0.38
3.50	3,263	87,396	0.39
3.67	2,500	89,896	0.40
3.83	2,500	92,396	0.42
4.00	2,500	94,896	0.43

DRAWDOWN/OUTLET VOLUME CALCULATIONS	
DESIGN INFILTRATION RATE (IN/HR)	0.4
DRAWDOWN TIME (HR)	96
DRAWDOWN IN 96 HRS (FT)	1.6
CMP TOTAL FOOTPRINT (SF)	37,500
DRAWDOWN VOLUME IN 96 HR	120,000
VOLUME TO OUTLET (CF)	0
AVERAGE DISCHARGE PER ELEVATION (CFS)	0.30
AVERAGE DISCHARGE PER ELEVATION (CF/HR)	1,076
DESIGN OUTLET VOLUME (CF IN 24 HR)	25,816
OUTLET PIPE CENTROID ELEVATION	1.17
PIPE DIAMETER (IN)	3
PEAK OUTFLOW (CFS)	0.43

CHAMBER B

CHAMBER B STORAGE			
ELEVATION (FT)	**STORAGE (CF)**	**CUMULATIVE STORAGE (CF)**	**DISCHARGE PER ELEVEATION (CFS)**
0.00	0	0	0.00
0.17	571	571	0
0.33	571	1,142	0
0.50	571	1,714	0
0.67	678	2,391	0
0.83	764	3,155	0
1.00	818	3,973	0
1.17	860	4,834	0
1.33	896	5,729	0
1.50	926	6,655	0
1.67	952	7,607	0
1.83	975	8,583	0
2.00	996	9,579	0
2.17	1,015	10,594	0
2.33	1,031	11,625	0
2.50	1,046	12,672	0
2.67	1,060	13,732	0.07
2.83	1,072	14,803	0.10
3.00	1,082	15,886	0.13
3.17	1,092	16,978	0.14
3.33	1,100	18,078	0.16
3.50	1,107	19,185	0.18
3.67	1,113	20,298	0.19
3.83	1,118	21,416	0.20
4.00	1,122	22,538	0.22
4.17	1,125	23,663	0.23
4.33	1,127	24,790	0.24
4.50	1,128	25,918	0.25
4.67	1,128	27,046	0.26
4.83	1,127	28,173	0.27
5.00	1,125	29,297	0.28
5.17	1,122	30,419	0.29
5.33	1,118	31,538	0.30
5.50	1,113	32,651	0.31
5.67	1,107	33,758	0.32
5.83	1,100	34,858	0.32
6.00	1,092	35,950	0.33
6.17	1,082	37,032	0.34
6.33	1,072	38,104	0.35
6.50	1,060	39,164	0.35
6.67	1,046	40,210	0.36
6.83	1,031	41,242	0.37
7.00	1,015	42,257	0.38
7.17	996	43,253	0.38
7.33	975	44,228	0.39
7.50	952	45,180	0.40
7.67	926	46,106	0.40
7.83	896	47,002	0.41
8.00	860	47,862	0.42
8.17	818	48,680	0.42
8.33	764	49,444	0.43
8.50	678	50,122	0.43
8.67	571	50,693	0.44
8.83	571	51,264	0.45
9.00	571	51,836	0.45

DRAWDOWN/OUTLET VOLUME CALCULATIONS	
DESIGN INFILTRATION RATE (IN/HR)	0.2
DRAWDOWN TIME (HR)	96
DRAWDOWN IN 96 HRS (FT)	1.6
CMP TOTAL FOOTPRINT (SF)	8568
DRAWDOWN VOLUME IN 96 HR	13709
VOLUME TO OUTLET (CF)	38127
AVERAGE DISCHARGE PER ELEVATION (CFS)	0.31
AVERAGE DISCHARGE PER ELEVATION (CF/HR)	1104
DESIGN OUTLET VOLUME (CF IN 24 HR)	26497
OUTLET PIPE CENTROID ELEVATION	2.5
PIPE DIAMETER (IN)	3
PEAK OUTFLOW (CFS)	0.45

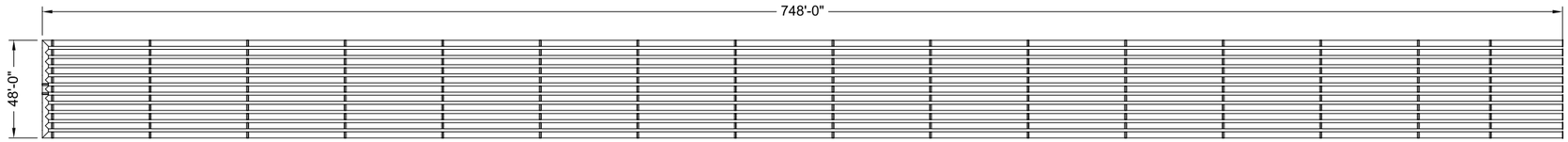
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 8,243 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 93,685 CF
- PIPE STORAGE VOLUME = 58,266 CF
- BACKFILL STORAGE VOLUME = 36,693 CF
- TOTAL STORAGE PROVIDED = 94,960 CF

PIPE DETAILS
- DIAMETER = 36"
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 18"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 6"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 6"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 70'

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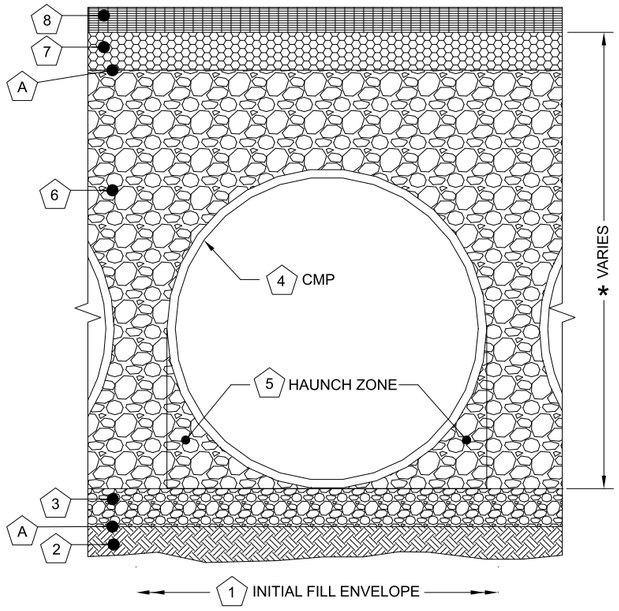
DATE	REVISION DESCRIPTION	BY

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO29422 Palmdale Basins
Chamber A
Palmdale, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
19757	29422	3/29/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	Infiltration Systems - CMP Infiltration & CMP Perforated Drainage Pipe			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types. Wrap the trench only.
6	Backfill	Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded, free draining stone, with a particle size of ½" – 2 ½" diameter is recommended.	AASHTO M 145-A-1 or AASHTO M 43 - 3, 4	Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, air-tamper, vibratory rod, or other effective methods. Compaction of all placed fill material is necessary and shall be considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the Project Engineer or his representative is satisfied with the level of compaction"
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	For soil aggregates larger than 3/8" a dedicated bedding layer is not required for CMP. Pipe may be placed on the trench bottom comprised of native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Soil aggregates less than 3/8" and unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation.
A	Geotextile Layer	None	None	Contech does not recommend geotextiles be placed under the invert of Infiltration systems due to the propensity for geotextiles to clog over time.
*	Note: The listed AASHTO designations are for gradation only. The stone must also be angular and clean.			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT.

FOUNDATION/BEDDING PREPARATION

2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMLY COMPACTED WITHOUT SOFT SPOTS.

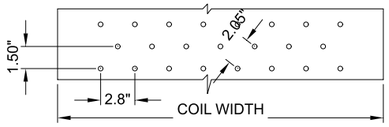
BACKFILL

MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

EQUIPMENT USED TO PLACE AND COMPACT THE BACKFILL SHALL BE OF A SIZE AND TYPE SO AS NOT TO DISTORT, DAMAGE, OR DISPLACE THE PIPE. ATTENTION MUST BE GIVEN TO PROVIDING ADEQUATE MINIMUM COVER FOR SUCH EQUIPMENT. MAINTAIN BALANCED LOADING ON ALL PIPES IN THE SYSTEM DURING ALL SUCH OPERATIONS.

