PRELIMINARY DRAINAGE REPORT FOR ANTELOPE VALLEY COMMERCE CENTER

CITY OF PALMDALE
CALIFORNIA

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This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.



10/12/2023

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I. INTRODUCTION

The Antelope Valley Commerce Center (AVCC) is an industrial site that is within a project boundary that is approximately 430 acres. The AVCC project is located within industrial land use based on the Palmdale General Plan. The project area has been previously studied by Lockheed Corporation as part of the Palmdale Business Park Center Specific Plan (PBPC-SP). Since the approval of the PBPC-SP, the Palmdale General Plan has updated the overall area to industrial use and the open space previously defined is no longer identified. An ALTA Survey was conducted for the project and a drainage easement in favor of the City of Palmdale was identified along the southwesterly limits of the project.

Based on preliminary watershed assessment, the general area lacks storm drain infrastructure. Moreover, the general drainage area south of the project remains undeveloped. In order to address a drainage and water quality solution that project must consider master drainage plans that have been approved for the surrounding areas.

The scope of this report will include the following:

- Determine the peak 50-year peak flow rates emanating from the onsite areas using the Modified Rational Method as outlined in the Los Angeles County Department of Public Works Hydrology Manual dated January 2006.
- Perform comparative analyses between the peak flow rate for the pre-project and post-project conditions.
- Develop a retention basin to mitigate increased runoff. The retention basin will implement the infiltration potential of the soil to mitigate increased runoff.
- Perform preliminary sizing of mainline storm drain which will capture and convey onsite flows to Infiltration Basin
- Prepare a drainage report to document the findings of the hydrology and hydraulic analyses prepared for the project site.
- Provide conclusions and the mitigation measures to demonstrate compliance with CEQA Section IX Hydrology and Water Quality.

II. PROJECT SITE AND DRAINAGE AREA OVERVIEW

The AVCC is located south of Columbia Way / East Avenue M, approximately 0.03 miles east of Sierra Sierra Hwy, north by Avenue M, and approximately 0.02 miles east of the active Union Pacific Railroad (UPRR) mainline tracks located adjacent to Sierra Highway; and directly north of Avenue M-12. Challenger Way runs north to south through the eastern portion of the project site. The land parcel is approximately 433 acres of open space. The proposed development seeks to improve approximately 433 acres that will be developed as part of a 4 phase development. The project is protected by an existing railroad that is located along the westerly project boundary. In the existing and post-project condition runoff emanating from a 400 acre area is located southwest of the project site, see Graphic 3 below.

Runoff from the southwesterly watershed area sheet flows in the northeasterly direction towards Sierra Highway. Along the Sierra Highway easterly right-of-way, a concrete channel directs runoff along the elevated railroad which prevents runoff from flowing to the east, see Graphic #1. The runoff collected by the earthen channel will flow under existing railroad bridge, see Graphic #2. The post-project condition will perpetuate the existing drainage patterns and ensure that the project is in compliance with the master drainage plan.



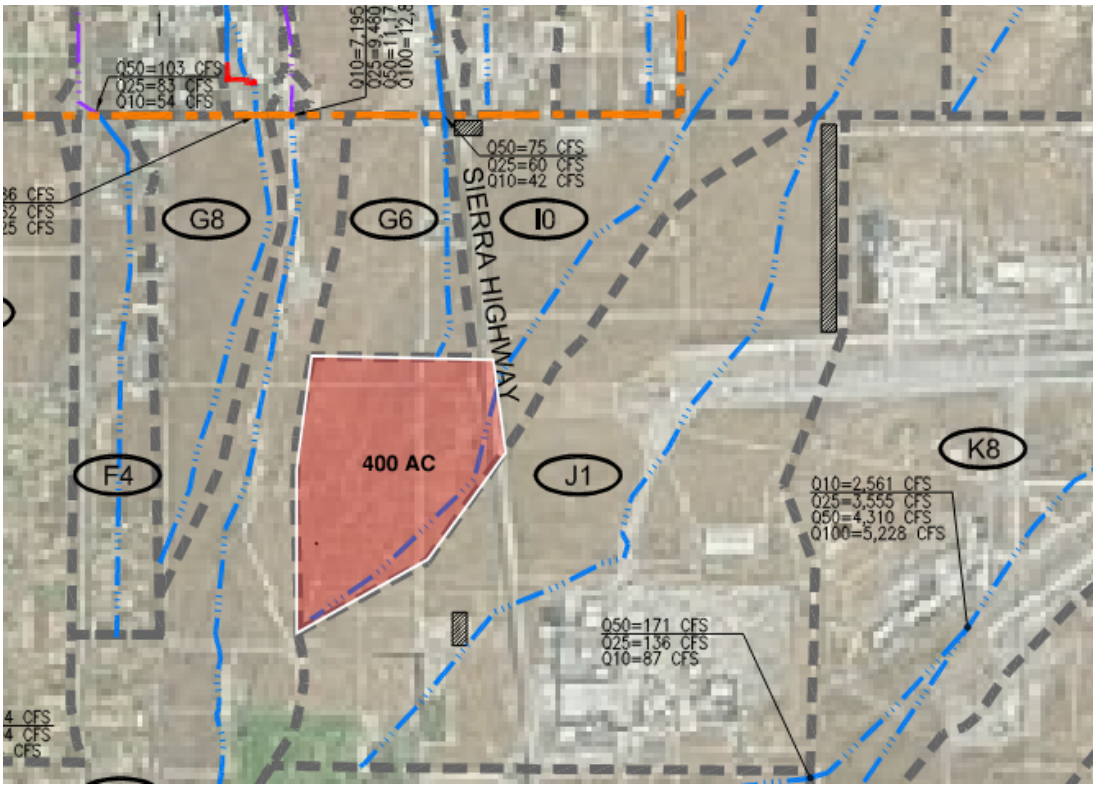
Graphic #1-Railroad & Concrete Channel looking northeasterly



Graphic #2-Railroad Bridge Crossing looking easterly

The flows passing under the railroad bridge will be conveyed into an existing reinforced concrete box that crosses Avenue M to the north. The flows passing under the railroad bridge will be perpetuated in the post-project condition.

Research was performed within the City of Palmdale and the City of Lancaster. Both the City of Palmdale and City of Lancaster have developed a Master Drainage Plan for the regional area. Based on the reports provided, the City of Lancaster went through a Master Drainage Plan (Lancaster MDP) revision in 2019. The City of Palmdale has a Master Drainage Plan that is dated 1996. The Palmdale MDP accounts for the improvement identified in the PBPC-SP. The Lancaster MDP and the Palmdale MDP have identified a proposed storm drain system that is to cross the existing railroad approximately 5,700 feet south of M Street along Sierra Highway. The proposed storm drain system is to collect approximately 400 acres of watershed area which is an area designated as Area I0, see Graphic #3.



Graphic #3-Lancaster MDP – 400 ac Watershed Area/Future Storm Drain

The AVCC Project Site will construct storm drain systems that are required to provide flood protection for the proposed development. Due to the lack of storm drain infrastructure, the project will design storm drain and basin systems that are compliant with the regional master drainage plan and perpetuate existing drainage patterns. Moreover, the storm drain and basin system will be designed to mitigate potential adverse impacts to downstream and upstream

property owners. Please note, in the interim condition the project will provide drainage solutions that will mitigate increase runoff and minimize downstream flooding to a level that mimics the existing condition.

III. HYDROLOGY

The preliminary hydrology prepared for this project utilized the MODRAT method documented in the LA County Hydrology Manual. MODRAT is the modified rational method which enables the development of hydrographs, and therefore enables channel routing of the flows to better account for travel time and how sub-drainage areas within the watershed area confluence.

The MODRAT analysis was carried out using the Aquaveo program WMS as instructed by the LA County Hydrology Manual. The program allows the user to specify the necessary basin and channel routing characteristics for a network of "basins" and "outlets" resulting in the production of hydrographs at each nodal element and at the downstream terminus of the overall network. The network of basins and outlets were done for the following two conditions:

1. Pre-Project Condition which assumes the existing flow patterns and existing topographical. The existing topography was used to develop watershed areas and sub-drainage areas that compose the overall watershed area.
2. Post-Project Condition which assumes the construction of the project based on a conceptual grading plan. The conceptual grading plan was used to identify the watershed areas and sub-drainage areas.

These output hydrographs were subsequently used to determine alterations in peak flowrate associated with the onsite project improvements and assessed to determine the necessary onsite storage volume to mitigate these alterations.

The program requires basin characteristics such as watershed areas and flow paths obtained via watershed delineation (Exhibits A/B), soil classification obtained with the LA County Soils Map (Excerpt B), and rainfall depth obtained with he LA County Rainfall Map (Excerpt A). Additionally, an impervious percentage was define for each modeled area and was designated based on the land use. The soils for the project site included soils types 124 and 134 with 124 classifying the majority of the project (134 restricted to the southeastern quadrant). The rainfall was taken to be homogenous for the project site at a value of three inches. The land uses for this study were limited to open space and commercial property with impervious percentages of 0% and 90%, respectively. Please note that for some HydroCalc calculations used on individual subareas, 0% was input as 0.01% as that is the minimum value accepted by the LA County HydroCalc software. All areas delineated in the Pre-Project condition (Exhibit A) were classified as open space with a 0% imperviousness. For the Post-Project condition (Exhibit B) Area D was classified entirely as commercial with 90% imperviousness, and Area E was classified as open space with 0% imperviousness.

TABLE 1: *WMS Input Overview (for area specific information see Exhibits A/B)*

AREA NAME	RAINFALL DEPTH	SOIL CLASS	IMPERVIOUS %
A	3"	124	0%
B	3"	124	0%
C	3"	124/134	0%
D	3"	124	90%
E	3"	124/134	0%

As previous stated, the pre- and post- project condition hydrology were developed in order to study the influence of the proposed project development. Exhibits A and B illustrate the watershed boundaries and flow paths used within this analysis. Importantly, the pre- project was divided into three watershed areas defined as 1, 2, and 3. The post-project was divided into two watershed areas defined as 1 and 2. In the pre-project and post-project condition Area 1 and Area 2 drain to the northeast on to Avenue M. Area 3 drains to the north to Avenue M to an existing culvert system, east of the intersection of Avenue M and Challenger Way. The existing Avenue M terrain is very flat and the existing condition has several low points where runoff accumulates. The existing Avenue M does not have any storm drain infrastructure to collect runoff that accumulates at these low points. These low points along Avenue M currently serve as project outlet points in the existing condition for Area 1 and Area 2. When runoff accumulation exceeds the natural storage volume of the existing depressions and the capacity of the existing culvert, flows will overtop the roadway. Moreover, runoff from Area 3 currently drains into an existing culvert located east of Avenue M / existing Railroad intersection. The post-project condition will reduce Area 3 to solely include the existing natural drainage channel.

The pre-project condition, as identified in Exhibit A, consist of 3 drainage area defined as Area 1, Area 2 and Area 3. The peak flow rates for the pre-project condition were based on the rational method as outlined by the hydrology manual developed by Los Angeles County Public Works. The peak flow rate for these three areas have been provided in the following table:

Drainage Area	Node	Q_{50} (ft^3/s)
1	2526	14.4
2	2489	11.9
3	2526	1.6

Please note that the hydrology analyses did not assess the 10 year or 25 year as outlined in the City of Palmdale requirements. These storm frequencies were not addressed since the project will design the storm drain systems for the 50 year storm event which is also defined as the Capital Flood. The 50 year storm event was utilized since the project is implementing an infiltration basin due to the lack of storm drain infrastructure.

The post-project hydrology assessment will consist of two drainage area defined as Area 1 and Area 2. The proposed development has been designed to perpetuate the existing drainage patterns and to provide storm drain infrastructure that is consistent with the MDP and will not

adversely impact downstream property owners. The post-project condition hydrology for Area 1 is based on a development solution that collects the runoff within the development area and discharges the runoff into Basin A as shown in Exhibit B. Basin A will be designed to function as an infiltration basin that will mitigate water quality, reduce downstream flows to be equal to or less than the pre-project condition and to promote groundwater infiltration. Area 2, which is tributary to the intersection of Avenue M and 15th Street does not include any development or proposed improvements. This area is being studied to demonstrate that the post-project flow rate is equal to or less than the pre-project condition. It should be noted that Post-Project Area 1 is tributary to an existing culvert east of Challenger Way which is an identical outlet point as the pre-project condition. Post-Project Area 2 is tributary to the intersection of 15 Street and Avenue M which is an identical outlet point as the pre-project condition

The focus of the hydrology analyses is to document how areas are being altered by the project development. The project development is within Area 1 as shown in Exhibit B consists of 447 acres compared to the pre-project Area 1 area of 290.4 acres. Area 2 drainage area in post-project hydrology has been reduced from the pre-project area of 326.1 acres to 188.9 acres. Please note that the total area for the pre-project condition is 616.5 acres for Area 1 and Area 2, which is less than the sum of the Area 1 and Area 2 area of 635.9 acres for the post-project condition. The difference can be attributed to redirection of Area 3 flow in the pre-project condition which have been included as part of post-project condition Area 1.

The pre-project condition results indicate a peak flow rate of 14.3 cfs and Total Volume of 6.1 ac-ft that are tributary to the existing culvert east of Challenger Way the pre-project Area 1 watershed area of 290.4 acres. The post-project condition resulted in 280.4 cfs delivered to the existing culvert east of Challenger Way. The post-project outlet/existing culvert will collect a total volume of 86.0 ac-ft for the 447 acres of watershed area.
The post-project must mitigate the increase flow and volume that is associated with the project. The development will implement Basin A to mitigate increase runoff at the project outlet by attenuating the 288.4 cfs peak inflow by the use of an infiltration basin. To mitigate the increased runoff the project must provide an infiltration basin for approximately 86 ac-ft of storage to retain the 50 year storm event and 18.5 acre-feet to retain the water quality volume. This storage is required to attenuate the post-project flowrate to the pre-project flowrate. The proposed infiltration basin design has provided approximately 100 ac-ft of storage within the proposed retention basin area which is greater than the 86 ac-ft of runoff volume generated by Area 1. Post-Project Area 2 will not be disturbed and the existing ground cover will match the existing condition land cover. Since Area 2 will reduce the pre-project watershed 326.1 acre area to 188.9 acres, the project will reduce the peak flow rate by 60% to Avenue M and 15 Street since the flow rate is proportional to the watershed area.

IV. HYDRAULICS

The post-project condition will include onsite storm drain to facilitate the conveyance of onsite flows to the project outlet which will coincide with an infiltration basin. The proposed storm drain has been preliminarily sized based on expected aggregation of flows in the mainline

systems at the downstream end of each watershed subarea. Therefore, each storm drain reach has a unique hydrologic subarea that is used to size the proposed storm drain. The proposed storm drain will be based on the maximum possible flowrate that will aggregate at the downstream end of the subarea. The storm drain size is assigned to storm drain reach until the expected flowrate changes at the intersection of the storm drain and a subarea boundary. The summary of all preliminary storm drain mainline sizes can be found in Exhibit C, Drainage Facilities Map.

The flowrates for sizing and sizing methodology was described above. Specifically, each RCP diameter was defined by using the Flowmaster Hydraulic Analysis tool by Bentely. The preliminary pipe sizes were resized to the nearest half-foot diameter provided based on a pipe capacity that was less than or equal to 75% of the full flow condition. This was done with a normal depth calculation and the partial flow condition was implemented to ensure sufficient capacity to address hydraulic losses. Flowmaster output calculations can be found in Appendix B.

The Post-Project Hydrology demonstrated a need to store approximately 80 ac-ft of onsite runoff as a mitigation measure. The project will provide an infiltration basin with a maximum storage capacity of approximately 104.9 ac-ft. The stage-storage curve can be assessed below in Table 3. It is expected that this basin is sufficient in volume capacity and will enable the entire onsite runoff volume to be infiltrated or attenuated and released in part at the pre-project flowrate.

TABLE 3: *Infiltration Basin Stage-Storage Data*

ELEVATION (ft)	AREA (ac)	INCREMENTAL VOLUME (ac-ft)	CUMULATIVE VOLUME (ac-ft)
2492	9.59	0.00	0.00
2493	9.77	9.68	9.68
2494	9.94	9.85	19.53
2495	10.13	10.04	29.57
2496	10.31	10.22	39.78
2497	10.49	10.40	50.18
2498	10.68	10.58	60.77
2499	10.86	10.77	71.54
2500	11.05	10.96	82.49
2501	11.24	11.14	93.64
2502	11.43	11.33	104.97

Potential infiltration for the project site was obtained from the geotechnical report, included in Appendix D.3. The infiltration rate for the basin area within the project is 1.7 inches per hour.

Using a basin bottom area of 9.59 acres and infiltration rate of 1.7 inches per hour, the in-situ soil would require 2.7 days to dewater the basin through infiltration. The drawdown time is based on the maximum runoff volume of 86.2 ac-ft which is generated by the 50 year storm event (Capital Flood Condition). The water quality volume would have a drawdown period of 0.6 days which is less than the 7 day requirement established by the City of Palmdale.

Storm Event	Runoff Volume (ft^3)	Drawdown Time (Days)
0.75" Storm	803498.4	0.57
50-year	3753356.4	2.64

The proposed project does not plan on constructing any MDP facilities that have been identified by the City of Palmdale or Lancaster. However, the project is providing drive aisles and streets that can be used in the future to construct the ultimate MDP storm drain system.

The proposed storm drain improvements for the project are presented in Exhibit C, Drainage Facilities Map. The improvements consist of following:

1. The project will implement the design of 4 major storm drain infrastructure systems located along Private Drive A, Street B, Street C and Private Drive C.
2. The proposed storm drain system will collect onsite and offsite runoff through the use of inlet structures and catch basins.
3. The storm drain systems will direct runoff into a proposed infiltration basin defined as Basin A.