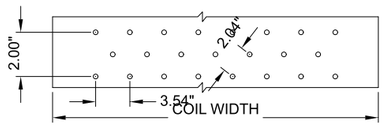
OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS. REFER TO TYPICAL BACKFILL DETAIL FOR MATERIAL REQUIRED.

2 2/3" x 1/2" CORRUGATION - STEEL AND ALUMINUM CMP EDGE SPACING EQUAL ON BOTH SIDES



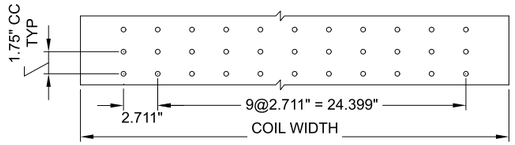
OPEN AREA = 3.76 SQ IN/SQ FT

3" x 1" CORRUGATION - STEEL AND ALUMINUM CMP (COIL PROVIDED FROM CONTECH LANTANA, FL PLANT)



OPEN AREA = 4.16 SQ IN/SQ FT

5" x 1" CORRUGATION - STEEL ONLY
EDGE SPACING EQUAL ON BOTH SIDES



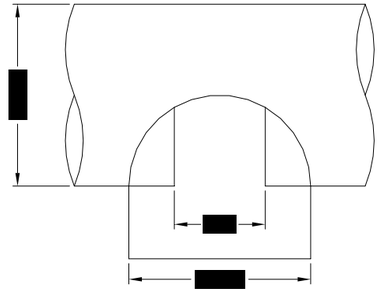
OPEN AREA = 3.33 SQ IN/SQ FT

NOTES:

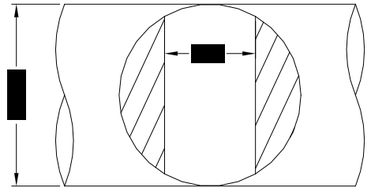
1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. ALL HOLES ⌀3/8".

TYPICAL PERFORATION DETAIL

SCALE: N.T.S.



PLAN

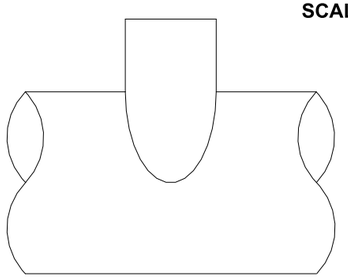


FRONT

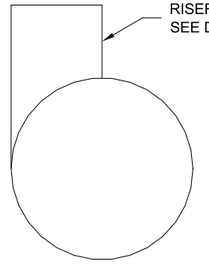
TYPICAL MANWAY DETAIL

SCALE: N.T.S.

NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.



ELEVATION

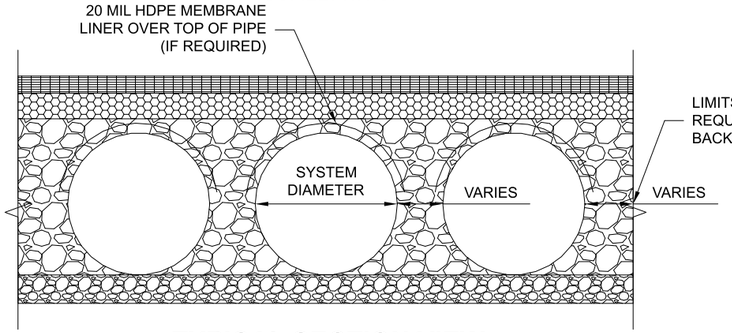


END

TYPICAL RISER DETAIL

SCALE: N.T.S.

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO29422 Palmdale Basins
Chamber A
Palmdale, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
19757	29422	3/29/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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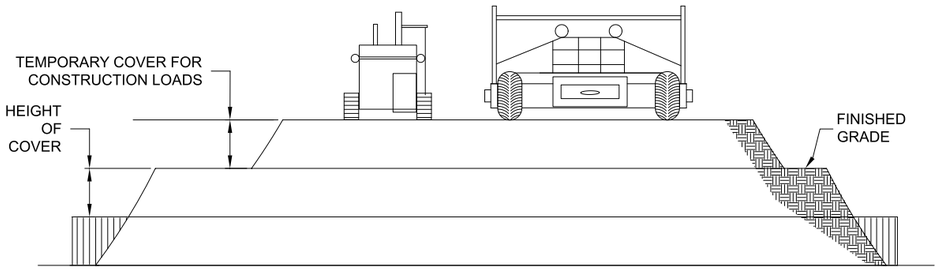


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

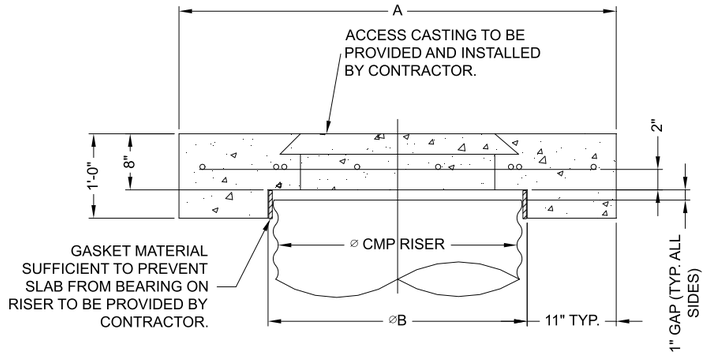
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

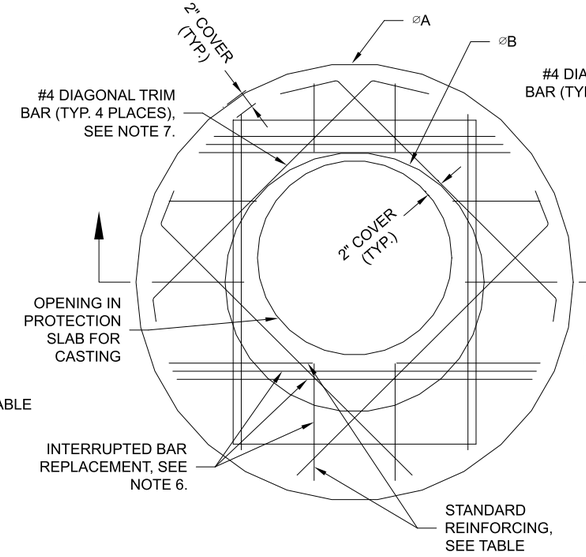
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



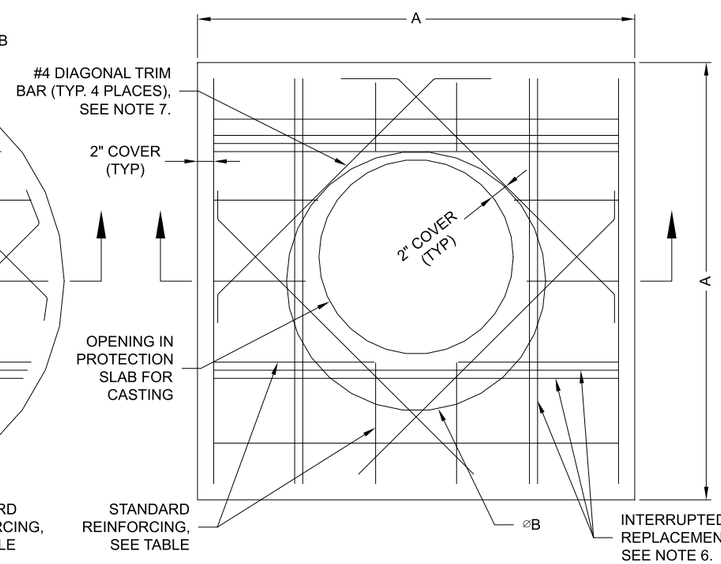
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

DATE	REVISION DESCRIPTION	BY

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO29422 Palmdale Basins
Chamber A
Palmdale, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
19757	29422	3/29/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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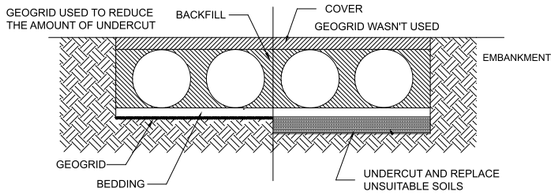
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

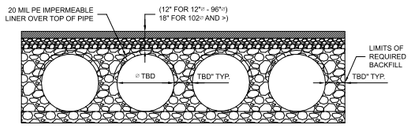


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

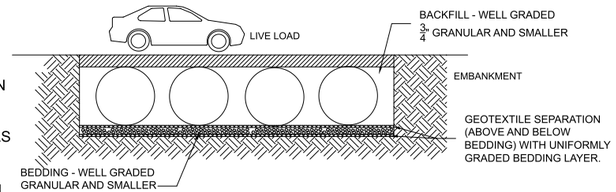
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

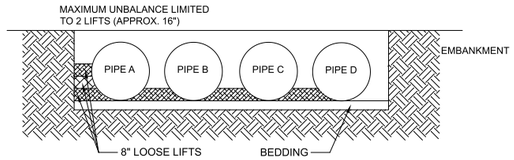
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



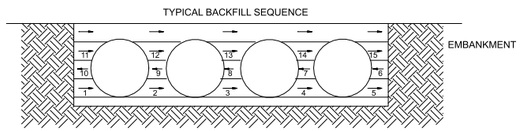
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

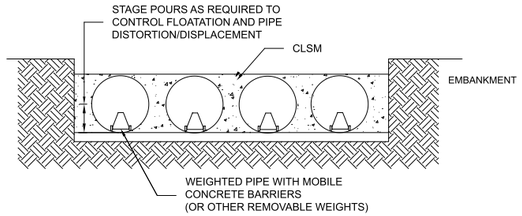


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

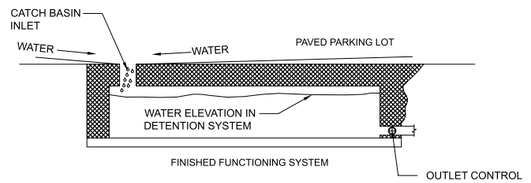


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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DATE	REVISION DESCRIPTION	BY

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO29422 Palmdale Basins
Chamber A
Palmdale, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
19757	29422	3/29/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

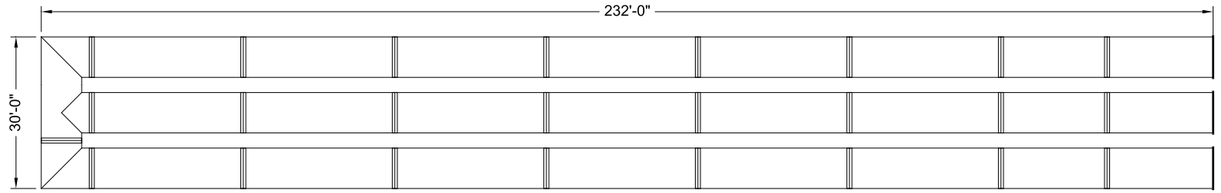
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 702 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 52,000 CF
- PIPE STORAGE VOLUME = 35,286 CF
- BACKFILL STORAGE VOLUME = 16,730 CF
- TOTAL STORAGE PROVIDED = 52,017 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 36"
- ABOVE PIPE = 6"
- WIDTH AT SIDES = 36"
- BELOW PIPE = 6"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 30'

DATE	REVISION DESCRIPTION	BY

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO29430 Palmdale Basins
Chamber B
Palmdale, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
19757	29430	3/29/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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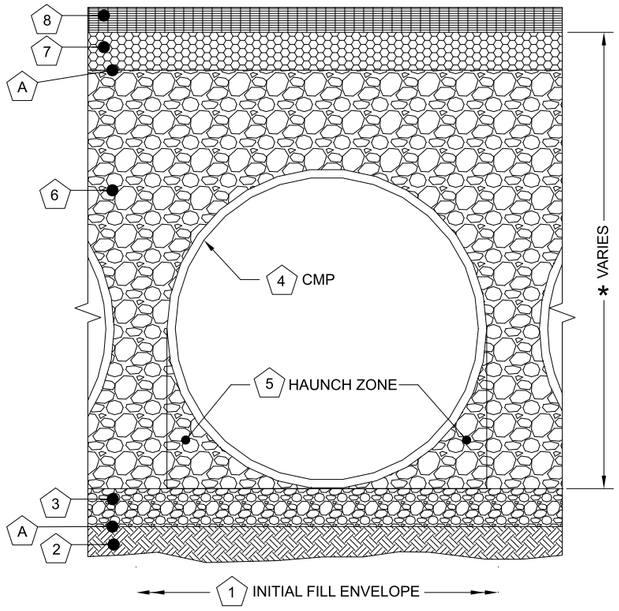


	Infiltration Systems - CMP Infiltration & CMP Perforated Drainage Pipe			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types. Wrap the trench only.
6	Backfill	Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded, free draining stone, with a particle size of ½" – 2 ½" diameter is recommended.	AASHTO M 145-A-1 or AASHTO M 43 - 3, 4	Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, air-tamper, vibratory rod, or other effective methods. Compaction of all placed fill material is necessary and shall be considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the Project Engineer or his representative is satisfied with the level of compaction"
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	For soil aggregates larger than 3/8" a dedicated bedding layer is not required for CMP. Pipe may be placed on the trench bottom comprised of native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Soil aggregates less than 3/8" and unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation.
A	Geotextile Layer	None	None	Contech does not recommend geotextiles be placed under the invert of Infiltration systems due to the propensity for geotextiles to clog over time.
*	Note: The listed AASHTO designations are for gradation only. The stone must also be angular and clean.			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT.

FOUNDATION/BEDDING PREPARATION

2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMLY COMPACTED WITHOUT SOFT SPOTS.

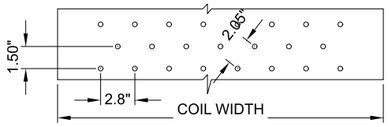
BACKFILL

MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

EQUIPMENT USED TO PLACE AND COMPACT THE BACKFILL SHALL BE OF A SIZE AND TYPE SO AS NOT TO DISTORT, DAMAGE, OR DISPLACE THE PIPE. ATTENTION MUST BE GIVEN TO PROVIDING ADEQUATE MINIMUM COVER FOR SUCH EQUIPMENT. MAINTAIN BALANCED LOADING ON ALL PIPES IN THE SYSTEM DURING ALL SUCH OPERATIONS.

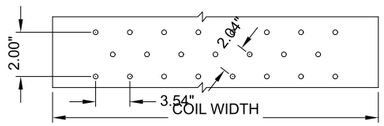
OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS. REFER TO TYPICAL BACKFILL DETAIL FOR MATERIAL REQUIRED.

2 2/3" x 1/2" CORRUGATION - STEEL AND ALUMINUM CMP EDGE SPACING EQUAL ON BOTH SIDES



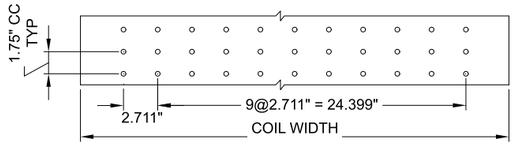
OPEN AREA = 3.76 SQ IN/SQ FT

3" x 1" CORRUGATION - STEEL AND ALUMINUM CMP (COIL PROVIDED FROM CONTECH LANTANA, FL PLANT)



OPEN AREA = 4.16 SQ IN/SQ FT

5" x 1" CORRUGATION - STEEL ONLY
EDGE SPACING EQUAL ON BOTH SIDES



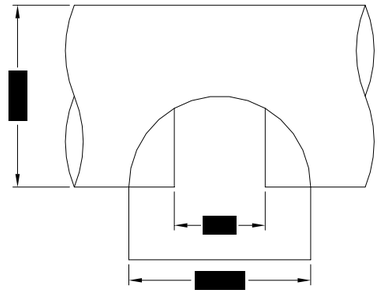
OPEN AREA = 3.33 SQ IN/SQ FT

NOTES:

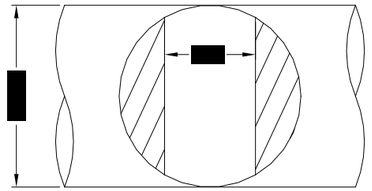
1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. ALL HOLES ⌀3/8".