The proposed storm drain system and Basin A are required to collect onsite and offsite flows. The proposed project solution is to perpetuate existing flow patterns and ensure that the project is compliant with the master drainage plan. Additionally, the proposed storm drain must ensure that the project provides the required mitigation measures to be in compliance with CEQA. The following table provides following hydrology and water quality issues that were addressed as part of the CEQA assessment:

CEQA Project Characteristic being Assessed	Response to CEQA Charaacteristics
Violate any water quality standards or waste discharge requirements ?	The project is proposing an infiltration basin as part of the storm drain improvements. The basin will collect water quality runoff volume from the project area and the 50 year storm event volume. The total water quality volume and 50 year volume will be retained and infiltrated through the basin. As a result, the project would have no adverse impacts to water quality deterioration since the project will comply with the California Regional Water Quality MS4 Permit which regulates post-project water quality.
Substantially deplete groundwater supplies or interfere with groundwater recharge such that there would be a net deficit in the aquifer?	The project is providing Basin A which is designed as an infiltration basin. The infiltration basin will promote groundwater recharge. In the current condition the runoff for the area has limited storage. The proposed basin will allow more runoff to be infiltrated into the groundwater aquifer in the post-project condition. As a result, the project would not impact groundwater supplies or the natural aquifer.
Substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river in a manner that would result in substantial erosion or siltation?	The existing watershed does not have a stream or river through the project. The post-project condition will perpetuate the existing drainage patterns. Moreover, the proposed Basin A will mitigate outflow to existing condition levels which would not exacerbate the downstream watercourses. Additionally, the proposed storm drains will implement the use of energy dissipators to reduce velocities to non-erosive levels.

CEQA Project Characteristic being Assessed	Response to CEQA Charaacteristics
Substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river or substantially increase flow rate or surface runoff in a manner that results in flooding to on and offsite area?	The existing watershed does not have a stream or river through the project. The post-project condition will perpetuate the existing drainage patterns. The project has implement Basin A to mitigate increase runoff to ensure flows do not exceed the existing condition and not adversely impact downstream flooding.
Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	The post-project condition will perpetuate the existing drainage patterns. The project has implement Basin A to mitigate increase runoff to ensure flows do not exceed the existing condition and not adversely impact downstream flooding.
Substantially degrade water quality?	The project is proposing an infiltration basin as part of the storm drain improvements. The basin will collect water quality runoff volume. The total water quality volume will be retained and infiltrated through the basin. As a result, the project would have no adverse impacts to water quality deterioration since the project will comply with the California Regional Water Quality MS4 Permit which regulates post-project water quality.
Place housing within a 100 year flood hazard area as mapped by FEMA?	The project does not have a FEMA Flood Hazard area.. However, the project is constructing the required storm drain infrastructure to ensure the development is protected from a 100 year flood hazards.
Place structures within a 100 year flood hazard that would impede or redirect flood flows.?	The project does not have a FEMA Flood Hazard area. Therefore, the development will not impede or redirect flows.
Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of levee or dam?	The existing watershed does not contain any existing levee or dam structures.
Inundation by seiche, tsunami or mudflow?	The project is not located near a waterbody or along the coast; therefore, seiche and tsunami are not relevant. Moreover, the terrain within the watershed is flat and runoff flows in a sheet flow condition. These characteristics are not subject to mudlfow.

Based on assessing the Hydrology and Water Quality characteristics identified as part of the CEQA process, the project will not have any adverse impacts with the construction of the storm drain and Basin A that are identified in Exhibit C, Drainage Facilities Map.

V. FINDINGS

A detailed onsite hydrology and hydraulic analyses were performed for the AVCC Project. The purpose of the study was to define storm drain systems to provide adequate flood protection. Additionally, the project assessed a basin solution that meets the City of Palmdale design criteria. The following conclusions have been developed for the project:

1. The project will increase the runoff on the project site area due to the increase in impervious area. The project will increase the peak flow rate from 14.3 cfs to 280.8 cfs. The project will implement an infiltration basin to mitigate the increase runoff generated by the project.

2. The project is proposing a series of storm drain systems outlined in the Drainage Facilities Map. These storm drain systems will provide the necessary flood protection to collect and convey the runoff generated by a 50 year storm event.
3. The proposed infiltration basin has been designed to store 105 acre-feet of runoff volume. The post-project condition generates 86.2 acre-feet during a 50 year storm event. The proposed basin is sufficiently large enough to store runoff from the project site and eliminate the possibility of increasing flows to the downstream property owners.
4. The proposed infiltration basin will require approximately 3.2 days to drawdown water quality volume which is equal to 18.4 acre-feet. This is within conformance of the City of Palmdale 7 day drawdown period.
5. The proposed project will not impact the implementation of the City of Palmdale and City of Lancaster MDP. Additionally, the project will be able to use the proposed basin as a future detention basin once the future MDP storm drain is designed by a future entity.
6. The project proposes 4 development phases within AVCC. During final engineering, the project must implement the following improvement:
    a. The project must construct Basin 1 and all appurtenances that provide a functional basin as part of the 1st phase. A function basin shall includes the following
        i. Access ramps to the bottom of the basin per city standards.
        ii. Concrete emergency spillway.
        iii. The required storm drain to ensure runoff from Area 1 is collected and conveyed into the basin. The required storm drain will be based on the rough grading plans that is part of Phase 1.
    b. The project will not be required to construct all storm drain shown in the drainage facilities map as part of Phase 1. However, the project must provide sufficient storm drain improvements to complement the rough grading plans and to ensure the following:
        i. The storm drain for Phase 1 must provide adequate flood protection for all proposed buildings.
        ii. Storm drain must be constructed to ensure downstream and upstream property owners are not impacted.
        iii. Provide sufficient storm drain and inlets to collect upstream drainage areas from Area 1.

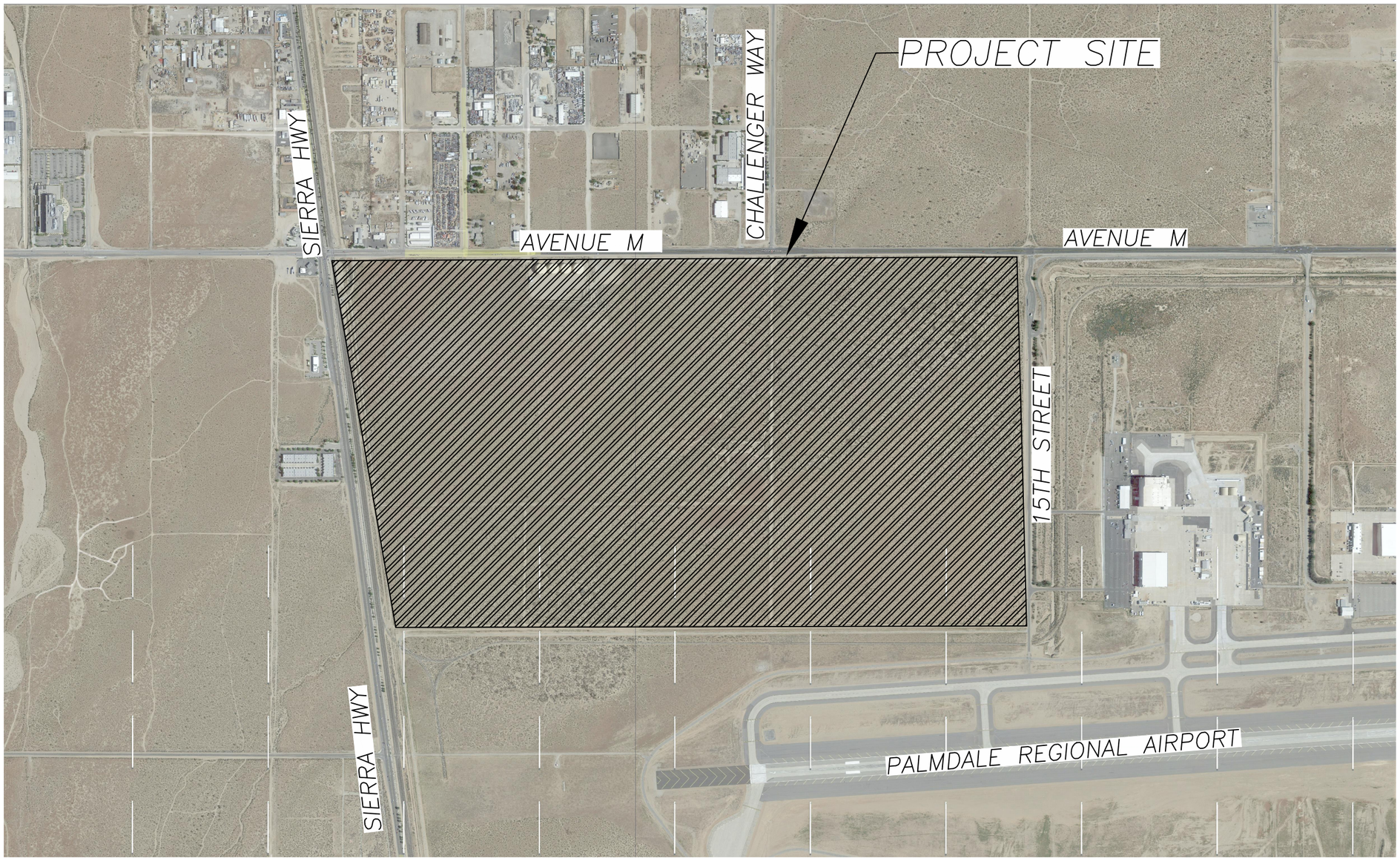
In closing, the storm drain facilities and the infiltration basin will provide the flood protection for the project. Additionally, the infiltration basin will mitigate increased runoff to eliminate potential downstream impacts. The proposed improvements are the required mitigation measures to ensure that the project does not have any impacts and is compliant with CEQA.

VI. REFERENCES

1. Los Angeles County Department of Public Works Hydrology Manual, January 2006.
2. Los Angeles County Flood Control Design Manual, March 1982
3. City of Lancaster MDP, Stantec, 2019
4. Palmdale Business Park Center Specific Plan, David A Price, March1996
5. City of Palmdale Master Drainage Plan, AKM 1996

FIGURES

FIGURE 1: VICINITY MAP



ANTELOPE VALLEY COMMERCE CENTER VICINITY MAP

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FIGURE 1

Drawing Name: O:\265.20.22\Engineering\Hydrology_Plan\Exhibits\Figure 1 - Vicinity Map.dwg
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APPENDICES

APPENDIX A: MODRAT PRE-PROJECT HYDROLOGY CALCULATIONS

HYDROCALC Pre-Project Results for 50 Year Storm Frequency Peak Flow Rate and Volume (AREA 1)											
Subarea ID Hydrocalc Model	Subarea ID WMS Model	Watershed Area	Area (ac)	Flow Path Length (ft)	Flow Path Slope (vft/hft)	Storm Event Rainfall Depth (in)	Percent Impervious	Soil Type	Time of Concentration	Peak Flow Rate (ft^3/s)	24 Hour Storm Volume (ac-ft)
1A	1A	1	37.2	2623	0.0072	3	0.01	124	30	3.10	1.00
3A	3A	1	45.4	4413	0.0068	3	0.01	124	30	3.78	1.22
4A	4A	1	38.4	4090	0.0073	3	0.01	124	30	3.20	1.03
6A	6A	1	52.9	4453	0.0083	3	0.01	124	30	4.41	1.42
7B	7B	1	56.2	2598	0.0089	3	0.01	124	30	4.68	1.50
9B	9B	1	26.8	1806	0.0089	3	0.01	124	30	2.23	0.72
11B	11B	1	33.5	2175	0.0083	3	0.01	124	30	2.79	0.90

HYDROCALC Pre-Project Results for 50 Year Storm Frequency Peak Flow Rate and Volume (AREA 2)											
Subarea ID Hydrocalc Model	Subarea ID WMS Model	Watershed Area	Area (ac)	Flow Path Length (ft)	Flow Path Slope (vft/hft)	Storm Event Rainfall Depth (in)	Percent Impervious	Soil Type	Time of Concentration	Peak Flow Rate (ft^3/s)	24 Hour Storm Volume (ac-ft)
1A	1A	2	47.6	2145	0.0091	3	0.01	134	30	3.96	1.27
3A	3A	2	20.5	1644	0.011	3	0.01	134	30	1.71	0.55
5A	5A	2	63.8	2742	0.0073	3	0.01	134	30	5.31	1.71
7A	**7A**	2	8.7	758	0.012	3	0.01	124	30	0.72	0.23
8B	**8B**	2	39.9	3055	0.0082	3	0.01	134	30	3.32	1.07
9B	**9B**	2	32.6	2426	0.0082	3	0.01	134	30	2.71	0.87
11B	**11B**	2	44.7	2930	0.0089	3	0.01	124	30	3.72	1.20
13A	13A	2	31.7	2294	0.011	3	0.01	124	30	2.64	0.85
14A	14A	2	36.6	3112	0.01	3	0.01	124	30	3.05	0.98

HYDROCALC Pre-Project Results for 50 Year Storm Frequency Peak Flow Rate and Volume (AREA 3)											
Subarea ID Hydrocalc Model	Subarea ID WMS Model	Watershed Area	Area (ac)	Flow Path Length (ft)	Flow Path Slope (vft/hft)	Storm Event Rainfall Depth (in)	Percent Impervious	Soil Type	Time of Concentration	Peak Flow Rate (ft^3/s)	24 Hour Storm Volume (ac-ft)
E1	1A	3	19.6	1711	0.0087	3	0.01	124	30	1.63	0.52

APPENDIX A.2: MODRAT PRE-PROJECT HYDROLOGY CALCULATIONS

File name: pre-project-AB.lac Run date: Tue Feb 22 07:43:25 2022

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	37.2	2.87	37.2	2.87	0.912	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	2A	0.0	0.00	37.2	2.87	0.912	3	1550	0.00451	30-6	0.00	0	124	0	3.00	0.00
1	3A	45.4	3.50	82.6	4.58	1.821	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	4A	38.4	2.96	121.0	7.52	2.763	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	5A	0.0	0.00	121.0	7.52	2.763	3	1098	0.00911	30-6	0.00	0	124	0	3.00	0.00
1	6A	52.9	4.08	173.9	10.57	3.846	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	7B	56.2	4.33	56.2	4.33	1.378	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	8B	0.0	0.00	56.2	4.33	1.378	1	1831	0.00874	0.00	0.00	0	124	0	3.00	0.00
1	9B	26.8	2.07	83.0	3.48	1.776	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	10B	0.0	0.00	83.0	3.48	1.776	1	1723	0.00522	0.00	0.00	0	124	0	3.00	0.00
1	11B	33.5	2.58	116.5	3.95	2.283	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	12AB	116.5	3.95	290.4	14.37	6.129	1	0	0.00000	0.00	0.00	0	124	0	3.00	0.00

File name: pre-project-AB.lac Run date: Tue Feb 22 07:43:25 2022

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 2 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	37.2	0.25	37.2	0.25	0.005	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	2A	0.0	0.00	37.2	0.25	0.005	3	1550	0.00451	30-6	0.00	0	124	0	3.00	0.00
1	3A	45.4	0.31	82.6	0.48	0.019	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	4A	38.4	0.26	121.0	0.74	0.024	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	5A	0.0	0.00	121.0	0.74	0.024	3	1098	0.00911	30-6	0.00	0	124	0	3.00	0.00
1	6A	52.9	0.36	173.9	1.04	0.043	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	7B	56.2	0.38	56.2	0.38	0.008	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	8B	0.0	0.00	56.2	0.38	0.008	1	1831	0.00874	0.00	0.00	0	124	0	3.00	0.00
1	9B	26.8	0.18	83.0	0.57	0.067	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	10B	0.0	0.00	83.0	0.57	0.067	1	1723	0.00522	0.00	0.00	0	124	0	3.00	0.00
1	11B	33.5	0.23	116.5	1.04	0.163	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	12AB	116.5	1.04	290.4	2.08	0.206	1	0	0.00000	0.00	0.00	0	124	0	3.00	0.00

Normal End of MODRAT

File name: pre-project-modrat-C.lac Run date: Mon Feb 14 09:03:35 2022

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	47.6	3.67	47.6	3.67	1.167	0	0	0.00000	0.00	0.00	0	134	30	3.00	0.00
1	2A	0.0	0.00	47.6	3.67	1.167	1	602	0.00997	0.00	0.00	0	134	0	3.00	0.00
1	3A	20.5	1.58	68.1	4.56	1.463	0	0	0.00000	0.00	0.00	0	134	30	3.00	0.00
1	4A	0.0	0.00	68.1	4.56	1.463	1	475	0.00211	0.00	0.00	0	134	0	3.00	0.00
1	5A	63.8	4.92	131.9	6.75	2.804	0	0	0.00000	0.00	0.00	0	134	30	3.00	0.00
1	6A	0.0	0.00	131.9	6.75	2.804	1	391	0.00767	0.00	0.00	0	134	0	3.00	0.00
1	7A	8.7	0.67	140.6	7.13	2.800	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	8B	39.9	3.08	39.9	3.08	0.978	0	0	0.00000	0.00	0.00	0	134	30	3.00	0.00
1	9B	32.6	2.51	72.5	5.59	1.778	0	0	0.00000	0.00	0.00	0	134	30	3.00	0.00
1	10B	0.0	0.00	72.5	5.59	1.778	1	2846	0.00773	0.00	0.00	0	134	0	3.00	0.00
1	11B	44.7	3.45	117.2	4.81	2.519	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	12AB	117.2	4.81	257.8	11.69	5.320	1	1222	0.00491	0.00	0.00	0	124	0	3.00	0.00
1	13A	31.7	2.44	289.5	10.85	5.708	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	14A	36.6	2.82	326.1	11.87	6.606	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	15A	0.0	0.00	326.1	11.87	6.606	0	0	0.00000	0.00	0.00	0	124	0	3.00	0.00

Normal End of MODRAT

APPENDIX B: MODRAT POST-PROJECT HYDROLOGY CALCULATIONS

APPENDIX B.1: HYDROCALC POST-PROJECT HYDROLOGY CALCULATIONS

HYDROCALC Post-Project Results for 50 Year Storm Frequency Peak Flow Rate and Volume (AREA 1)											
Subarea ID Hydrocalc Model	Subarea ID WMS Model	Area (ac)	AREA SQ MI	Flow Path Length (ft)	Flow Path Slope (vft/hft)	Storm Event Rainfall Depth (in)	Percent Impervious	Soil Type	Time of Concentration	Peak Flow Rate (ft^3/s)	24 Hour Storm Volume (ac-ft)
A1	1A	10.8	0.0169	1423	0.00702741	3	0.9	124	24	7.58	2.20
A3	3A	30.5	0.0477	2159	0.00694766	3	0.9	124	30	19.28	6.20
B4	4B	31.5	0.0492	2506	0.00359138	3	0.9	124	30	19.92	6.40
A7	7A	15.9	0.0248	591	0.00169205	3	0.9	124	18	12.78	3.23
C9	9C	12.2	0.0191	762	0.00787402	3	0.9	124	16	10.37	2.48
C11	11C	17.7	0.0277	1371	0.00510576	3	0.9	124	25	12.19	3.60
C13	13C	12.3	0.0192	679	0.00589102	3	0.9	124	16	10.45	2.50
A15	15A	10.4	0.0163	569	0.00702988	3	0.9	124	14	9.41	2.11
A17	17A	12.1	0.0189	629	0.00476948	3	0.9	124	15	10.60	2.46
A19	19A	16.4	0.0256	955	0.0052356	3	0.9	124	20	12.55	3.33
D20	20D	46.2	0.0722	1826	0.00876232	3	0.9	124	27	30.69	9.39
D22	22D	42.5	0.0664	1883	0.00849708	3	0.9	124	28	27.76	8.64
D24	24D	35.1	0.0548	1706	0.00996483	3	0.9	124	26	23.74	7.14
D25	25D	38.6	0.0603	3234	0.00773037	3	0.9	124	30	24.41	7.85
D27	27D	49.4	0.0772	1149	0.00522193	3	0.9	124	22	36.14	10.04
A30	A30	4.8	0.0075	720	0.00694444	3	0.9	124	16	4.08	0.98
A31	31A	5.3	0.0083	549	0.00364299	3	0.9	124	15	4.64	1.08
A32	32A	14	0.0219	385	0.02597403	3	0.9	124	8	16.49	2.85
E33	33E	8.8	0.0138	705	0.00567376	3	0.9	124	16	7.48	1.79
E35	35E	11.5	0.0180	721	0.00138696	3	0.9	124	21	8.60	2.34
E37	37E	10.6	0.0166	474	0.00210971	3	0.9	124	15	9.28	2.16
F39	39F	5.8	0.0091	456	0.00657895	3	0.9	124	12	5.64	1.18
F41	41F	4.6	0.0072	576	0.00694444	3	0.9	124	14	4.16	0.94

HYDROCALC Post-Project Results for 50 Year Storm Frequency Peak Flow Rate and Volume											
Subarea ID	MODEL	Area (ac)	AREA SQ MI	Flow Path Length (ft)	Flow Path Slope (vft/hft)	Storm Event Rainfall Depth (in)	Percent Impervious	Soil Type	Time of Concentration	Peak Flow Rate (ft^3/s)	24 Hour Storm Volume (ac-ft)
A1	1A	37.1	0.0580	2145	0.00979	3	0.01	134	30	3.09	0.99
A3	3A	16.4	0.0256	1168	0.00771	3	0.01	124	30	1.37	0.44
A5	5A	63.8	0.0997	2742	0.00729	3	0.01	134	30	5.31	1.71
A7	7A	8.7	0.0136	758	0.00396	3	0.01	134	30	0.72	0.23
A8	8A	14.4	0.0225	1610	0.0106	3	0.01	124	30	1.20	0.39
A10	10A	29.2	0.0456	2025	0.011	3	0.01	124	30	2.43	0.78
A11	11A	19.3	0.0302	1827	0.011	3	0.01	124	30	1.61	0.52

APPENDIX B.2: MODRAT POST-PROJECT HYDROLOGY CALCULATIONS

File name: post-project-abcd.lac Run date: Tue Jul 26 21:34:12 2022

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 1 Storm Frequency 50

LOCATION	SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	RAIN TC (MIN)	PCT IMPV (IN)
1 1A	10.8	7.58	10.8	7.58	2.177	0	0	0.00000	0.00	0.00	0	124	24	3.00 0.90
1 2A	0.0	0.00	10.8	7.58	2.177	4	430	0.00300	2.00	0.00	0	124	0	3.00 0.00
1 3A	30.5	19.28	41.3	26.70	8.110	0	0	0.00000	0.00	0.00	0	124	30	3.00 0.90
1 4B	31.5	19.92	31.5	19.92	6.334	0	0	0.00000	0.00	0.00	0	124	30	3.00 0.90
1 5B	0.0	0.00	31.5	19.92	6.334	4	580	0.00300	3.50	0.00	0	124	0	3.00 0.00
1 6AB	31.5	0.00	72.8	46.41	14.235	4	633	0.00300	4.00	0.00	0	124	0	3.00 0.00
1 7A	15.9	12.78	88.7	58.06	17.221	0	0	0.00000	0.00	0.00	0	124	18	3.00 0.90
1 8A	0.0	0.00	88.7	58.06	17.221	4	701	0.00300	4.00	0.00	0	124	0	3.00 0.00
1 9C	12.2	10.36	12.2	10.36	2.466	0	0	0.00000	0.00	0.00	0	124	16	3.00 0.90
1 10C	0.0	0.00	12.2	10.36	2.466	4	912	0.00300	2.00	0.00	0	124	0	3.00 0.00
1 11C	17.7	12.19	29.9	21.77	5.826	0	0	0.00000	0.00	0.00	0	124	25	3.00 0.90
1 12C	0.0	0.00	29.9	21.77	5.826	4	968	0.00300	3.00	0.00	0	124	0	3.00 0.00
1 13C	12.3	10.45	42.2	29.93	8.095	0	0	0.00000	0.00	0.00	0	124	16	3.00 0.90
1 14AC	42.2	29.93	130.9	87.51	25.080	4	596	0.00300	4.50	0.00	0	124	0	3.00 0.00
1 15A	10.4	9.41	141.3	93.20	26.943	0	0	0.00000	0.00	0.00	0	124	14	3.00 0.90

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  1  16A        0.0     0.00     141.3     93.20    26.943     4    649  0.00300     5.00    0.00          0   124
0  3.00  0.00
  1  17A       12.1    10.60     153.4     99.61    29.140     0      0  0.00000     0.00    0.00          0   124
15  3.00  0.90
  1  18A        0.0     0.00     153.4     99.61    29.140     4    662  0.00300     5.00    0.00          0   124
0  3.00  0.00
  1  19A       16.4    12.55     169.8    109.24    32.197     0      0  0.00000     0.00    0.00          0   124
20  3.00  0.90
  1  20D       46.2    30.69      46.2     30.69     9.300     0      0  0.00000     0.00    0.00          0   124
27  3.00  0.90
  1  21D        0.0     0.00      46.2     30.69     9.300     4   1436  0.00766     3.50    0.00          0   124
0  3.00  0.00
  1  22D       42.5    27.75      88.7     57.61    17.625     0      0  0.00000     0.00    0.00          0   124
28  3.00  0.90
  1  23D        0.0     0.00      88.7     57.61    17.625     4   1177  0.00765     4.00    0.00          0   124
0  3.00  0.00
  1  24D       35.1    23.73     123.8     80.04    24.453     0      0  0.00000     0.00    0.00          0   124
26  3.00  0.90
  1  25D       38.6    24.41     162.4    104.02    32.214     0      0  0.00000     0.00    0.00          0   124
30  3.00  0.90
  1  26D        0.0     0.00     162.4    104.02    32.214     4   1196  0.00300     4.50    0.00          0   124
0  3.00  0.00
  1  27D       49.4    36.13     211.8    134.73    41.872     0      0  0.00000     0.00    0.00          0   124
22  3.00  0.90
  1  28D        0.0     0.00     211.8    134.73    41.872     4    966  0.00300     5.00    0.00          0   124
0  3.00  0.00
  1  29AD     211.8     0.00     381.6    242.35    73.767     4     79  0.00300     6.50    0.00          0   124
0  3.00  0.00
  1  30A        4.8     4.08     386.4    244.45    74.527     0      0  0.00000     0.00    0.00          0   124
16  3.00  0.90
  1  31A        5.3     4.64     391.7    246.63    75.599     0      0  0.00000     0.00    0.00          0   124
15  3.00  0.90
  1  32A       14.0    16.46     405.7    250.21    78.438     0      0  0.00000     0.00    0.00          0   124
8  3.00  0.90
  1  33E        8.8     7.48       8.8      7.48     1.779     0      0  0.00000     0.00    0.00          0   124
16  3.00  0.90
  1  34E        0.0     0.00       8.8      7.48     1.779     4    490  0.00300     2.50    0.00          0   124
0  3.00  0.00
  1  35E       11.5     8.60      20.3     15.79     3.899     0      0  0.00000     0.00    0.00          0   124
21  3.00  0.90
  1  36E        0.0     0.00      20.3     15.79     3.899     4    765  0.00300     3.00    0.00          0   124
0  3.00  0.00
  1  37E       10.6     9.28      30.9     23.75     5.834     0      0  0.00000     0.00    0.00          0   124
15  3.00  0.90
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1	38E	0.0	0.00	30.9	23.75	5.834	4	590	0.00300	3.00	0.00	0	124
0	3.00	0.00											
1	39F	5.8	5.64	5.8	5.64	1.174	0	0	0.00000	0.00	0.00	0	124
12	3.00	0.90											
1	40F	0.0	0.00	5.8	5.64	1.174	4	648	0.00300	2.00	0.00	0	124
0	3.00	0.00											
1	41F	4.6	4.16	10.4	9.22	1.905	0	0	0.00000	0.00	0.00	0	124
14	3.00	0.90											
1	42F	0.0	0.00	10.4	9.22	1.905	4	721	0.00300	2.50	0.00	0	124
0	3.00	0.00											
1	43AE	30.9	0.00	436.6	272.59	84.061	0	0	0.00000	0.00	0.00	0	124
0	3.00	0.00											
1	44AF	10.4	0.00	447.0	280.84	85.765	1	0	0.00000	0.00	0.00	0	124
0	3.00	0.00											

File name: post-project-abcd.lac Run date: Tue Jul 26 21:34:12 2022

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 2 Storm Frequency 50

LOCATION	SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	RAIN TC (MIN)	PCT IMPV (IN)
1	1A	10.8	0.60	10.8	0.60	0.010	0	0	0.00000	0.00	0.00	0	124	
24	3.00	0.90												
1	2A	0.0	0.00	10.8	0.60	0.010	4	430	0.00300	2.00	0.00	0	124	
0	3.00	0.00												
1	3A	30.5	1.70	41.3	2.21	0.046	0	0	0.00000	0.00	0.00	0	124	
30	3.00	0.90												
1	4B	31.5	1.76	31.5	1.76	0.036	0	0	0.00000	0.00	0.00	0	124	
30	3.00	0.90												
1	5B	0.0	0.00	31.5	1.76	0.036	4	580	0.00300	3.50	0.00	0	124	
0	3.00	0.00												
1	6AB	31.5	0.00	72.8	3.88	0.093	4	633	0.00300	4.00	0.00	0	124	
0	3.00	0.00												
1	7A	15.9	0.88	88.7	4.69	0.130	0	0	0.00000	0.00	0.00	0	124	
18	3.00	0.90												
1	8A	0.0	0.00	88.7	4.69	0.130	4	701	0.00300	4.00	0.00	0	124	
0	3.00	0.00												

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  1   9C       12.2     0.67      12.2      0.67     0.007     0      0  0.00000     0.00   0.00          0   124
16  3.00  0.90
  1  10C        0.0     0.00      12.2      0.67     0.007     4    912  0.00300     2.00   0.00          0   124
0  3.00  0.00
  1  11C       17.7     0.98      29.9      1.57     0.032     0      0  0.00000     0.00   0.00          0   124
25  3.00  0.90
  1  12C        0.0     0.00      29.9      1.57     0.032     4    968  0.00300     3.00   0.00          0   124
0  3.00  0.00
  1  13C       12.3     0.68      42.2      2.17     0.059     0      0  0.00000     0.00   0.00          0   124
16  3.00  0.90
  1  14AC      42.2     2.17     130.9      6.81     0.223     4    596  0.00300     4.50   0.00          0   124
0  3.00  0.00
  1  15A       10.4     0.57     141.3      7.33     0.266     0      0  0.00000     0.00   0.00          0   124
14  3.00  0.90
  1  16A        0.0     0.00     141.3      7.33     0.266     4    649  0.00300     5.00   0.00          0   124
0  3.00  0.00
  1  17A       12.1     0.67     153.4      7.95     0.317     0      0  0.00000     0.00   0.00          0   124
15  3.00  0.90
  1  18A        0.0     0.00     153.4      7.95     0.317     4    662  0.00300     5.00   0.00          0   124
0  3.00  0.00
  1  19A       16.4     0.91     169.8      8.82     0.377     0      0  0.00000     0.00   0.00          0   124
20  3.00  0.90
  1  20D       46.2     2.57      46.2      2.57     0.047     0      0  0.00000     0.00   0.00          0   124
27  3.00  0.90
  1  21D        0.0     0.00      46.2      2.57     0.047     4   1436  0.00766     3.50   0.00          0   124
0  3.00  0.00
  1  22D       42.5     2.37      88.7      4.88     0.126     0      0  0.00000     0.00   0.00          0   124
28  3.00  0.90
  1  23D        0.0     0.00      88.7      4.88     0.126     4   1177  0.00765     4.00   0.00          0   124
0  3.00  0.00
  1  24D       35.1     1.95     123.8      6.78     0.204     0      0  0.00000     0.00   0.00          0   124
26  3.00  0.90
  1  25D       38.6     2.15     162.4      8.94     0.248     0      0  0.00000     0.00   0.00          0   124
30  3.00  0.90
  1  26D        0.0     0.00     162.4      8.94     0.248     4   1196  0.00300     4.50   0.00          0   124
0  3.00  0.00
  1  27D       49.4     2.74     211.8     11.69     0.394     0      0  0.00000     0.00   0.00          0   124
22  3.00  0.90
  1  28D        0.0     0.00     211.8     11.69     0.394     4    966  0.00300     5.00   0.00          0   124
0  3.00  0.00
  1  29AD     211.8     0.00     381.6     20.52     0.873     4     79  0.00300     6.50   0.00          0   124
0  3.00  0.00
  1  30A        4.8     0.26     386.4     20.70     0.878     0      0  0.00000     0.00   0.00          0   124
16  3.00  0.90
```

```
  1  31A        5.3     0.29     391.7     20.99     0.881     0       0  0.00000     0.00   0.00          0   124
15  3.00  0.90
  1  32A       14.0     0.77     405.7     21.76     0.885     0       0  0.00000     0.00   0.00          0   124
8  3.00  0.90
  1  33E        8.8     0.49       8.8      0.49     0.005     0       0  0.00000     0.00   0.00          0   124
16  3.00  0.90
  1  34E        0.0     0.00       8.8      0.49     0.005     4     490  0.00300     2.50   0.00          0   124
0  3.00  0.00
  1  35E       11.5     0.64      20.3      1.03     0.016     0       0  0.00000     0.00   0.00          0   124
21  3.00  0.90
  1  36E        0.0     0.00      20.3      1.03     0.016     4     765  0.00300     3.00   0.00          0   124
0  3.00  0.00
  1  37E       10.6     0.58      30.9      1.53     0.032     0       0  0.00000     0.00   0.00          0   124
15  3.00  0.90
  1  38E        0.0     0.00      30.9      1.53     0.032     4     590  0.00300     3.00   0.00          0   124
0  3.00  0.00
  1  39F        5.8     0.32       5.8      0.32     0.003     0       0  0.00000     0.00   0.00          0   124
12  3.00  0.90
  1  40F        0.0     0.00       5.8      0.32     0.003     4     648  0.00300     2.00   0.00          0   124
0  3.00  0.00
  1  41F        4.6     0.25      10.4      0.48     0.007     0       0  0.00000     0.00   0.00          0   124
14  3.00  0.90
  1  42F        0.0     0.00      10.4      0.48     0.007     4     721  0.00300     2.50   0.00          0   124
0  3.00  0.00
  1  43AE      30.9     0.00     436.6     23.20     0.926     0       0  0.00000     0.00   0.00          0   124
0  3.00  0.00
  1  44AF      10.4     0.00     447.0     23.59     0.936     1       0  0.00000     0.00   0.00          0   124
0  3.00  0.00