TYPICAL PERFORATION DETAIL

SCALE: N.T.S.



PLAN

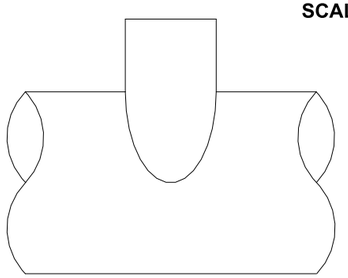


FRONT

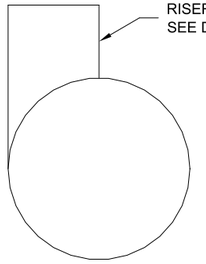
TYPICAL MANWAY DETAIL

SCALE: N.T.S.

NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.



ELEVATION

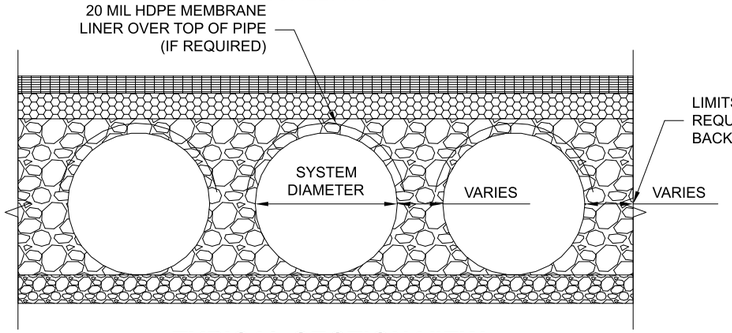


END

TYPICAL RISER DETAIL

SCALE: N.T.S.

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO29430 Palmdale Basins
Chamber B
Palmdale, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
19757	29430	3/29/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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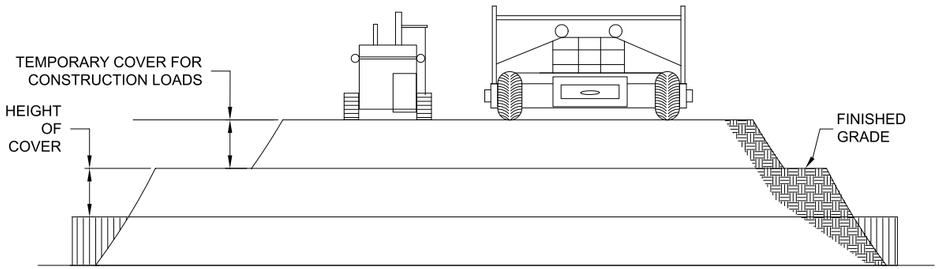


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

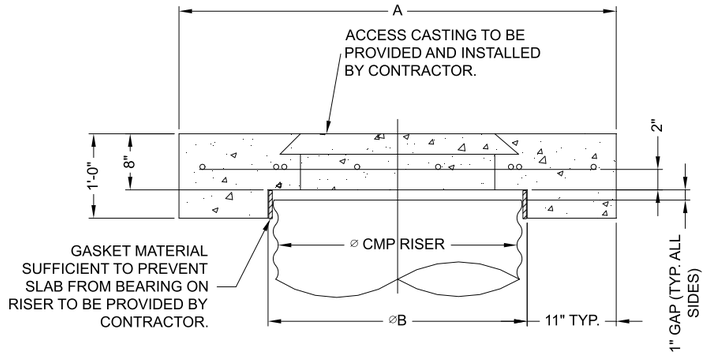
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

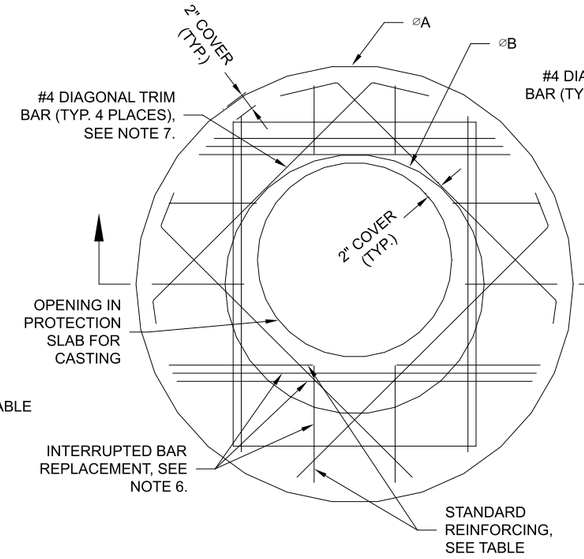
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



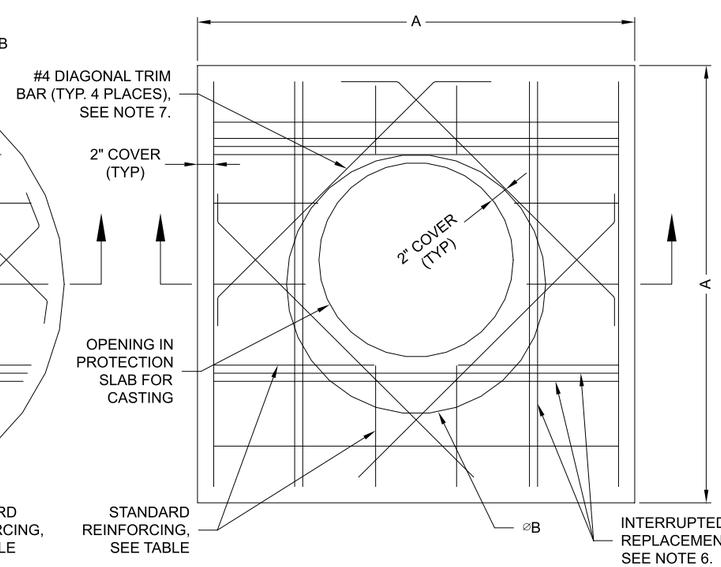
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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SHEET NO.: 1		

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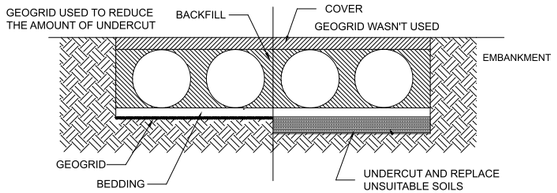
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

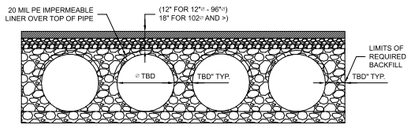


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

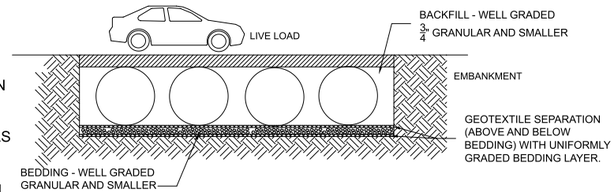
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

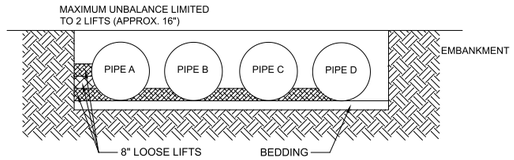
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



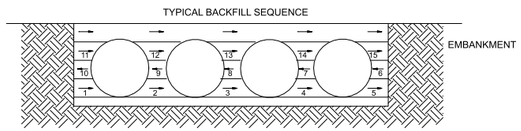
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

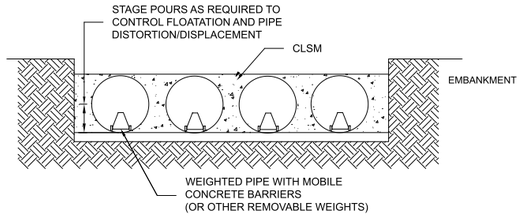


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

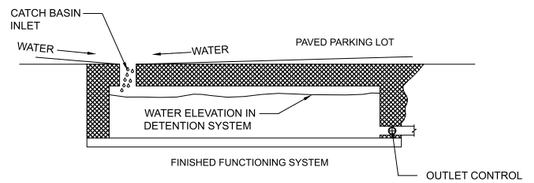


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH CMP DETENTION SYSTEMS
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DYO29430 Palmdale Basins
Chamber B
Palmdale, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
19757	29430	3/29/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

Appendix E
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.