Normal End of MODRAT
```

File name: post-project-east.lac Run date: Mon Feb 14 09:41:58 2022

Los Angeles County Flood Control District
Modified Rational Method Hydrology

Storm Day 1 Storm Frequency 50

LOCATION		SUBAREA AREA (ACRES)	SUBAREA Q (CFS)	TOTAL AREA (ACRES)	TOTAL Q (CFS)	TOTAL VOLUME (AC-FT)	CONV TYPE	CONV LNGTH (FT)	CONV SLOPE (FT/FT)	CONV SIZE	CONV Z	CONTROL Q (CFS)	SOIL NAME	TC (MIN)	RAIN (IN)	PCT IMPV
1	1A	37.1	2.86	37.1	2.86	0.910	0	0	0.00000	0.00	0.00	0	134	30	3.00	0.00
1	2A	0.0	0.00	37.1	2.86	0.910	1	603	0.00829	0.00	0.00	0	134	0	3.00	0.00
1	3A	16.4	1.26	53.5	3.42	1.107	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	4A	0.0	0.00	53.5	3.42	1.107	1	480	0.00417	0.00	0.00	0	124	0	3.00	0.00
1	5A	63.8	4.92	117.3	6.45	2.463	0	0	0.00000	0.00	0.00	0	134	30	3.00	0.00
1	6A	0.0	0.00	117.3	6.45	2.463	1	403	0.00744	0.00	0.00	0	134	0	3.00	0.00
1	7A	8.7	0.67	126.0	6.80	2.462	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	8A	14.4	1.11	140.4	7.75	2.815	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	9A	0.0	0.00	140.4	7.75	2.815	1	1234	0.00486	0.00	0.00	0	124	0	3.00	0.00
1	10A	29.2	2.25	169.6	6.89	3.235	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	11A	19.3	1.49	188.9	7.24	3.708	0	0	0.00000	0.00	0.00	0	124	30	3.00	0.00
1	12A	0.0	0.00	188.9	7.24	3.708	1	0	0.00000	0.00	0.00	0	124	0	3.00	0.00

Normal End of MODRAT

APPENDIX C: PRELIMINARY STORM DRAIN SIZING CALCULATIONS

Worksheet for LAT A1.1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	3.50	ft
Discharge	36.10	ft³/s

Results

Normal Depth	2.07	ft
Flow Area	5.91	ft²
Wetted Perimeter	6.13	ft
Hydraulic Radius	0.96	ft
Top Width	3.44	ft
Critical Depth	1.86	ft
Percent Full	59.0	%
Critical Slope	0.00417	ft/ft
Velocity	6.11	ft/s
Velocity Head	0.58	ft
Specific Energy	2.65	ft
Froude Number	0.82	
Maximum Discharge	59.27	ft³/s
Discharge Full	55.10	ft³/s
Slope Full	0.00129	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	59.03	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A1.1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.07	ft
Critical Depth	1.86	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00417	ft/ft

Worksheet for LAT A1-R1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	5.00	ft
Discharge	134.70	ft^3/s

Results

Normal Depth	3.87	ft
Flow Area	16.30	ft^2
Wetted Perimeter	10.75	ft
Hydraulic Radius	1.52	ft
Top Width	4.18	ft
Critical Depth	3.32	ft
Percent Full	77.4	%
Critical Slope	0.00439	ft/ft
Velocity	8.26	ft/s
Velocity Head	1.06	ft
Specific Energy	4.93	ft
Froude Number	0.74	
Maximum Discharge	153.44	ft^3/s
Discharge Full	142.64	ft^3/s
Slope Full	0.00268	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	77.37	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A1-R1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.87	ft
Critical Depth	3.32	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00439	ft/ft

Worksheet for LAT A1-R2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	4.50	ft
Discharge	104.00	ft^3/s

Results

Normal Depth	3.56	ft
Flow Area	13.48	ft^2
Wetted Perimeter	9.86	ft
Hydraulic Radius	1.37	ft
Top Width	3.66	ft
Critical Depth	3.00	ft
Percent Full	79.0	%
Critical Slope	0.00456	ft/ft
Velocity	7.71	ft/s
Velocity Head	0.92	ft
Specific Energy	4.48	ft
Froude Number	0.71	
Maximum Discharge	115.86	ft^3/s
Discharge Full	107.70	ft^3/s
Slope Full	0.00280	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	79.03	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A1-R2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.56	ft
Critical Depth	3.00	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00456	ft/ft

Worksheet for LAT A1-R3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	4.00	ft
Discharge	80.00	ft^3/s

Results

Normal Depth	3.34	ft
Flow Area	11.22	ft^2
Wetted Perimeter	9.23	ft
Hydraulic Radius	1.22	ft
Top Width	2.96	ft
Critical Depth	2.71	ft
Percent Full	83.6	%
Critical Slope	0.00483	ft/ft
Velocity	7.13	ft/s
Velocity Head	0.79	ft
Specific Energy	4.13	ft
Froude Number	0.65	
Maximum Discharge	84.63	ft^3/s
Discharge Full	78.67	ft^3/s
Slope Full	0.00310	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	83.57	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A1-R3

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.34	ft
Critical Depth	2.71	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00483	ft/ft

Worksheet for LAT A1-R4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	3.50	ft
Discharge	47.40	ft^3/s

Results

Normal Depth	2.50	ft
Flow Area	7.36	ft^2
Wetted Perimeter	7.05	ft
Hydraulic Radius	1.04	ft
Top Width	3.16	ft
Critical Depth	2.15	ft
Percent Full	71.5	%
Critical Slope	0.00458	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.64	ft
Specific Energy	3.15	ft
Froude Number	0.74	
Maximum Discharge	59.27	ft^3/s
Discharge Full	55.10	ft^3/s
Slope Full	0.00222	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	71.49	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A1-R4

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.50	ft
Critical Depth	2.15	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00458	ft/ft

Worksheet for LAT A1-R5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	3.00	ft
Discharge	30.70	ft³/s

Results

Normal Depth	2.11	ft
Flow Area	5.30	ft²
Wetted Perimeter	5.96	ft
Hydraulic Radius	0.89	ft
Top Width	2.74	ft
Critical Depth	1.80	ft
Percent Full	70.2	%
Critical Slope	0.00473	ft/ft
Velocity	5.79	ft/s
Velocity Head	0.52	ft
Specific Energy	2.63	ft
Froude Number	0.73	
Maximum Discharge	39.30	ft³/s
Discharge Full	36.53	ft³/s
Slope Full	0.00212	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	70.21	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A1-R5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.11	ft
Critical Depth	1.80	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00473	ft/ft

Worksheet for LAT A2-R1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	3.00	ft
Discharge	21.80	ft³/s

Results

Normal Depth	1.67	ft
Flow Area	4.04	ft²
Wetted Perimeter	5.05	ft
Hydraulic Radius	0.80	ft
Top Width	2.98	ft
Critical Depth	1.50	ft
Percent Full	55.6	%
Critical Slope	0.00426	ft/ft
Velocity	5.40	ft/s
Velocity Head	0.45	ft
Specific Energy	2.12	ft
Froude Number	0.82	
Maximum Discharge	39.30	ft³/s
Discharge Full	36.53	ft³/s
Slope Full	0.00107	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	55.64	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A2-R1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.67	ft
Critical Depth	1.50	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00426	ft/ft

Worksheet for LAT A2-R2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.00	ft
Discharge	10.40	ft³/s

Results

Normal Depth	1.40	ft
Flow Area	2.35	ft²
Wetted Perimeter	3.97	ft
Hydraulic Radius	0.59	ft
Top Width	1.83	ft
Critical Depth	1.16	ft
Percent Full	70.1	%
Critical Slope	0.00527	ft/ft
Velocity	4.42	ft/s
Velocity Head	0.30	ft
Specific Energy	1.71	ft
Froude Number	0.69	
Maximum Discharge	13.33	ft³/s
Discharge Full	12.39	ft³/s
Slope Full	0.00211	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	70.14	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A2-R2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.40	ft
Critical Depth	1.16	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00527	ft/ft

Worksheet for LAT A3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.00	ft
Discharge	7.58	ft^3/s

Results

Normal Depth	1.13	ft
Flow Area	1.83	ft^2
Wetted Perimeter	3.40	ft
Hydraulic Radius	0.54	ft
Top Width	1.98	ft
Critical Depth	0.98	ft
Percent Full	56.5	%
Critical Slope	0.00483	ft/ft
Velocity	4.14	ft/s
Velocity Head	0.27	ft
Specific Energy	1.40	ft
Froude Number	0.76	
Maximum Discharge	13.33	ft^3/s
Discharge Full	12.39	ft^3/s
Slope Full	0.00112	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	56.51	%
Downstream Velocity	Infinity	ft/s

Worksheet for LAT A3

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.13	ft
Critical Depth	0.98	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00483	ft/ft

Worksheet for LINEA-R1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	6.50	ft
Discharge	242.40	ft^3/s

Results

Normal Depth	4.58	ft
Flow Area	24.98	ft^2
Wetted Perimeter	12.95	ft
Hydraulic Radius	1.93	ft
Top Width	5.93	ft
Critical Depth	4.17	ft
Percent Full	70.4	%
Critical Slope	0.00388	ft/ft
Velocity	9.70	ft/s
Velocity Head	1.46	ft
Specific Energy	6.04	ft
Froude Number	0.83	
Maximum Discharge	308.88	ft^3/s
Discharge Full	287.14	ft^3/s
Slope Full	0.00214	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	70.44	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEA-R1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.58	ft
Critical Depth	4.17	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00388	ft/ft

Worksheet for LINEA-R2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	5.00	ft
Discharge	109.20	ft^3/s

Results

Normal Depth	3.28	ft
Flow Area	13.64	ft^2
Wetted Perimeter	9.44	ft
Hydraulic Radius	1.45	ft
Top Width	4.75	ft
Critical Depth	2.98	ft
Percent Full	65.6	%
Critical Slope	0.00397	ft/ft
Velocity	8.00	ft/s
Velocity Head	1.00	ft
Specific Energy	4.27	ft
Froude Number	0.83	
Maximum Discharge	153.44	ft^3/s
Discharge Full	142.64	ft^3/s
Slope Full	0.00176	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	65.55	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEA-R2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.28	ft
Critical Depth	2.98	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00397	ft/ft

Worksheet for LINEA-R3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	5.00	ft
Discharge	99.60	ft³/s

Results

Normal Depth	3.08	ft
Flow Area	12.68	ft²
Wetted Perimeter	9.02	ft
Hydraulic Radius	1.41	ft
Top Width	4.86	ft
Critical Depth	2.84	ft
Percent Full	61.5	%
Critical Slope	0.00384	ft/ft
Velocity	7.86	ft/s
Velocity Head	0.96	ft
Specific Energy	4.04	ft
Froude Number	0.86	
Maximum Discharge	153.44	ft³/s
Discharge Full	142.64	ft³/s
Slope Full	0.00146	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	61.54	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEA-R3

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.08	ft
Critical Depth	2.84	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00384	ft/ft

Worksheet for LINE A-R4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	4.50	ft
Discharge	93.20	ft^3/s

Results

Normal Depth	3.23	ft
Flow Area	12.23	ft^2
Wetted Perimeter	9.10	ft
Hydraulic Radius	1.34	ft
Top Width	4.05	ft
Critical Depth	2.83	ft
Percent Full	71.8	%
Critical Slope	0.00431	ft/ft
Velocity	7.62	ft/s
Velocity Head	0.90	ft
Specific Energy	4.14	ft
Froude Number	0.77	
Maximum Discharge	115.86	ft^3/s
Discharge Full	107.70	ft^3/s
Slope Full	0.00225	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	71.83	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINE A-R4

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.23	ft
Critical Depth	2.83	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00431	ft/ft

Worksheet for LINE A-R5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	4.00	ft
Discharge	71.40	ft^3/s

Results

Normal Depth	2.99	ft
Flow Area	10.07	ft^2
Wetted Perimeter	8.35	ft
Hydraulic Radius	1.21	ft
Top Width	3.48	ft
Critical Depth	2.56	ft
Percent Full	74.7	%
Critical Slope	0.00454	ft/ft
Velocity	7.09	ft/s
Velocity Head	0.78	ft
Specific Energy	3.77	ft