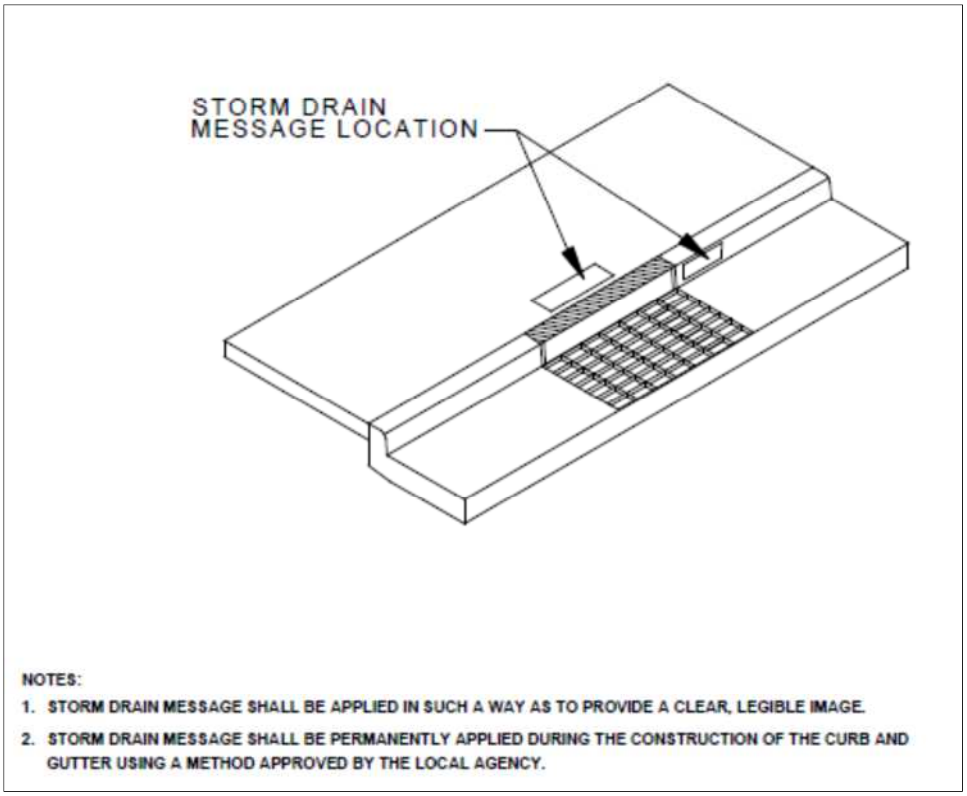


Figure D-1. Storm Drain Message Location – Curb Type Inlet

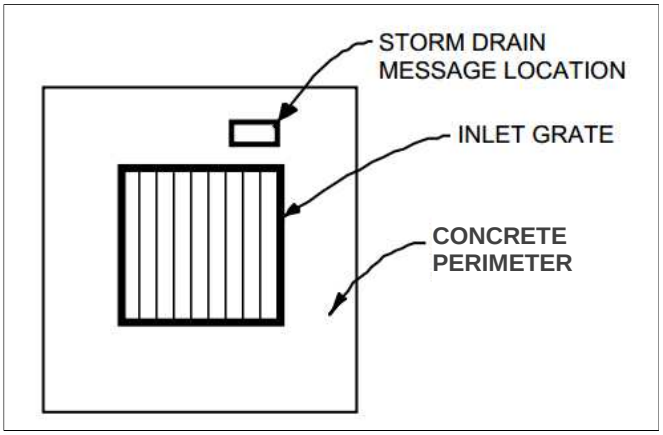


Figure D-2. Storm Drain Message Location – Catch Basin/Area Type Inlet

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.

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.

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.

- 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 F
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 solstitalis*) 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 reseeding 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 G
Infiltration Report

March 9, 2022

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

Attention: Mr. Mark S. Milakovich
President

Project No.: **22G109-2**

Subject: **Results of Infiltration Testing**
Proposed Warehouse
8th Street, South of Rancho Vista Boulevard
Palmdale, California

Reference: Geotechnical Investigation, Proposed Warehouse, 8th Street, South of Ranch Vista Boulevard, Palmdale, California, Prepared by Southern California Geotechnical, Inc. (SCG) for Covington Development Group, Inc., SCG Project No. 22G109-1R, dated March 7, 2022.

Mr. Milakovich:

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. 21P430, dated September 29, 2021. The scope of the infiltration testing consisted of site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite 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 on the west side of 8th Street, approximately 800 feet south of the intersection of 8th Street and Rancho Vista Boulevard in Palmdale, California. The site is bounded to the north and west by a railroad easement, to the south by a vacant lot, and to the east by 8th Street. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The subject site consists of a roughly rectangular-shaped parcel, 18± acres in size. The site is currently vacant and undeveloped. The ground surface cover for the site generally consists of exposed soil with sparse native grass and weed growth. Trash and debris are scattered

throughout the site. A drainage course is located along the southern property line trending east-west of the site.

Based on our review of readily available historical aerial photographs and Google Earth, most of the site appears to have been rough graded between the years of 2010 and 2011. It appears that a construction trailer along with rock and soil stockpiles were present at the site between the years of 2011 and 2013.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the overall site topography gently slopes downward to the east at a gradient of approximately 1 percent. Areas located in the central and eastern regions of the site appear to have been cut 1 to 3± feet below existing site grades. The depths of the drainage course range from 1 to 9± feet lower than the surrounding elevations.

Proposed Development

A conceptual site plan, identified as Scheme 1 and prepared by HPA, Inc., for the proposed development was provided to our office by the client. Based on this plan, the subject site will be developed with a 389,200± ft² warehouse, located in the central region of the site. Dock-high doors will be constructed along the northern and southern building walls. The proposed building is expected to be surrounded by AC pavements in the parking and drive areas, PCC pavements in the loading dock area, and concrete flatwork and landscaped planters throughout the site.

The proposed development will use on-site storm water infiltration. The infiltration system will consist of below-grade chambers located in the northeastern and southeastern regions of the site. The bottom of the infiltration chambers will be approximately 10± feet below the existing site grades.

Concurrent Study

SCG conducted a geotechnical investigation at the subject site, referenced above. As a part of this study, five (5) borings advanced to depths of 20 to 25± feet below the existing site grades.

Artificial fill soils were encountered at the ground surface at Boring No. B-3. These fill soils extend to a depth of 3± feet below the existing site grades. The fill soils generally consist of medium dense fine sandy silts with a varying amount of clay. The fill soils possess a disturbed appearance and mottled appearance resulting in their classification as artificial fill. Native alluvium was encountered below the fill soils at Boring No. B-3 and at the ground surface of all of the remaining boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to dense fine to coarse sands and silty fine sands with varying gravel content. Boring No. B-4 encountered a layer of very dense clayey fine sands to fine sandy clays at depths of 17 to 22± feet below the existing site grades.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings and the moisture contents of the recovered soil samples, the static

groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

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) Open File Report 105, the Seismic Hazard Zone Report for the Palmdale 7.5-Minute Quadrangle, which indicated that the historic high groundwater level for the site was greater than 40 feet below the ground surface.

Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 0.3 miles northeast from the site. Water level readings within this monitoring well indicates a high groundwater level of 445 feet (April 1982) below the ground surface.

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of two (2) infiltration test borings advanced to a depth of 10± 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 I-1 to I-2) 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 all infiltration test locations, extending to the maximum explored depth of 10± feet below existing site grades. The alluvium generally consists of medium dense silty fine sands with varying sand and gravel content. Groundwater was not encountered at any of the infiltration borings. The Infiltration Test 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. As previously mentioned, the infiltration testing was performed in general accordance with Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration (GS200.1) published by Los Angeles County Public Works – Geotechnical Engineering and Materials Division, dated June 30, 2021.

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 boring did not completely infiltrate within a 30-minute time period after filling each boring, a falling head test was the appropriate test method.

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 12± inches higher than the bottom of the borings and less than or equal to the water level used during the pre-soaking process. Readings were taken at 30-minute intervals for all infiltration tests. 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:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	10	Silty fine to medium Sand, trace coarse Sand, trace fine Gravel	0.2
I-2	10	Silty fine to medium Sand, trace coarse Sand, trace fine Gravel	0.4

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 to C-2 of this report.

Design Recommendations

Two (2) infiltration tests were performed at the northeastern and southeastern region of the subject site. The measured infiltration rates at the infiltration test locations range from 0.6 to 1.2 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:

Infiltration System	**Design Infiltration Rate (inches/hour)**
Southeast	0.2
Northeast	0.4

The design of the proposed storm water infiltration system 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 system 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 rate.** It should be noted that the recommended infiltration rate is based on infiltration testing at two (2) discrete locations and the overall infiltration rate of the storm water infiltration system could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the Los Angeles County guidelines and are considered valid only for the time and place of the actual test. 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, grainsize 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 system can significantly reduce the infiltration ability of the chambers. 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 system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the chamber 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.

Chamber Maintenance

The proposed project includes below-grade chamber systems. Water flowing into these systems will carry some level of sediment. Wind-blown sediments will also contribute to sediment deposition at the bottom of the chamber. This layer has the potential to significantly reduce the infiltration rate of the chamber subgrade soils. Therefore, a formal chamber maintenance program should be established to ensure that these silt and clay deposits are removed from the system on a regular basis.

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 system.

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,

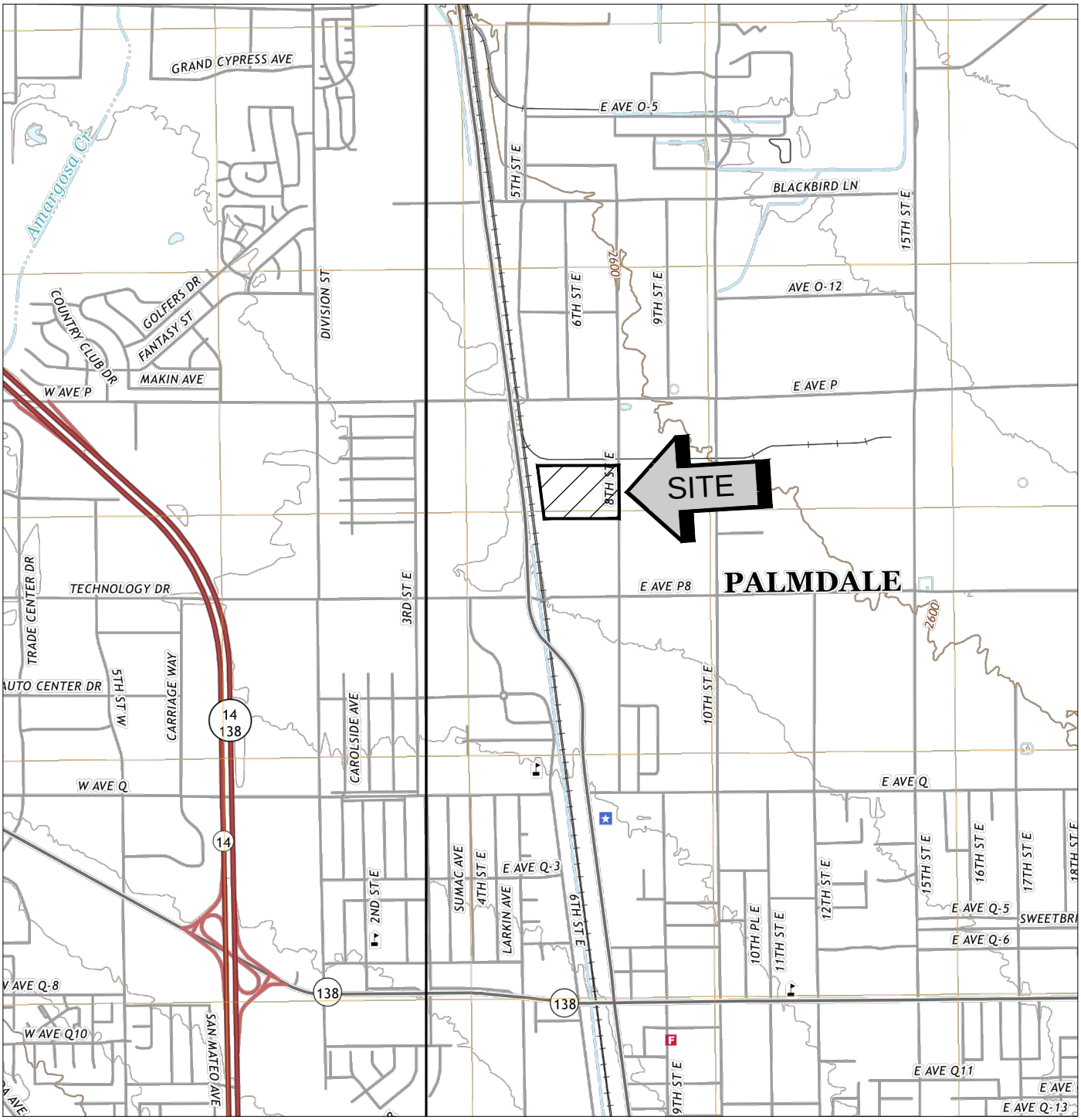
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Oscar Sandoval
Staff Engineer

Robert G. Trazo, GE 2655
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT TRAZO
No. 2655
GEOTECHNICAL
STATE OF CALIFORNIA

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



SOURCE: USGS TOPOGRAPHIC MAP OF THE RITTER RIDGE & PALMDALE QUADRANGLES, LOS ANGELES, CALIFORNIA, 2018.