Froude Number	0.73	
Maximum Discharge	84.63	ft^3/s
Discharge Full	78.67	ft^3/s
Slope Full	0.00247	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	74.70	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINE A-R5

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.99	ft
Critical Depth	2.56	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00454	ft/ft

Worksheet for LINE A-R6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	4.00	ft
Discharge	58.10	ft³/s

Results

Normal Depth	2.56	ft
Flow Area	8.48	ft²
Wetted Perimeter	7.41	ft
Hydraulic Radius	1.14	ft
Top Width	3.84	ft
Critical Depth	2.30	ft
Percent Full	63.9	%
Critical Slope	0.00417	ft/ft
Velocity	6.85	ft/s
Velocity Head	0.73	ft
Specific Energy	3.29	ft
Froude Number	0.81	
Maximum Discharge	84.63	ft³/s
Discharge Full	78.67	ft³/s
Slope Full	0.00164	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	63.93	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINE A-R6

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.56	ft
Critical Depth	2.30	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00417	ft/ft

Worksheet for LINE A-R7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	3.50	ft
Discharge	46.40	ft^3/s

Results

Normal Depth	2.46	ft
Flow Area	7.23	ft^2
Wetted Perimeter	6.96	ft
Hydraulic Radius	1.04	ft
Top Width	3.20	ft
Critical Depth	2.13	ft
Percent Full	70.3	%
Critical Slope	0.00454	ft/ft
Velocity	6.42	ft/s
Velocity Head	0.64	ft
Specific Energy	3.10	ft
Froude Number	0.75	
Maximum Discharge	59.27	ft^3/s
Discharge Full	55.10	ft^3/s
Slope Full	0.00213	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	70.31	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINE A-R7

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.46	ft
Critical Depth	2.13	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00454	ft/ft

Worksheet for LINE A-R8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.50	ft
Discharge	19.90	ft^3/s

Results

Normal Depth	1.83	ft
Flow Area	3.85	ft^2
Wetted Perimeter	5.13	ft
Hydraulic Radius	0.75	ft
Top Width	2.21	ft
Critical Depth	1.51	ft
Percent Full	73.2	%
Critical Slope	0.00507	ft/ft
Velocity	5.17	ft/s
Velocity Head	0.42	ft
Specific Energy	2.25	ft
Froude Number	0.69	
Maximum Discharge	24.17	ft^3/s
Discharge Full	22.46	ft^3/s
Slope Full	0.00235	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	73.20	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINE A-R8

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.83	ft
Critical Depth	1.51	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00507	ft/ft

Worksheet for LINEB-R1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.50	ft
Discharge	13.80	ft³/s

Results

Normal Depth	1.42	ft
Flow Area	2.87	ft²
Wetted Perimeter	4.26	ft
Hydraulic Radius	0.67	ft
Top Width	2.48	ft
Critical Depth	1.25	ft
Percent Full	56.7	%
Critical Slope	0.00452	ft/ft
Velocity	4.81	ft/s
Velocity Head	0.36	ft
Specific Energy	1.78	ft
Froude Number	0.79	
Maximum Discharge	24.17	ft³/s
Discharge Full	22.46	ft³/s
Slope Full	0.00113	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	56.66	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEB-R1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.42	ft
Critical Depth	1.25	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00452	ft/ft

Worksheet for LINEB-R2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.00	ft
Discharge	9.20	ft³/s

Results

Normal Depth	1.28	ft
Flow Area	2.13	ft²
Wetted Perimeter	3.72	ft
Hydraulic Radius	0.57	ft
Top Width	1.92	ft
Critical Depth	1.08	ft
Percent Full	64.2	%
Critical Slope	0.00507	ft/ft
Velocity	4.32	ft/s
Velocity Head	0.29	ft
Specific Energy	1.57	ft
Froude Number	0.72	
Maximum Discharge	13.33	ft³/s
Discharge Full	12.39	ft³/s
Slope Full	0.00165	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	64.16	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEB-R2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.28	ft
Critical Depth	1.08	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00507	ft/ft

Worksheet for LINEB-R3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.00	ft
Discharge	5.70	ft³/s

Results

Normal Depth	0.95	ft
Flow Area	1.48	ft²
Wetted Perimeter	3.05	ft
Hydraulic Radius	0.48	ft
Top Width	2.00	ft
Critical Depth	0.84	ft
Percent Full	47.6	%
Critical Slope	0.00462	ft/ft
Velocity	3.86	ft/s
Velocity Head	0.23	ft
Specific Energy	1.18	ft
Froude Number	0.79	
Maximum Discharge	13.33	ft³/s
Discharge Full	12.39	ft³/s
Slope Full	0.00063	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	47.62	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEB-R3

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.95	ft
Critical Depth	0.84	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00462	ft/ft

Worksheet for LINEC-R1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	3.00	ft
Discharge	27.80	ft^3/s

Results

Normal Depth	1.96	ft
Flow Area	4.89	ft^2
Wetted Perimeter	5.64	ft
Hydraulic Radius	0.87	ft
Top Width	2.86	ft
Critical Depth	1.71	ft
Percent Full	65.3	%
Critical Slope	0.00456	ft/ft
Velocity	5.69	ft/s
Velocity Head	0.50	ft
Specific Energy	2.46	ft
Froude Number	0.77	
Maximum Discharge	39.30	ft^3/s
Discharge Full	36.53	ft^3/s
Slope Full	0.00174	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	65.28	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEC-R1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.96	ft
Critical Depth	1.71	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00456	ft/ft

Worksheet for LINEC-R2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	3.00	ft
Discharge	23.80	ft³/s

Results

Normal Depth	1.76	ft
Flow Area	4.32	ft²
Wetted Perimeter	5.24	ft
Hydraulic Radius	0.82	ft
Top Width	2.95	ft
Critical Depth	1.57	ft
Percent Full	58.8	%
Critical Slope	0.00435	ft/ft
Velocity	5.50	ft/s
Velocity Head	0.47	ft
Specific Energy	2.24	ft
Froude Number	0.80	
Maximum Discharge	39.30	ft³/s
Discharge Full	36.53	ft³/s
Slope Full	0.00127	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	58.82	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEC-R2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.76	ft
Critical Depth	1.57	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00435	ft/ft

Worksheet for LINEC-R3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.50	ft
Discharge	15.80	ft^3/s

Results

Normal Depth	1.55	ft
Flow Area	3.19	ft^2
Wetted Perimeter	4.52	ft
Hydraulic Radius	0.70	ft
Top Width	2.43	ft
Critical Depth	1.34	ft
Percent Full	61.8	%
Critical Slope	0.00468	ft/ft
Velocity	4.96	ft/s
Velocity Head	0.38	ft
Specific Energy	1.93	ft
Froude Number	0.76	
Maximum Discharge	24.17	ft^3/s
Discharge Full	22.46	ft^3/s
Slope Full	0.00148	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	61.83	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEC-R3

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.55	ft
Critical Depth	1.34	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00468	ft/ft

Worksheet for LINEC-R4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00300	ft/ft
Diameter	2.00	ft
Discharge	7.50	ft³/s

Results

Normal Depth	1.12	ft
Flow Area	1.82	ft²
Wetted Perimeter	3.39	ft
Hydraulic Radius	0.54	ft
Top Width	1.98	ft
Critical Depth	0.97	ft
Percent Full	56.1	%
Critical Slope	0.00482	ft/ft
Velocity	4.13	ft/s
Velocity Head	0.27	ft
Specific Energy	1.39	ft
Froude Number	0.76	
Maximum Discharge	13.33	ft³/s
Discharge Full	12.39	ft³/s
Slope Full	0.00110	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	56.14	%
Downstream Velocity	Infinity	ft/s

Worksheet for LINEC-R4

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.12	ft
Critical Depth	0.97	ft
Channel Slope	0.00300	ft/ft
Critical Slope	0.00482	ft/ft

APPENDIX D: INFILTRATION BASIN SIZING

APPENDIX D.1: BASIN VOLUME CALCULATIONS

Basin Volume Calculations				
ELEVATION (ft)	AREA (ft^2)	AREA (ac)	INCREMENTAL VOLUME (ac-ft)	CUMULATIVE VOLUME (ac-ft)
2492	417601.42	9.59	0.00	0.00
2493	425368.98	9.77	9.68	9.68
2494	433193.09	9.94	9.85	19.53
2495	441073.75	10.13	10.04	29.57
2496	449010.96	10.31	10.22	39.78
2497	457004.72	10.49	10.40	50.18
2498	465055.02	10.68	10.58	60.77
2499	473161.87	10.86	10.77	71.54
2500	481325.28	11.05	10.96	82.49
2501	489545.23	11.24	11.14	93.64
2502	497821.26	11.43	11.33	104.97
1	assume infiltration only at the bottom area of the basin			
Watershed Runoff Volume = 86 ac-ft, Maximum Depth=2500.4				

APPENDIX D.2: DRAWDOWN TIME FOR INFILTRATION BASIN

Draw Down Time for Proposed Infiltration Basin					
Storm Type	**0.75" Storm Volume (ac-ft)**	**Infiltration Rate (ft/hr)**	**Bottom Area (ac)**	**Draw Down Time (hrs)**	**Draw Down Time (days)**
0.75"	18.45	0.14	9.59	13.58	0.57
50-Year	86.17	0.14	9.59	63.42	2.64
Design Note 1	*Infiltration rate is 1.7 in/hr (See Appenidx D.3)*				
Design Note 2	*Assume infiltration only at the bottom area of the basin*				

APPENDIX D.3: GEOTECHNICAL INFILTRATION RATE STUDY

May 10, 2022
(Revised March 15, 2023)

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

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

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

Project No.: **22G143-2R**

Subject: **Preliminary Results of Infiltration Testing**
Proposed Warehouse Development: Phase I
SEC E Avenue M and Sierra Highway
Palmdale, California

Reference: Geotechnical Investigation, Proposed Warehouse Development: Phase I, SEC E Avenue M and Sierra Highway, Palmdale, California, Prepared by Southern California Geotechnical, Inc. (SCG) for Covington Development Partners, LLC., SCG Project No. 22G143-1, dated May 5, 2022.

Mr. Di Sano:

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

Scope of Services

The scope of services performed for this project was in accordance with our Proposal No. 22P143R2, dated February 23, 2022. The scope of the infiltration testing consisted of site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the 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 overall subject site is located at the southeast corner of East Avenue M and Sierra Highway in Palmdale, California. The site is bounded to the north by East Avenue M, to the west by Sierra Highway and a railroad easement, and to the south and east by vacant lots. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The overall site consists of several rectangular- to irregularly- shaped parcels, which total 433.70± acres in size. The site will be developed over four (4) phases identified as Phase I through Phase IV. Phase I is located in the northeastern area of the overall site and totals

124.02± acres in size. Phase II is located in the southeastern area of the site and totals 101.93± acres in size. Phase III is located in the western area of the overall site and totals 63.57± acres in size. Phase IV is located in the southern area of the overall site and totals 109.48± acres in size. Based on our visit to the site, the site is vacant and undeveloped. The ground surface cover consists of exposed soil with sparse to moderate native vegetation. Joshua trees are dispersed throughout the site, with a moderate concentration observed in eastern portion of the site. A dirt road, which is the continuation of Challenger Way trending north-south, is present in the eastern portion of the site. Sparse trash debris are littered along this road.

Detailed topographic information was not available at the time of this report. Based on the elevations obtained from Google Earth and visual observations made at the time of the subsurface investigation, the overall site topography slopes downward to the northeast at a gradient less than 1± percent.

Proposed Development

A conceptual site plan identified as Scheme 3, prepared by HPA, Inc., has been provided to our office by the client. Based on this site plan, Phase I will consist of the development of a total of six (6) warehouses, identified as Building 1 through Building 6. These buildings will range from 135,895± ft² to 1,004,880± ft² in size. A detention basin is also to be included as part of Phase I. Phase II will consist of three (3) warehouses that will range from 275,230± ft² to 1,631,040± ft² in size. Phase III will consist of one (1) industrial building and two (2) warehouses. The industrial building will be 57,200± ft² in size and the warehouses will be 258,420 and 953,030± ft² in size. The buildings will be constructed with dock-high doors along a portion of at least one building wall. The buildings will be surrounded by asphaltic concrete (AC) pavements in the automobile parking and drive areas, Portland cement concrete (PCC) pavements in the loading dock areas, and concrete flatwork and landscaped planters throughout the site. The proposed development for Phase IV is presently unknown. New public streets will be part of the overall proposed development. The boundaries for Phase I, Phase II and Phase III of the proposed development are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. It should be noted that the design-level investigation is only for Phase I of the overall site.

The proposed development will use on site storm water infiltration. The infiltration systems will consist of the following:

Phase	Infiltration System Type	Infiltration System	Locations
I	5 Infiltration Chambers 1 Infiltration Basin	"A" through E" "F"	North-Central Northeast
II	3 Infiltration Chambers	"J" through "L"	Southeast
III	3 Infiltration Chambers	"G" through "I"	West

The bottom of the infiltration chambers will be approximately 10± feet below the existing site grades. The bottom of the detention basin will be approximately 10± feet below existing site grades.

Concurrent Study

SCG conducted a geotechnical investigation at the subject site, referenced above. As a part of this study, thirty-five (35) borings advanced to depths of 5 to 30± feet below the existing site grades.

Native alluvium was encountered at the ground surface at all of the boring locations, extending to at least the maximum depth explored of 30± feet. Most of the borings encountered loose sands, silty sands and sandy silts, extending to depths of 2½ to 8½± feet. At greater depths and extending to the maximum depth explored of 30± feet, the alluvium generally consists of medium dense to dense, sands, silty sands and sandy silts.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a greater depth than 30± feet below existing site grades.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary references used to determine the historic groundwater depths in this area are the California Geological Survey (CGS) Seismic Hazard Zone Report 094 and Seismic Hazard Zone Report 095, Seismic Hazard Zone Report for the Torrance 7.5-Minute Quadrangle, and Seismic Hazard Zone Report for the Torrance 7.5-Minute Quadrangle, respectively, which indicate that the historic high groundwater level for the site is approximately 370 feet below the ground surface.

Recent water level data was also obtained from the California State Water Resources Control Board, GeoTracker, website, http://geotracker.waterboards.ca.gov/. The nearest monitoring well on record is located 300± feet northeast of the site. Water level readings within this monitoring well indicate a groundwater level of 399± feet below the ground surface in January 2019.

Recent water level data was obtained from the California Department of Water Resources website, https://wdl.water.ca.gov/waterdatalibrary/. Several monitoring wells are located within 1± mile of the site. Water level readings within these monitoring wells indicate a high groundwater level of 121± feet below the ground surface in February 1922.

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of fifteen (15) infiltration test borings advanced to a depth of 10 to 12± 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. Four of the infiltration tests (Infiltration Test Nos. I-2, I-5, I-14, and I-15) could not be completed at the time of this report due a concurrent biology survey. SCG will return at a later date to complete the infiltration testing and provide an update infiltration report. The approximate locations of the infiltration

test borings (identified as I-1 to I-15) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

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

Geotechnical Conditions

Native alluvium was encountered at the ground surface at infiltration test locations, extending to the maximum explored depth of 15± feet below existing site grades. The alluvium consists of loose to dense fine to medium sandy silts, silty fine to coarse sands, loose to medium dense fine to coarse sands, and silty fine sands. Variable trace quantities of gravel were encountered within the infiltration borings. The Boring Logs, which illustrate the conditions encountered at each test location are included within this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration systems that will be used at the subject site. The infiltration testing was performed in general accordance with 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 borings did not completely infiltrate within a 30-minute time period after filling each boring, a falling head test was the appropriate test method. Based on the conditions encountered at each of the individual infiltration test borings, measurement intervals were assigned according to the county guidelines and ranged from 11-minutes to 30-minutes at each discreet test location.

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 at three of the infiltration test locations. The remaining locations had readings taken at intervals ranging from 11-minutes to 27-minutes, which were based on the conditions encountered during the pre-soak process. 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	Measured Infiltration Rate (inches/hour)
I-1	12	Brown fine to coarse Sand, trace Silt	5.3
I-2	10	Brown fine to coarse Sand, trace Silt, trace fine Gravel	TBD
I-3	10	Brown fine to coarse Sand, trace Silt	8.4
I-4	10	Brown fine to coarse Sand, trace Silt	10.0
I-5	10	Brown Silty fine to coarse Sand	TBD
I-6	10	Brown Silty fine to medium Sand, trace coarse Sand	1.7
I-7	10	Brown Silty fine to coarse Sand	5.4
I-8	10	Brown Gravelly fine to coarse Sand, trace Silt	7.1
I-9	10	Brown fine to coarse Sand, trace fine Gravel, trace Silt	6.0
I-10	10	Brown fine to coarse Sand, trace fine Gravel, trace Silt	8.5
I-11	10	Light Brown Silty fine Sand	11.7
I-12	10	Brown Silty fine to coarse Sand	5.7
I-13	10	Brown fine to coarse Sand, trace Silt, trace fine Gravel	6.1
I-14	10	Brown to Dark Brown Silty fine to medium Sand, trace coarse Sand	TBD
I-15	10	Brown fine to medium Sandy Silt	TBD

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-15 of this report.

Design Recommendations

A total of eleven (11) infiltration tests were performed at the subject site. The measured infiltration rates at the infiltration test locations range from 1.7 to 11.7 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	Infiltration Test No.	Infiltration System Type	Infiltration System Location	Design Infiltration Rate (inches/hour)
"A"	I-1	Below-Grade Chamber	Northern-central	1.8
"B"	I-2	Below-Grade Chamber	Northern-central	TBD
"C"	I-3	Below-Grade Chamber	Central	2.8
"D"	I-4	Below-Grade Chamber	Central	3.3
"E"	I-5	Below-Grade Chamber	Central-east	TBD
*"F"	I-6 through I-9	Detention Basin	Northeast	1.7
"G"	I-10	Below-Grade Chamber	Northwest	2.8
"H"	I-11	Below-Grade Chamber	Northwest	3.9
"I"	I-12	Below-Grade Chamber	Western	1.9
"J"	I-13	Below-Grade Chamber	Southern	2.0
"K"	I-14	Below-Grade Chamber	Southeast	TBD
"L"	I-15	Below-Grade Chamber	Southeast	TBD

***It should be noted that an average infiltration rate was utilized for the design infiltration rate at Infiltration System "F".**

As previously stated, infiltration testing was not performed at Infiltration Test Nos. I-2, I-5, I-14, and I-15 due to a concurrent biology survey at the subject site. Therefore, design infiltration rates for Infiltration Systems "B", "E", "K", and "L" are not provided in this report. SCG will return at a later date to complete the infiltration testing at these four (4) locations. Once that information is available, SCG will issue an update infiltration report.

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 eleven (11) 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.

Basin Maintenance

The proposed project may include infiltration basins. Water flowing into these basins will carry some level of sediment. Wind-blown sediments and erosion of the basin side walls will also contribute to sediment deposition at the bottom of the basin. This layer has the potential to

significantly reduce the infiltration rate of the basin subgrade soils. Therefore, a formal basin maintenance program should be established to ensure that these silt and clay deposits are removed from the basin on a regular basis. Appropriate vegetation on the basin sidewalls and bottom may reduce erosion and sediment deposition.

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

Location of Infiltration Systems

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



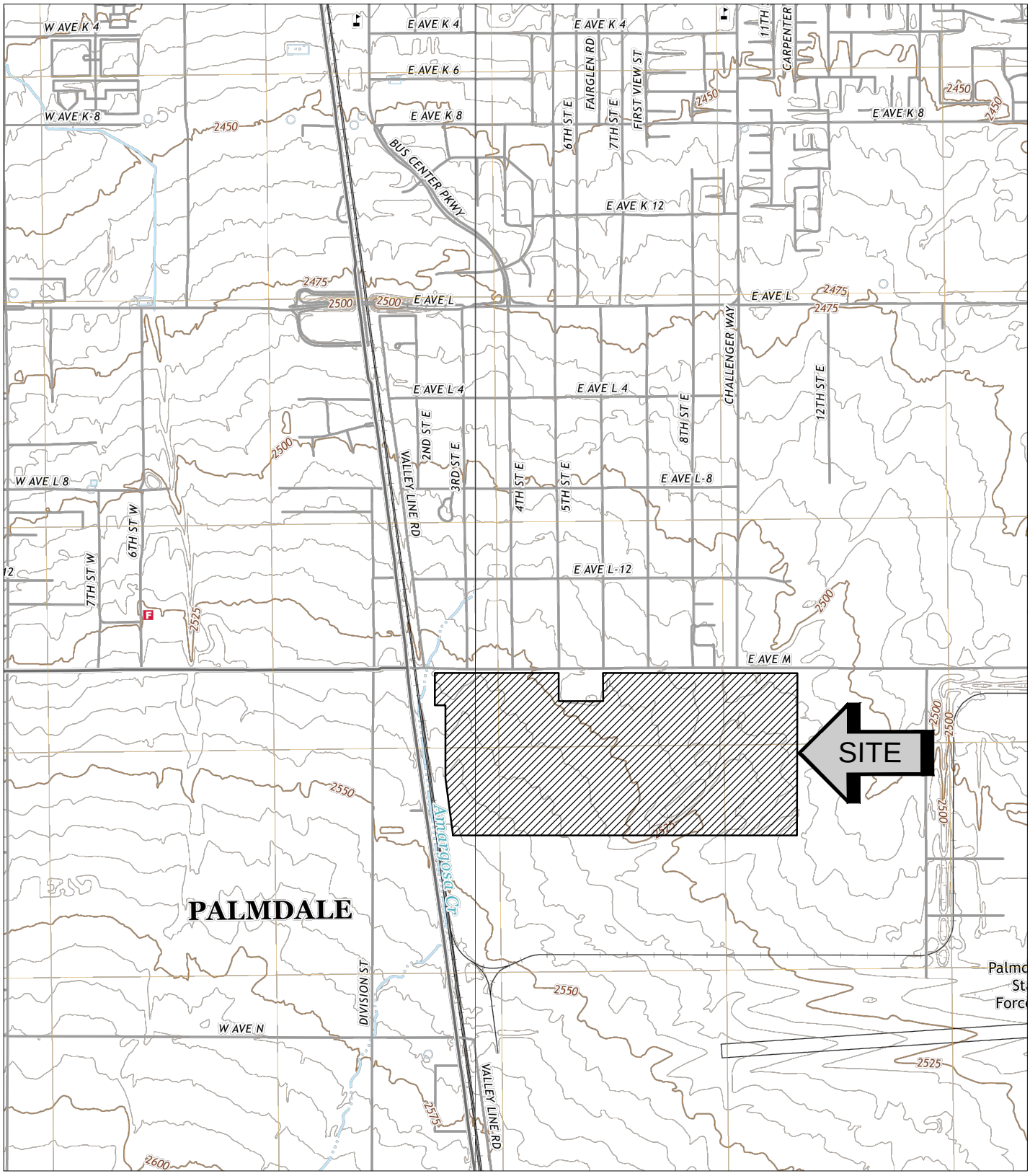
Ryan Bremer
Staff Geologist





Robert G. Trazo, GE 2655
Principal Engineer

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (17 Pages)
Infiltration Test Results Spreadsheets (13 Pages)
Grain Size Analysis Graphs (15 Pages)



SOURCE: USGS TOPOGRAPHIC MAPS OF THE LANCASTER EAST AND LANCASTER WEST QUADRANGLES, LOS ANGELES COUNTY, CALIFORNIA, 2018.

SITE LOCATION MAP

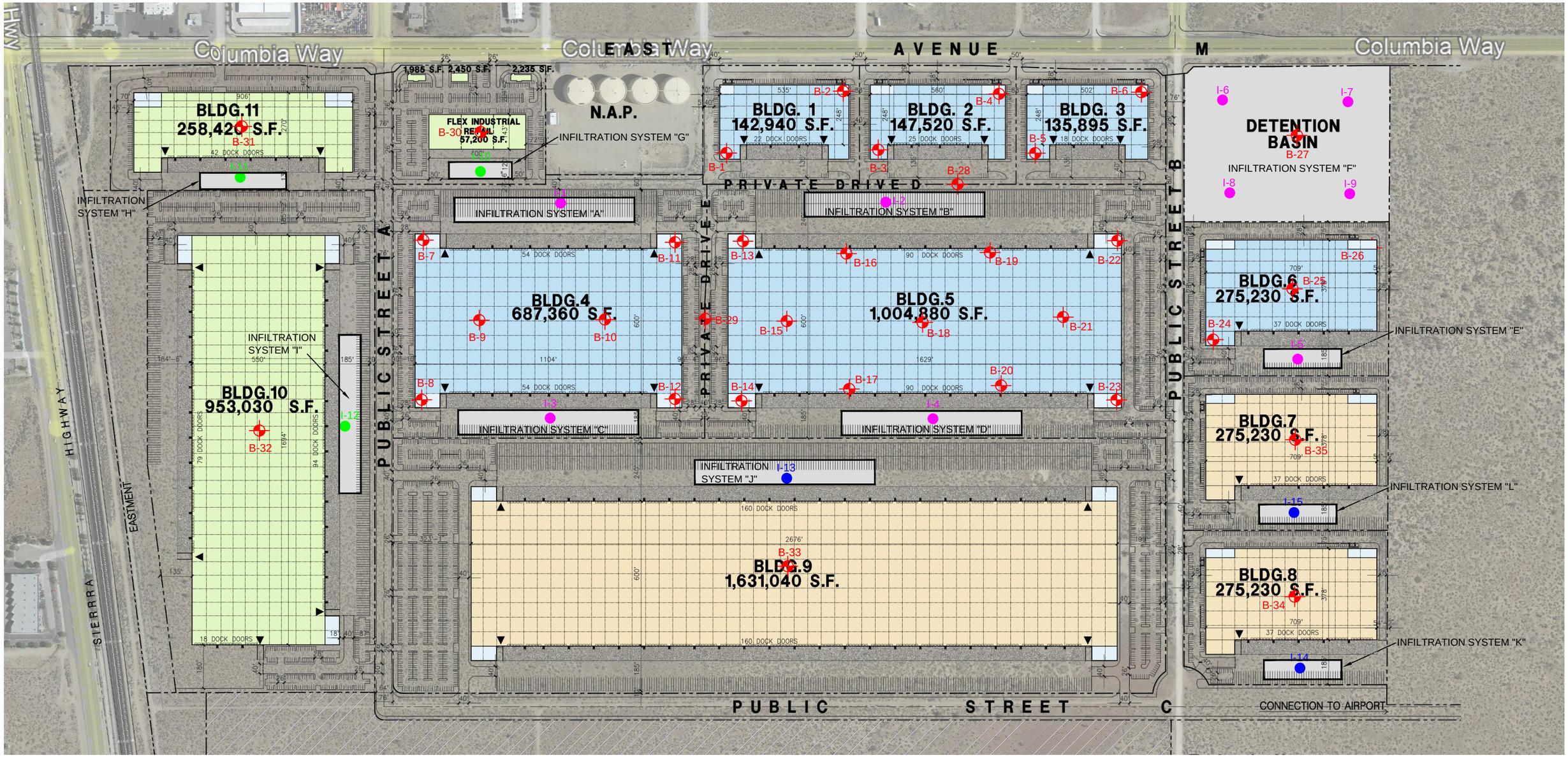
PROPOSED WAREHOUSE DEVELOPMENT: PHASE I

PALMDALE, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: JAH CHKD: JLL	
SCG PROJECT 22G143-2	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION (PHASE I)
- APPROXIMATE INFILTRATION TEST LOCATION (PHASE II)
- APPROXIMATE INFILTRATION TEST LOCATION (PHASE III)
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 22G143-1)

- PHASE I
- PHASE II
- PHASE III
- PHASE IV

NORTH

NOTE: CONCEPTUAL SITE PLAN PREPARED BY HPA ARCHITECTS.
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH.

INFILTRATION TEST LOCATION PLAN

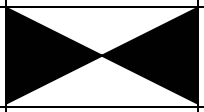
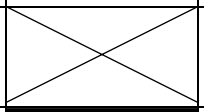
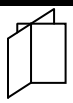
PROPOSED WAREHOUSE DEVELOPMENT: PHASE 1

PALMDALE, CALIFORNIA

SCALE: 1" = 400'	
DRAWN: JAH CHKD: JLL	
SCG PROJECT 22G143-2	
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.

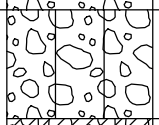
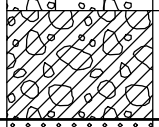
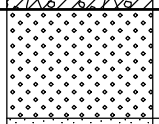
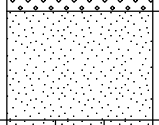
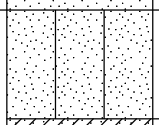
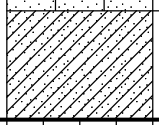
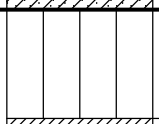
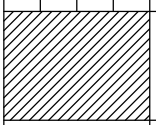
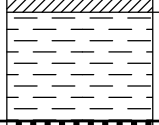
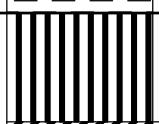
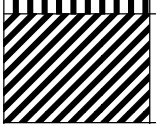
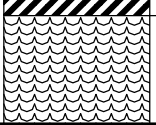
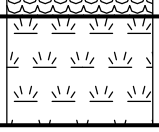
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

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.: 22G143-2 | DRILLING DATE: 3/14/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		8			ALLUVIUM: Dark Brown fine to medium Sandy Silt, trace coarse Sand, trace fine Gravel, loose-damp		3					
		8			Brown Silty fine to medium Sand, trace coarse Sand, loose-damp		3					
5		17			Brown fine to medium Sandy Silt, trace coarse Sand, medium dense-damp		4					
		11			Brown Silty fine to coarse Sand, medium dense-dry		2					
10		24			Brown fine to coarse Sand, trace Silt, medium dense-damp		3					
					Boring Terminated at 12'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-1**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-10

JOB NO.: 22G143-2 | DRILLING DATE: 3/16/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		6			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium Sand, loose-damp		3					
		9			Brown fine to medium Sand, trace coarse Sand, trace fine Gravel, trace Silt, loose-dry		2					
5		14			Dark Brown Silty fine to medium Sand, trace coarse Sand, trace fine Gravel, trace fine root fibers, medium dense-damp		7					
		14			Brown fine to coarse Sand, trace fine Gravel, trace Silt, medium dense-damp		3					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-10**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-11

JOB NO.: 22G143-2 | DRILLING DATE: 3/16/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		13			ALLUVIUM: Brown fine Sandy Silt, trace fine to coarse Gravel, medium dense-dry		2					
		7			Brown Silty fine to coarse Sand, trace fine to coarse Gravel, loose-dry		2					
5		8					2					
		23			Light Brown Silty fine Sand, medium dense-damp		4					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-11**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-12

JOB NO.: 22G143-2 | DRILLING DATE: 3/16/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		10			ALLUVIUM: Brown Silty fine to coarse Sand, medium dense-dry to damp		2					
		11					1					
5		19					2					
		21					4					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-12**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-13

JOB NO.: 22G143-2 | DRILLING DATE: 3/16/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		9			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium to coarse Sand, loose-damp		4					
		14			Brown Silty fine to medium Sand, trace coarse Sand, medium dense-dry		2					
5		15					1					
		13			Brown fine to coarse Sand, trace Silt, trace fine Gravel, medium dense-dry		2					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-13**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-14

JOB NO.: 22G143-2 | DRILLING DATE: 3/16/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		4			ALLUVIUM: Dark Brown Silty fine to medium Sand, trace coarse Sand, loose-damp		5					
		15			Dark Brown fine Sandy Silt, trace medium to coarse Sand, medium dense-damp		3					
5		20			Brown to Dark Brown Silty fine to medium Sand, trace coarse Sand, medium dense-dry to damp		3					
		15					2					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-14**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-15

JOB NO.: 22G143-2 | DRILLING DATE: 3/17/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		3			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium Sand, very loose-damp		5					
		6			Dark Brown Silty fine to coarse Sand, trace fine Gravel, loose-dry		1					
5		13			Dark Brown fine Sandy Silt, trace medium Sand, medium dense-damp		3					
		22			Brown fine to medium Sandy Silt, medium dense-damp		4					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-15**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 22G143-2 | DRILLING DATE: 3/14/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		11			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium to coarse Sand, medium dense-damp		4					
		10			Brown fine to coarse Sand, trace Silt, trace fine Gravel, medium dense-dry		1					
5		12					2					
		20					2					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-2**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-3

JOB NO.: 22G143-2 | DRILLING DATE: 3/14/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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			ALLUVIUM: Brown to Dark Brown fine Sandy Silt, trace medium Sand, trace fine root fibers, trace to little fine Gravel, loose-damp		4					
		16					3					
5		16					3					
		16			Brown fine to coarse Sand, trace Silt, medium dense-dry		1					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-3**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-4

JOB NO.: 22G143-2 | DRILLING DATE: 3/14/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		9			ALLUVIUM: Dark Brown fine Sandy Silt, trace fine root fibers, little medium to coarse Sand, loose-damp		6					
		14			Brown Silty fine to medium Sand, trace coarse Sand, medium dense-dry		1					
5		14			Brown fine Sandy Silt, trace medium Sand, medium dense-dry		2					
		16			Brown fine to coarse Sand, trace Silt, medium dense-dry		1					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-4**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-5

JOB NO.: 22G143-2 | DRILLING DATE: 3/17/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium Sand, loose to medium dense-dry to damp		4					
		13					2					
5					Brown Silty fine to coarse Sand, medium dense-dry							
		12					2					
		17					2					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-5**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-6

JOB NO.: 22G143-2 | DRILLING DATE: 3/14/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		6			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium Sand, loose to medium dense-dry to damp		5					
		12					2					
5		17			Brown Silty fine to medium Sand, trace fine root fibers, trace coarse Sand, trace fine Gravel, medium dense-dry		1					
		16			Brown Silty fine to medium Sand, trace coarse Sand, medium dense-dry		2					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-6**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-7

JOB NO.: 22G143-2 | DRILLING DATE: 3/17/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		4			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium Sand, loose to medium dense-dry to damp		6					
		12					1					
5		13			Brown Silty fine to medium Sand, trace fine Gravel, trace coarse Sand, medium dense-dry		2					
		21			Brown Silty fine to coarse Sand, medium dense-dry to damp		3					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-7**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-8

JOB NO.: 22G143-2 DRILLING DATE: 3/17/22 WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 DRILLING METHOD: Hollow Stem Auger CAVE DEPTH: ---
LOCATION: Palmdale, California LOGGED BY: Michelle Esparza 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
		7			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium Sand, loose-dry to damp		5					
		6					2					
5		11			Brown Gravelly fine to coarse Sand, trace Silt, medium dense to dense-dry		1					
		32					2					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-8**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-9

JOB NO.: 22G143-2 | DRILLING DATE: 3/17/22 | WATER DEPTH: Dry
PROJECT: Prop. Warehouse Development: Phase 1 | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: Palmdale, California | LOGGED BY: Michelle Esparza | 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
		6			ALLUVIUM: Dark Brown fine Sandy Silt, trace medium Sand, loose to medium dense-dry to damp		5					
		17					2					
5		10			Brown Silty fine to meidum Sand, trace coarse Sand, medium dense-dry		1					
		13			Brown fine to coarse Sand, trace fine Gravel, medium dense-dry		2					
10					Boring Terminated at 10'							

TBL 22G143-2.GPJ SOCALGEO.GDT 5/10/22

TEST BORING LOG **PLATE B-9**

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	12.22	(ft)

Infiltration Test Hole: I-1

Start Time for Pre-Soak	8:48 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	10:04 AM	Time Interal Between Readings	25

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	8:48 AM	14.0	7.22	5.00	2.5	16.1	3.0	5.4
	Final	9:02 AM		12.22					
2	Initial	9:08 AM	25.0	7.22	5.00	2.5	9.0	3.0	3.0
	Final	9:33 AM		12.22					
3	Initial	9:39 AM	25.0	7.22	5.00	2.5	9.0	3.0	3.0
	Final	10:04 AM		12.22					
4	Initial	10:04 AM	25.0	7.22	4.03	3.0	6.1	3.0	2.0
	Final	10:29 AM		11.25					
5	Initial	10:29 AM	25.0	7.22	3.94	3.0	5.9	3.0	2.0
	Final	10:54 AM		11.16					
6	Initial	10:54 AM	25.0	7.22	3.83	3.1	5.7	3.0	1.9
	Final	11:19 AM		11.05					
7	Initial	11:19 AM	25.0	7.22	3.74	3.1	5.4	3.0	1.8
	Final	11:44 AM		10.96					
8	Initial	11:44 AM	25.0	7.22	3.80	3.1	5.6	3.0	1.9
	Final	12:09 PM		11.02					
9	Initial	12:09 PM	25.0	7.22	3.73	3.1	5.4	3.0	1.8
	Final	12:34 PM		10.95					
10	Initial	12:34 PM	25.0	7.22	3.70	3.2	5.4	3.0	1.8
	Final	12:59 PM		10.92					
11	Initial	12:59 PM	25.0	7.22	3.69	3.2	5.3	3.0	1.8
	Final	1:24 PM		10.91					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.09	(ft)

Infiltration Test Hole: I-3

Start Time for Pre-Soak	2:31 PM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	3:09 PM	Time Interal Between Readings	17

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	2:31 PM	12.0	6.09	4.00	2.0	18.5	3.0	6.2
	Final	2:43 PM		10.09					
2	Initial	2:47 PM	17.0	6.09	4.00	2.0	13.0	3.0	4.3
	Final	3:04 PM		10.09					
3	Initial	3:09 PM	17.0	6.09	3.82	2.1	11.9	3.0	4.0
	Final	3:26 PM		9.91					
4	Initial	3:26 PM	17.0	6.09	3.71	2.1	11.3	3.0	3.8
	Final	3:43 PM		9.80					
5	Initial	3:43 PM	17.0	6.09	3.33	2.3	9.4	3.0	3.1
	Final	4:00 PM		9.42					
6	Initial	4:00 PM	17.0	6.09	3.26	2.4	9.1	3.0	3.0
	Final	4:17 PM		9.35					
7	Initial	4:17 PM	17.0	6.09	3.16	2.4	8.6	3.0	2.9
	Final	4:34 PM		9.25					
8	Initial	4:34 PM	17.0	6.09	3.13	2.4	8.5	3.0	2.8
	Final	4:51 PM		9.22					
9	Initial	4:51 PM	17.0	6.09	3.12	2.4	8.4	3.0	2.8
	Final	5:08 PM		9.21					
10	Initial	5:08 PM	17.0	6.09	3.10	2.5	8.4	3.0	2.8
	Final	5:25 PM		9.19					
11	Initial	5:25 PM	17.0	6.09	3.10	2.5	8.4	3.0	2.8
	Final	5:42 PM		9.19					
11	Initial	5:42 PM	17.0	6.09	3.11	2.4	8.4	3.0	2.8
	Final	5:59 PM		9.20					

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

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

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

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

Where: Q = Measured Infiltration Rate (in inches per hour)

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

Δt = Time Interval

r = Test Hole (Borehole) Radius

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

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.10	(ft)

Infiltration Test Hole	I-4		
Start Time for Pre-Soak	9:17 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	10:03 AM	Time Interal Between Readings	19

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	9:17 AM	16.0	6.10	4.00	2.0	13.8	3.0	4.6
	Final	9:33 AM		10.10					
2	Initial	9:40 AM	19.0	6.10	4.00	2.0	11.7	3.0	3.9
	Final	9:59 AM		10.10					
3	Initial	10:03 AM	19.0	6.10	3.87	2.1	11.0	3.0	3.7
	Final	10:22 AM		9.97					
4	Initial	10:33 AM	19.0	6.10	3.86	2.1	10.9	3.0	3.6
	Final	10:52 AM		9.96					
5	Initial	11:05 AM	19.0	6.10	3.85	2.1	10.8	3.0	3.6
	Final	11:24 AM		9.95					
6	Initial	11:24 AM	19.0	6.10	3.86	2.1	10.9	3.0	3.6
	Final	11:43 AM		9.96					
7	Initial	11:43 AM	19.0	6.10	3.75	2.1	10.3	3.0	3.4
	Final	12:02 PM		9.85					
8	Initial	12:05 PM	19.0	6.10	3.70	2.2	10.1	3.0	3.4
	Final	12:24 PM		9.80					
9	Initial	12:24 PM	19.0	6.10	3.70	2.2	10.1	3.0	3.4
	Final	12:43 PM		9.80					
10	Initial	12:45 PM	19.0	6.10	3.69	2.2	10.0	3.0	3.3
	Final	1:04 PM		9.79					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.12	(ft)

Infiltration Test Hole: I-6

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

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	2:09 PM	30.0	6.12	2.56	2.7	3.5	3.0	1.2
	Final	2:39 PM		8.68					
2	Initial	2:44 PM	30.0	6.12	2.09	3.0	2.7	3.0	0.9
	Final	3:14 PM		8.21					
3	Initial	5:16 PM	30.0	6.12	1.78	3.1	2.2	3.0	0.7
	Final	5:46 PM		7.90					
4	Initial	5:49 PM	30.0	6.12	1.58	3.2	1.9	3.0	0.6
	Final	6:19 PM		7.70					
5	Initial	6:21 PM	30.0	6.12	1.47	3.3	1.7	3.0	0.6
	Final	6:51 PM		7.59					
6	Initial	6:54 PM	30.0	6.12	1.48	3.3	1.7	3.0	0.6
	Final	7:24 PM		7.60					
7	Initial	7:27 PM	30.0	6.12	1.48	3.3	1.7	3.0	0.6
	Final	7:57 PM		7.60					
8	Initial	8:00 PM	30.0	6.12	1.47	3.3	1.7	3.0	0.6
	Final	8:30 PM		7.59					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.12	(ft)

Infiltration Test Hole: I-7

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

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	3:55 PM	30.0	6.12	4.00	2.0	7.4	3.0	2.5
	Final	4:25 PM		10.12					
2	Initial	4:25 PM	30.0	6.12	3.68	2.2	6.3	3.0	2.1
	Final	4:55 PM		9.80					
3	Initial	5:03 PM	30.0	6.12	3.55	2.2	5.9	3.0	2.0
	Final	5:33 PM		9.67					
4	Initial	5:36 PM	30.0	6.12	3.48	2.3	5.7	3.0	1.9
	Final	6:06 PM		9.60					
5	Initial	6:10 PM	30.0	6.12	3.37	2.3	5.4	3.0	1.8
	Final	6:40 PM		9.49					
6	Initial	6:43 PM	30.0	6.12	3.37	2.3	5.4	3.0	1.8
	Final	7:13 PM		9.49					
7	Initial	7:16 PM	30.0	6.12	3.38	2.3	5.5	3.0	1.8
	Final	7:46 PM		9.50					
8	Initial	7:49 PM	30.0	6.12	3.37	2.3	5.4	3.0	1.8
	Final	8:19 PM		9.49					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.10	(ft)

Infiltration Test Hole	I-8

Start Time for Pre-Soak	7:55 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	9:24 AM	Time Interal Between Readings	27

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	7:55 AM	17.0	6.10	4.00	2.0	13.0	3.0	4.3
	Final	8:12 AM		10.10					
2	Initial	8:52 AM	27.0	6.10	4.00	2.0	8.2	3.0	2.7
	Final	9:19 AM		10.10					
3	Initial	9:24 AM	27.0	6.10	3.88	2.1	7.7	3.0	2.6
	Final	9:51 AM		9.98					
4	Initial	10:27 AM	27.0	6.10	3.81	2.1	7.5	3.0	2.5
	Final	10:54 AM		9.91					
5	Initial	10:58 AM	27.0	6.10	3.73	2.1	7.2	3.0	2.4
	Final	11:25 AM		9.83					
6	Initial	11:28 AM	27.0	6.10	3.72	2.1	7.2	3.0	2.4
	Final	11:55 AM		9.82					
7	Initial	11:57 AM	27.0	6.10	3.74	2.1	7.2	3.0	2.4
	Final	12:24 PM		9.84					
8	Initial	12:27 PM	27.0	6.10	3.71	2.1	7.1	3.0	2.4
	Final	12:54 PM		9.81					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.20	(ft)

Infiltration Test Hole: I-9

Start Time for Pre-Soak	8:18 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	9:55 AM	Time Interal Between Readings	17

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	8:18 AM	11.0	6.20	4.00	2.0	20.1	3.0	6.7
	Final	8:29 AM		10.20					
2	Initial	8:31 AM	17.0	6.20	4.00	2.0	13.0	3.0	4.3
	Final	8:48 AM		10.20					
3	Initial	9:55 AM	17.0	6.20	3.67	2.2	11.1	3.0	3.7
	Final	10:12 AM		9.87					
4	Initial	10:32 AM	17.0	6.20	3.39	2.3	9.7	3.0	3.2
	Final	10:49 AM		9.59					
5	Initial	11:03 AM	17.0	6.20	3.22	2.4	8.9	3.0	3.0
	Final	11:20 AM		9.42					
6	Initial	11:35 AM	17.0	6.20	2.95	2.5	7.7	3.0	2.6
	Final	11:52 AM		9.15					
7	Initial	12:03 PM	17.0	6.20	2.60	2.7	6.4	3.0	2.1
	Final	12:20 PM		8.80					
8	Initial	12:35 PM	17.0	6.20	2.49	2.8	6.0	3.0	2.0
	Final	12:52 PM		8.69					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.11	(ft)

Infiltration Test Hole	I-10

Start Time for Pre-Soak	12:44 PM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	1:24 PM	Time Interal Between Readings	14

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	12:44 PM	7.0	6.11	4.00	2.0	31.6	3.0	10.5
	Final	12:51 PM		10.11					
2	Initial	1:00 PM	14.0	6.11	4.00	2.0	15.8	3.0	5.3
	Final	1:14 PM		10.11					
3	Initial	1:24 PM	14.0	6.11	3.64	2.2	13.3	3.0	4.4
	Final	1:38 PM		9.75					
4	Initial	1:43 PM	14.0	6.11	3.19	2.4	10.6	3.0	3.5
	Final	1:57 PM		9.30					
5	Initial	4:15 PM	14.0	6.11	2.94	2.5	9.3	3.0	3.1
	Final	4:29 PM		9.05					
6	Initial	4:32 PM	14.0	6.11	2.81	2.6	8.7	3.0	2.9
	Final	4:46 PM		8.92					
7	Initial	4:48 PM	14.0	6.11	2.80	2.6	8.7	3.0	2.9
	Final	5:02 PM		8.91					
8	Initial	5:06 PM	14.0	6.11	2.78	2.6	8.6	3.0	2.9
	Final	5:20 PM		8.89					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.11	(ft)

Infiltration Test Hole	I-10

Start Time for Pre-Soak	12:44 PM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	1:24 PM	Time Interal Between Readings	14

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
9	Initial	5:20 PM	14.0	6.11	2.78	2.6	8.6	3.0	2.9
	Final	5:34 PM		8.89					
10	Initial	5:34 PM	14.0	6.11	2.76	2.6	8.5	3.0	2.8
	Final	5:48 PM		8.87					
11	Initial	5:48 PM	14.0	6.11	2.77	2.6	8.5	3.0	2.8
	Final	6:02 PM		8.88					
12	Initial	6:02 PM	14.0	6.11	2.76	2.6	8.5	3.0	2.8
	Final	6:16 PM		8.87					
13	Initial	6:16 PM	14.0	6.11	2.76	2.6	8.5	3.0	2.8
	Final	6:30 PM		8.87					
14	Initial	6:30 PM	14.0	6.11	2.75	2.6	8.4	3.0	2.8
	Final	6:44 PM		8.86					
15	Initial	6:44 PM	14.0	6.11	2.76	2.6	8.5	3.0	2.8
	Final	6:58 PM		8.87					
16	Initial	6:58 PM	14.0	6.11	2.76	2.6	8.5	3.0	2.8
	Final	7:12 PM		8.87					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.05	(ft)

Infiltration Test Hole	I-11		
Start Time for Pre-Soak	7:48 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	8:16 AM	Time Interal Between Readings	11

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	7:48 AM	6.0	6.05	4.00	2.0	36.9	3.0	12.3
	Final	7:54 AM		10.05					
2	Initial	7:59 AM	11.0	5.05	5.00	2.5	20.5	3.0	6.8
	Final	8:10 AM		10.05					
3	Initial	8:16 AM	11.0	5.05	4.60	2.7	17.5	3.0	5.8
	Final	8:27 AM		9.65					
4	Initial	8:32 AM	11.0	5.05	4.16	2.9	14.7	3.0	4.9
	Final	8:43 AM		9.21					
5	Initial	8:46 AM	11.0	5.05	4.06	3.0	14.1	3.0	4.7
	Final	8:57 AM		9.11					
6	Initial	8:59 AM	11.0	5.05	3.90	3.1	13.2	3.0	4.4
	Final	9:10 AM		8.95					
7	Initial	9:12 AM	11.0	5.05	3.68	3.2	12.1	3.0	4.0
	Final	9:23 AM		8.73					
8	Initial	9:25 AM	11.0	5.05	3.66	3.2	12.0	3.0	4.0
	Final	9:36 AM		8.71					
9	Initial	9:36 AM	11.0	5.05	3.66	3.2	12.0	3.0	4.0
	Final	9:47 AM		8.71					
10	Initial	9:49 AM	11.0	5.05	3.65	3.2	11.9	3.0	4.0
	Final	10:00 AM		8.70					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.05	(ft)

Infiltration Test Hole: I-11

Start Time for Pre-Soak	7:48 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	8:16 AM	Time Interal Between Readings	11

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)
11	Initial	10:00 AM	11.0	5.05	3.65	3.2	11.9	3.0	4.0
	Final	10:11 AM		8.70					
12	Initial	10:12 AM	11.0	5.05	3.64	3.2	11.9	3.0	4.0
	Final	10:23 AM		8.69					
13	Initial	10:25 AM	11.0	5.05	3.62	3.2	11.8	3.0	3.9
	Final	10:36 AM		8.67					
14	Initial	10:37 AM	11.0	5.05	3.63	3.2	11.8	3.0	3.9
	Final	10:48 AM		8.68					
15	Initial	10:49 AM	11.0	5.05	3.62	3.2	11.8	3.0	3.9
	Final	11:00 AM		8.67					
16	Initial	11:00 AM	11.0	5.05	3.61	3.2	11.7	3.0	3.9
	Final	11:11 AM		8.66					

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	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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.07	(ft)

Infiltration Test Hole	I-12		
Start Time for Pre-Soak	10:07 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	10:56 AM	Time Interal Between Readings	23

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	10:07 AM	19.0	6.07	4.00	2.0	11.7	3.0	3.9
	Final	10:26 AM		10.07					
2	Initial	10:29 AM	23.0	6.07	4.00	2.0	9.6	3.0	3.2
	Final	10:52 AM		10.07					
3	Initial	10:56 AM	23.0	5.05	4.60	2.7	8.3	3.0	2.8
	Final	11:19 AM		9.65					
4	Initial	11:26 AM	23.0	5.05	4.16	2.9	7.0	3.0	2.3
	Final	11:49 AM		9.21					
5	Initial	11:52 AM	23.0	5.05	4.06	3.0	6.7	3.0	2.2
	Final	12:15 PM		9.11					
6	Initial	12:18 PM	23.0	5.05	3.90	3.1	6.3	3.0	2.1
	Final	12:41 PM		8.95					
7	Initial	12:43 PM	23.0	5.05	3.68	3.2	5.7	3.0	1.9
	Final	1:06 PM		8.73					
8	Initial	1:10 PM	23.0	5.05	3.66	3.2	5.7	3.0	1.9
	Final	1:33 PM		8.71					
9	Initial	1:33 PM	23.0	5.05	3.66	3.2	5.7	3.0	1.9
	Final	1:56 PM		8.71					
10	Initial	1:56 PM	23.0	5.05	3.65	3.2	5.7	3.0	1.9
	Final	2:19 PM		8.70					

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: Phase I
Project Location	Palmdale, California
Project Number	22G143-2
Engineer	ME

Test Hole Radius	4.00	(in)
Test Depth	10.11	(ft)

Infiltration Test Hole: I-13

Start Time for Pre-Soak	7:45 AM	Water Remaining in Boring (Y/N)	Y
Start Time for Standard	10:13 AM	Time Interal Between Readings	30

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Measured Infiltration Rate Q (in/hr)	Reduction Factor (RF)	Design Infiltration Rate Q (in/hr)
1	Initial	7:45 AM	25.0	7.11	3.00	1.5	8.6	3.0	2.9
	Final	8:10 AM		10.11					
2	Initial	8:16 AM	30.0	7.11	2.85	1.6	6.5	3.0	2.2
	Final	8:46 AM		9.96					
3	Initial	10:13 AM	30.0	7.11	2.81	1.6	6.4	3.0	2.1
	Final	10:43 AM		9.92					
4	Initial	10:45 AM	30.0	7.11	2.79	1.6	6.3	3.0	2.1
	Final	11:15 AM		9.90					
5	Initial	11:22 AM	30.0	7.11	2.75	1.6	6.1	3.0	2.0
	Final	11:52 AM		9.86					
6	Initial	11:58 AM	30.0	7.11	2.80	1.6	6.3	3.0	2.1
	Final	12:28 PM		9.91					
7	Initial	12:31 PM	30.0	7.11	2.78	1.6	6.3	3.0	2.1
	Final	1:01 PM		9.89					
8	Initial	1:05 PM	30.0	7.11	2.79	1.6	6.3	3.0	2.1
	Final	1:35 PM		9.90					
9	Initial	1:37 PM	30.0	7.11	2.77	1.6	6.2	3.0	2.1
	Final	2:07 PM		9.88					
10	Initial	2:10 PM	30.0	7.11	2.75	1.6	6.1	3.0	2.0
	Final	2:40 PM		9.86					

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)

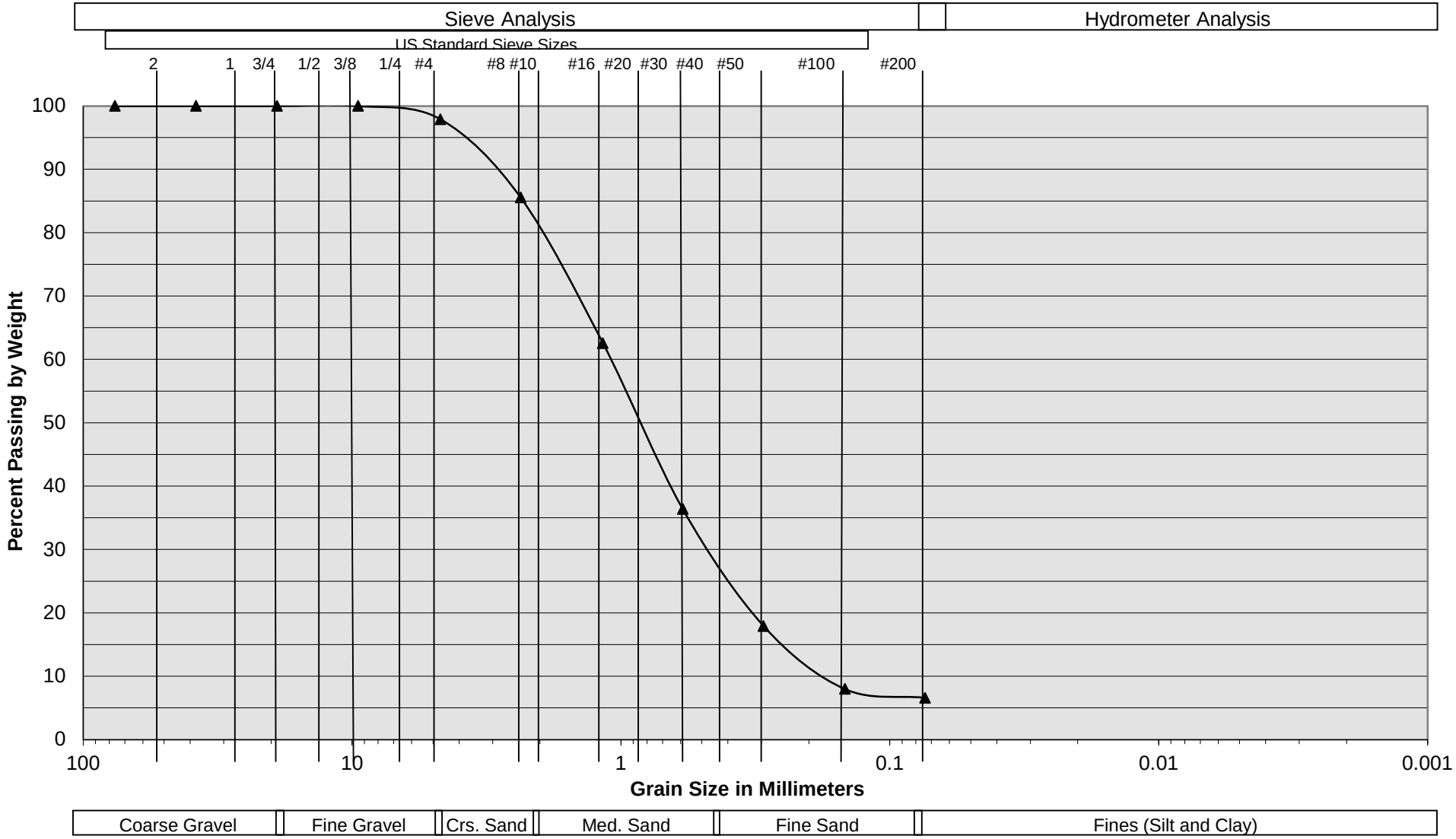
ΔH = Change in Height (Water Level) over the time interval

r = Test Hole (Borehole) Radius

Δt = Time Interval

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

Grain Size Distribution

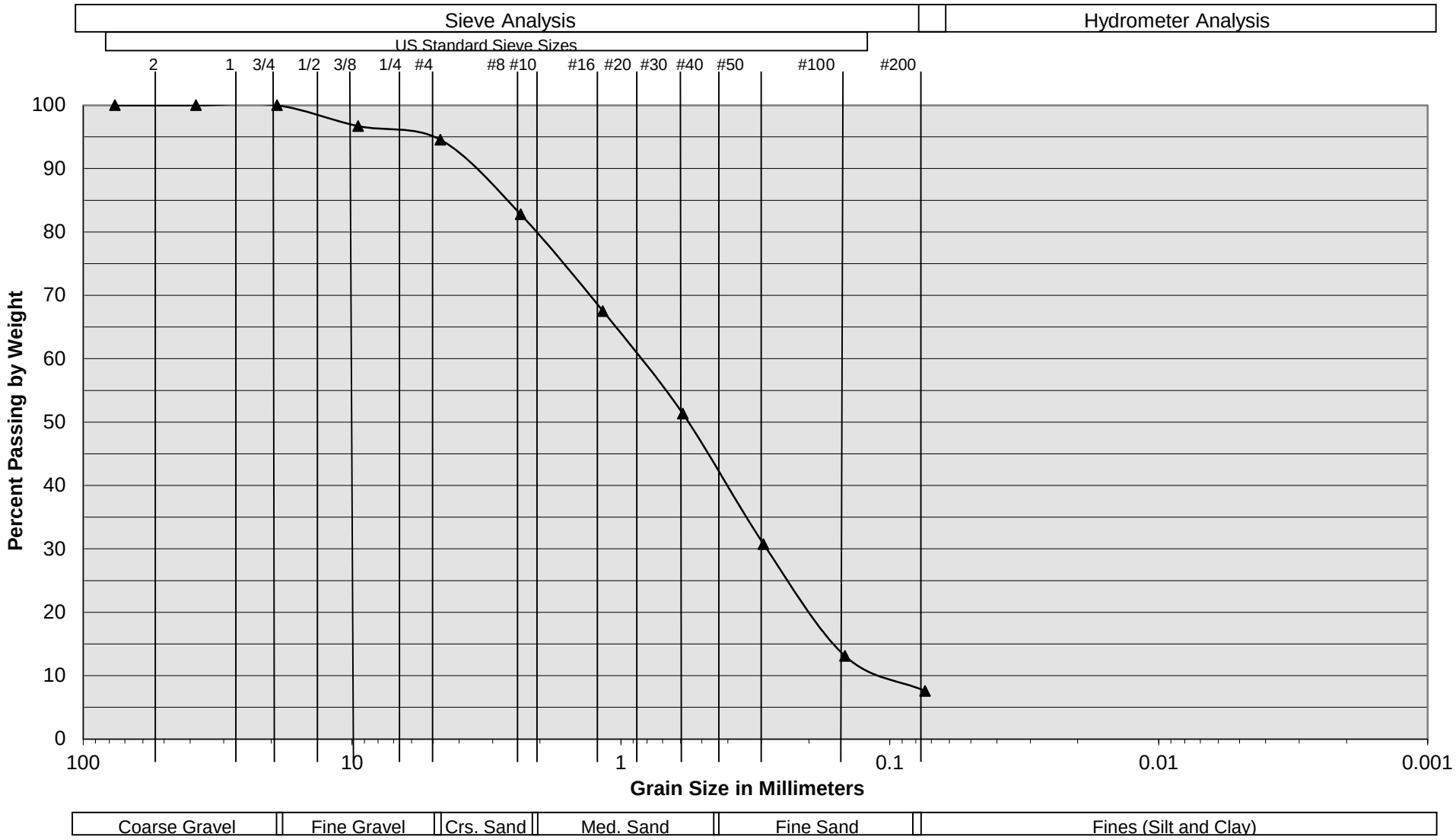


Sample Description	I-1 @ 13½ to 15'
Soil Classification	Brown fine to coarse Sand, trace Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

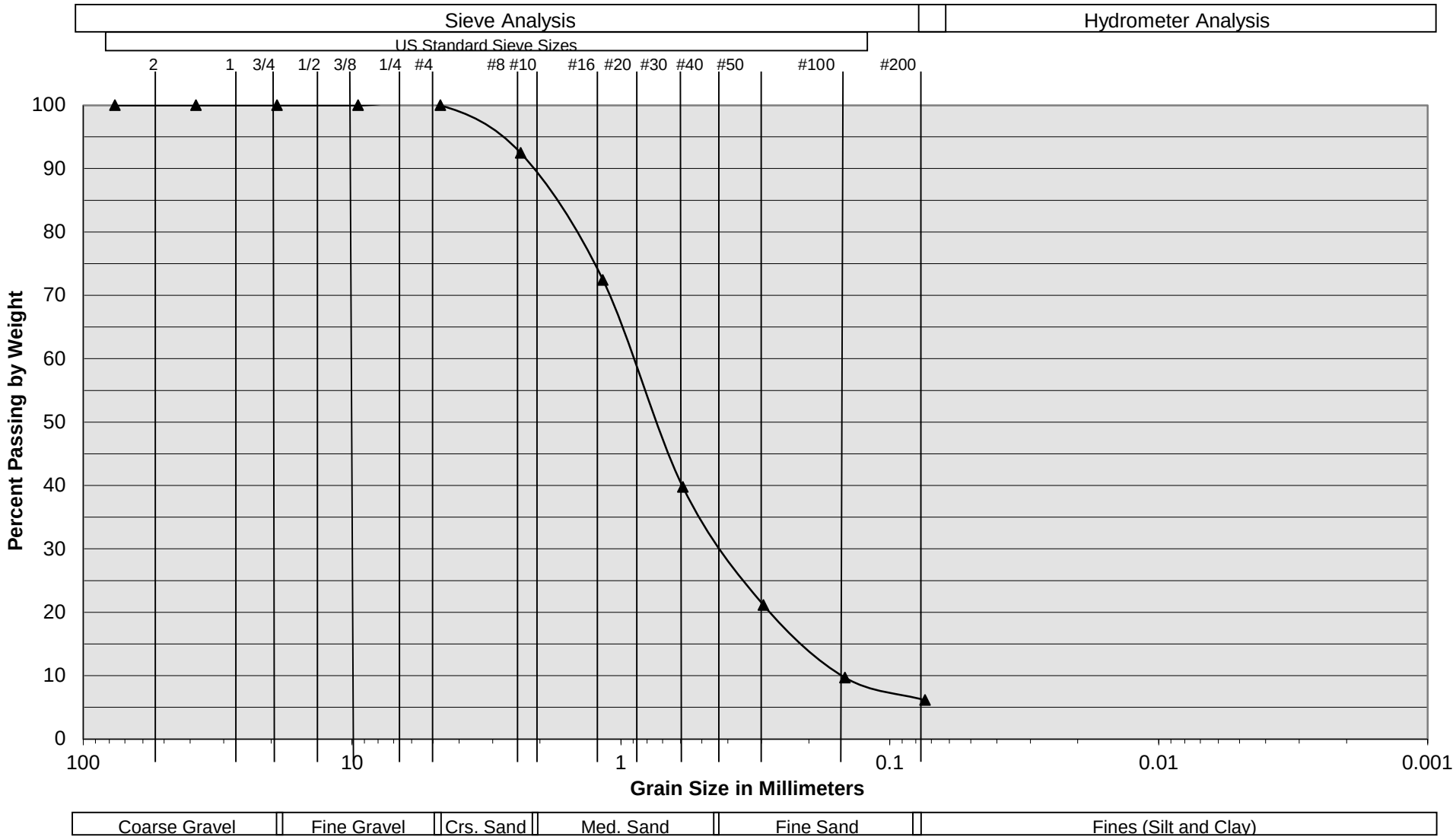


Sample Description	I-2 @ 8½ to 10'
Soil Classification	Brown fine to coarse Sand, trace fine Gravel, trace Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

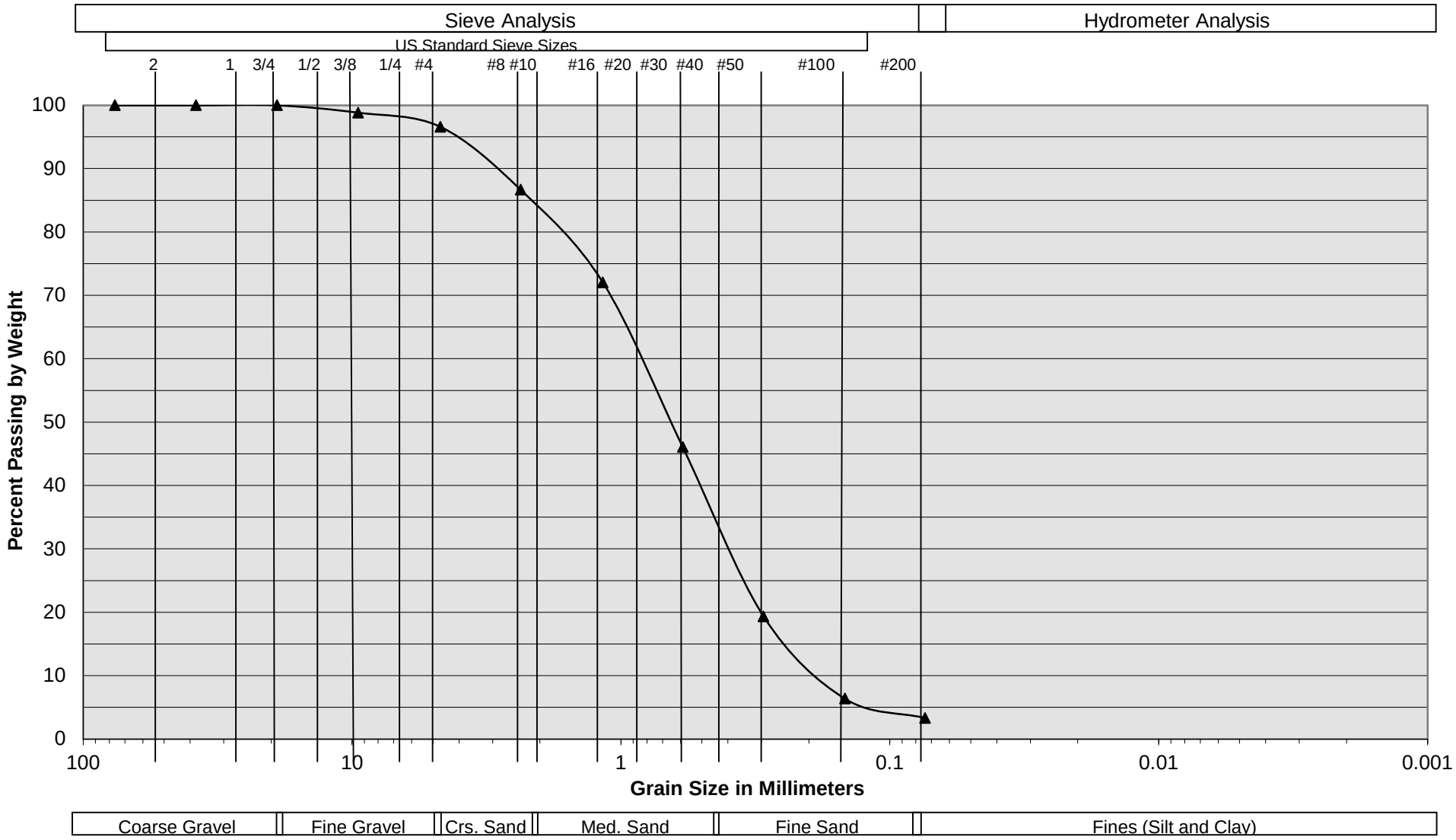


Sample Description	I-3 @ 8½ to 10'
Soil Classification	Brown fine to coarse Sand, trace Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

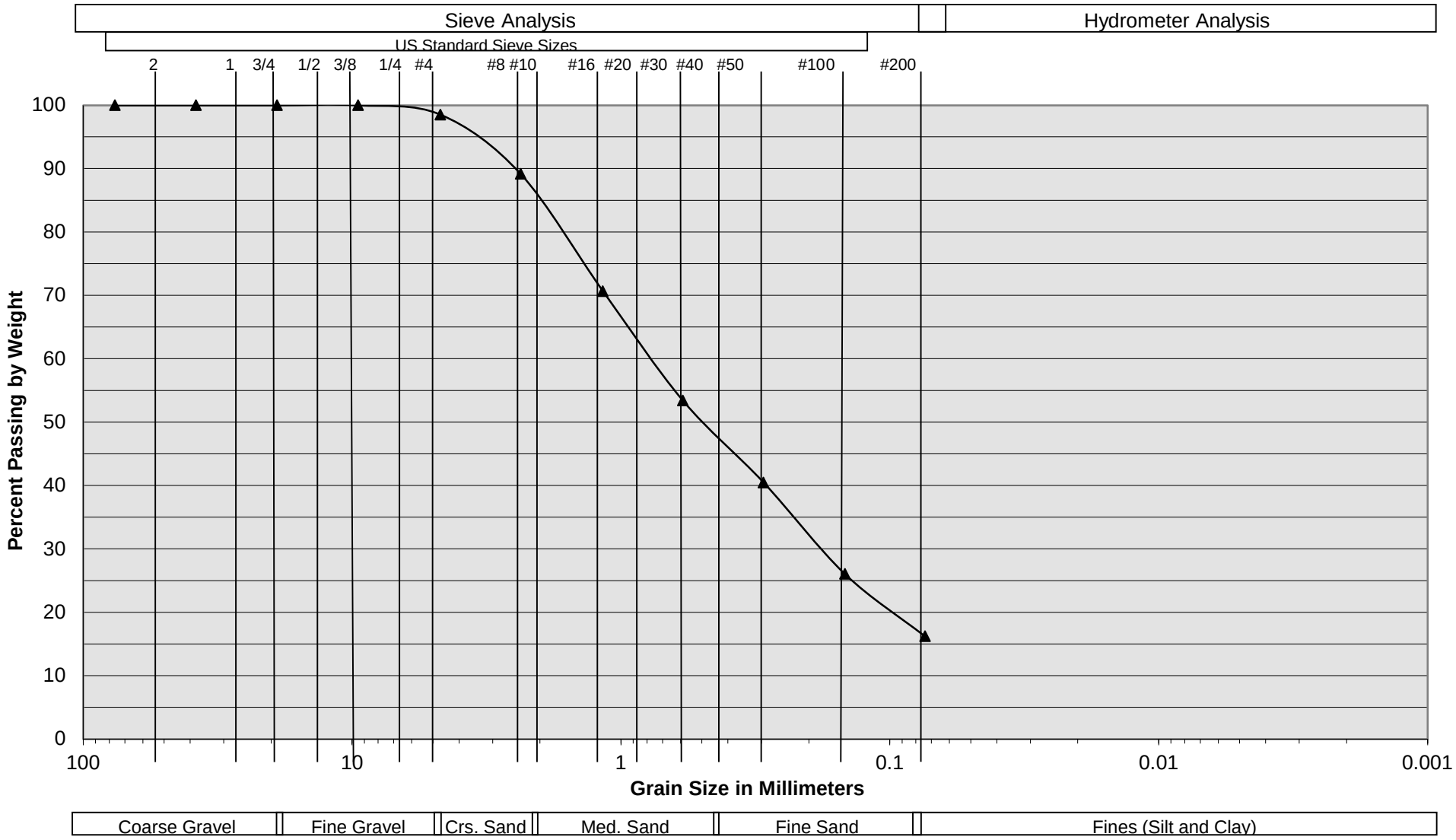


Sample Description	I-4 @ 8½ to 10'
Soil Classification	Brown fine to coarse Sand, trace Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

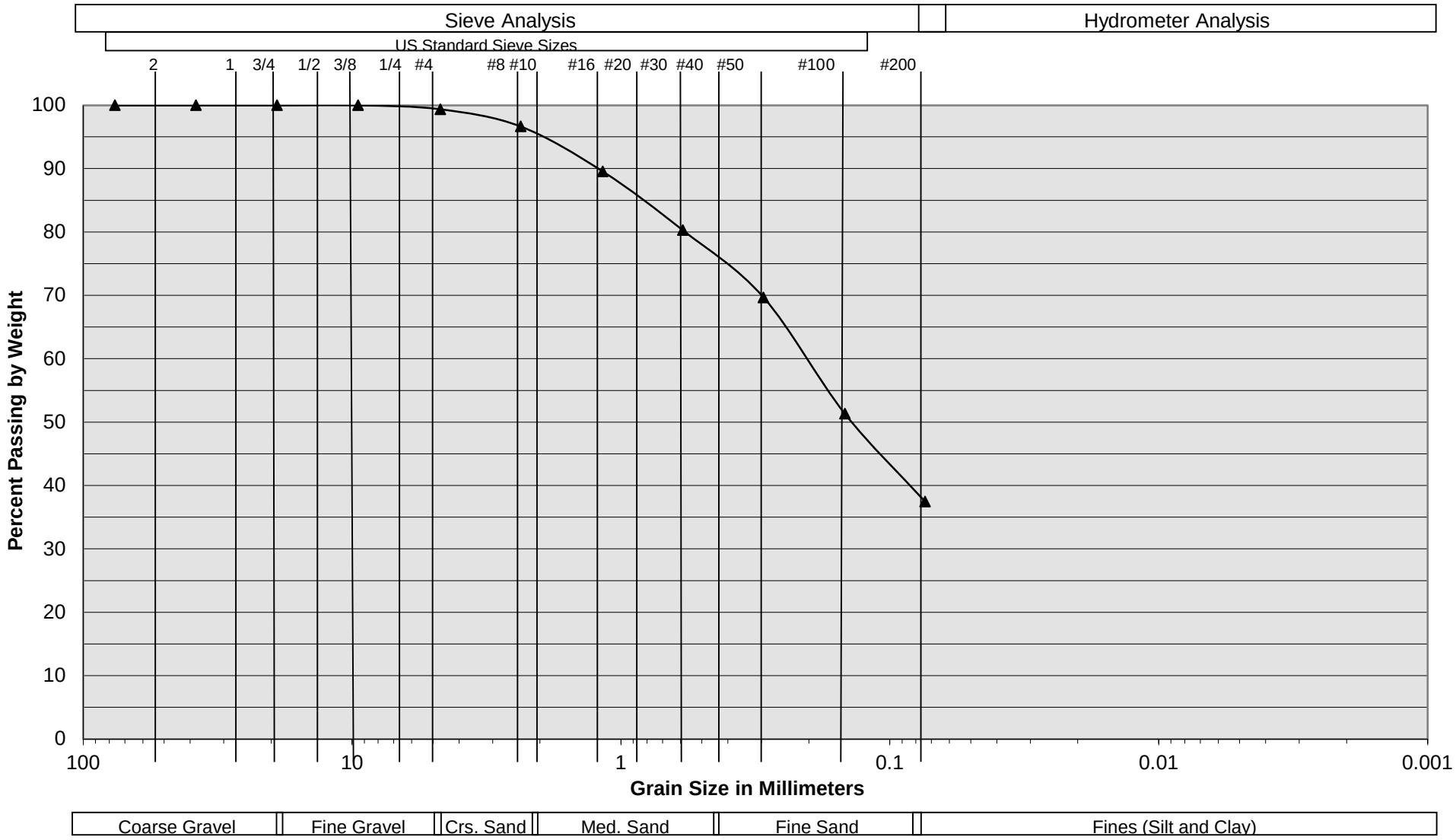


Sample Description	I-5 @ 8½ to 10'
Soil Classification	Brown Silty fine to coarse Sand

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