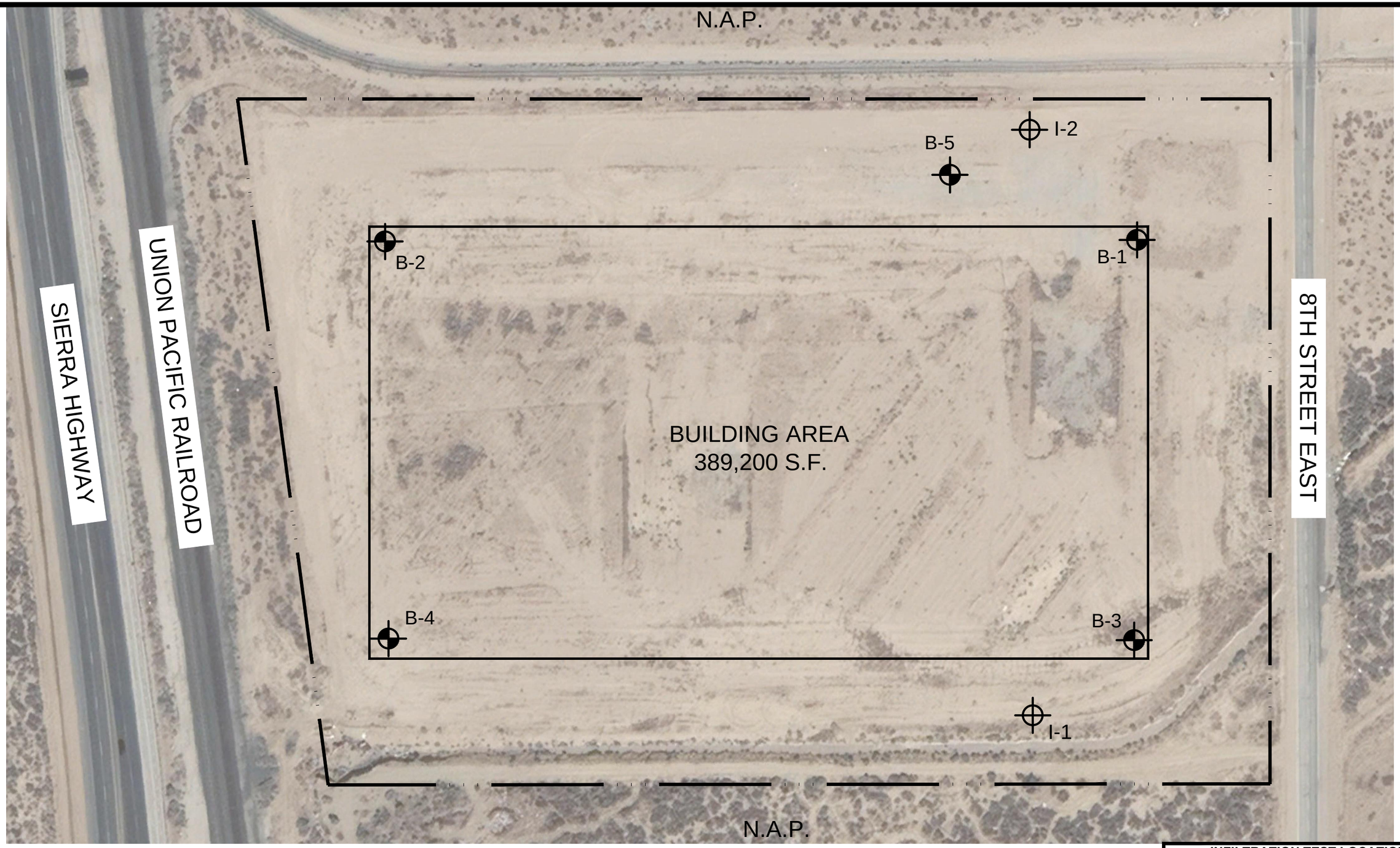
SITE LOCATION MAP

PROPOSED WAREHOUSE

PALMDALE, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: MD CHKD: RGT	
SCG PROJECT 22G109-2	
PLATE 1	

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

APPROXIMATE INFILTRATION TEST LOCATION

APPROXIMATE BORING LOCATION

NORTH

NOTE: CONCEPTUAL SITE PLAN (SCHEME 1) PREPARED BY HPA, INC.
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH (2018)

INFILTRATION TEST LOCATION PLAN

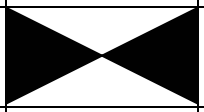
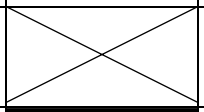
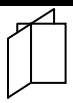
PROPOSED WAREHOUSE

PALMDALE, CALIFORNIA

SCALE: 1" = 100'	
DRAWN: OS CHKD: RGT	
SCG PROJECT 22G109-2	
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/ft^3.

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

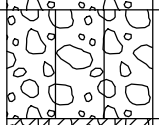
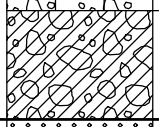
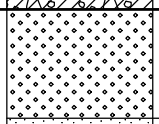
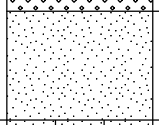
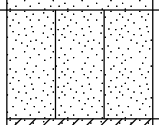
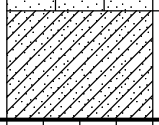
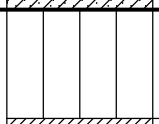
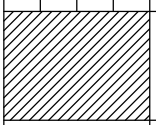
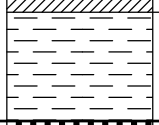
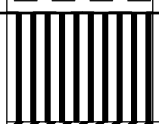
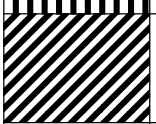
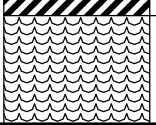
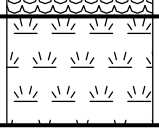
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

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

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-1

JOB NO.: 22G109-2
PROJECT: Proposed Warehouse
LOCATION: Palmdale, California

DRILLING DATE: 1/25/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Oscar Sandoval

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM: Gray Brown Silty fine Sand, trace medium Sand, medium dense-damp							
		27					5					
5					Light Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel, medium dense-dry to damp							
		28					3			14		
10					Boring Terminated at 10'							

TBL 22G109-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 22G109-2
PROJECT: Proposed Warehouse
LOCATION: Palmdale, California

DRILLING DATE: 1/25/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Oscar Sandoval

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
5		11			ALLUVIUM: Light Brown to Brown Silty fine to medium Sand, trace coarse Sand, medium dense-dry to damp		3					
10		10			Light Brown Silty fine to medium Sand, little coarse Sand, trace fine Gravel, medium dense-dry		2			13		
					Boring Terminated at 10'							

TBL 22G109-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG

PLATE B-2

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Palmdale, CA
Project Number	22G109-2
Engineer	CB

Test Hole Radius	3.00	(in)
Test Depth	10.20	(ft)

Infiltration Test Hole: I-1

Start Time for Pre-Soak	8:40am	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	9:10am	Time Interal Between Readings	30min

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	9:10 AM	30.0	7.20	0.55	2.7	0.6	3.0	0.2
	Final	9:40 AM		7.75					
2	Initial	9:40 AM	30.0	7.20	0.56	2.7	0.6	3.0	0.2
	Final	10:10 AM		7.76					
3	Initial	10:10 AM	30.0	7.20	0.55	2.7	0.6	3.0	0.2
	Final	10:40 AM		7.75					
4	Initial	10:40 AM	30.0	7.20	0.56	2.7	0.6	3.0	0.2
	Final	11:10 AM		7.76					
5	Initial	11:10 AM	30.0	7.20	0.55	2.7	0.6	3.0	0.2
	Final	11:40 AM		7.75					
6	Initial	11:40 AM	30.0	7.20	0.56	2.7	0.6	3.0	0.2
	Final	12:10 PM		7.76					

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 to 3
Shallow Test Pit	
Small Diameter Boring	
Large Diameter Boring	
High Fow-rate	RF_t = 3
Grain Size Analysis Method	RF_t = 2 to 3
Site variability, number of tests and thoroughness of subsurface investigation	RF_v = 1 to 3
Long-term siltation, plugging, and maintenance	RF_s = 1 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
Project Location	Palmdale, CA
Project Number	22G109-2
Engineer	CB

Test Hole Radius	3.00	(in)
Test Depth	10.20	(ft)

Infiltration Test Hole: I-2

Start Time for Pre-Soak	9:00am	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	9:30am	Time Interal Between Readings	30min

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	9:30 AM	30.0	8.00	0.80	1.8	1.2	3.0	0.4
	Final	10:00 AM		8.80					
2	Initial	10:00 AM	30.0	8.00	0.81	1.8	1.3	3.0	0.4
	Final	10:30 AM		8.81					
3	Initial	10:30 AM	30.0	8.00	0.80	1.8	1.2	3.0	0.4
	Final	11:00 AM		8.80					
4	Initial	11:00 AM	30.0	8.00	0.81	1.8	1.3	3.0	0.4
	Final	11:30 AM		8.81					
5	Initial	11:30 AM	30.0	8.00	0.81	1.8	1.3	3.0	0.4
	Final	12:00 PM		8.81					
6	Initial	12:00 PM	30.0	8.00	0.80	1.8	1.2	3.0	0.4
	Final	12:30 PM		8.80					

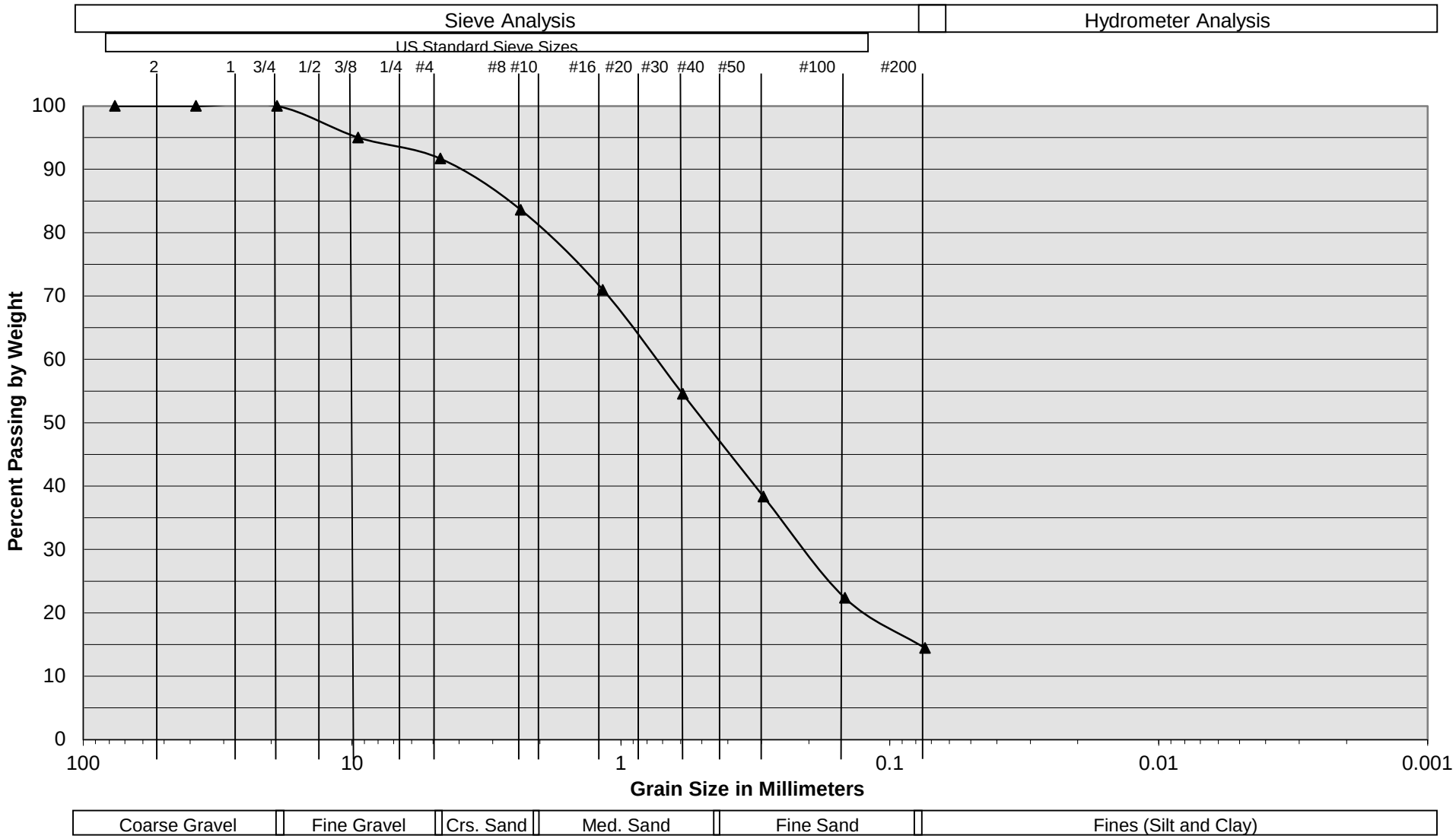
Design Infiltration Rate = (Measured Infiltration Rate)/(Reduction Factor)
Reduction Factor (RF) = $RF_t+RF_v+RF_s$

Reduction Factors	
Double-ring Infiltrometer	RF_t = 1 to 3
Shallow Test Pit	
Small Diameter Boring	
Large Diameter Boring	
High Fow-rate	RF_t = 3
Grain Size Analysis Method	RF_t = 2 to 3
Site variability, number of tests and thoroughness of subsurface investigation	RF_v = 1 to 3
Long-term siltation, plugging, and maintenance	RF_s = 1 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

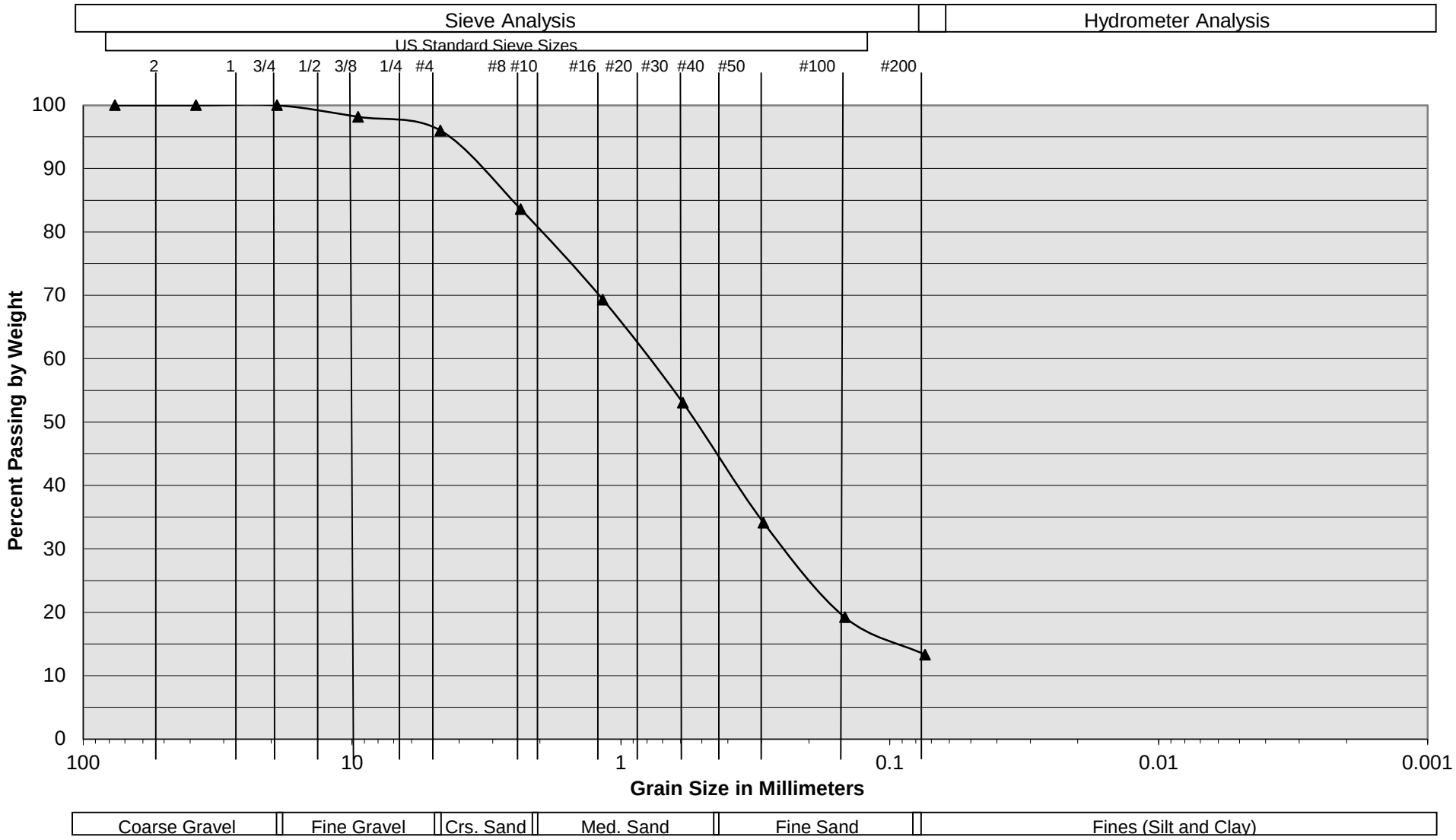


Sample Description	I-1 @ 8½'
Soil Classification	Light Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel

Proposed Warehouse
Palmdale, CA
Project No. 22G109-2
PLATE C- 1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-2 @ 8½'
Soil Classification	Light Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel

Proposed Warehouse
Palmdale, CA
Project No. 22G109-2
PLATE C- 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation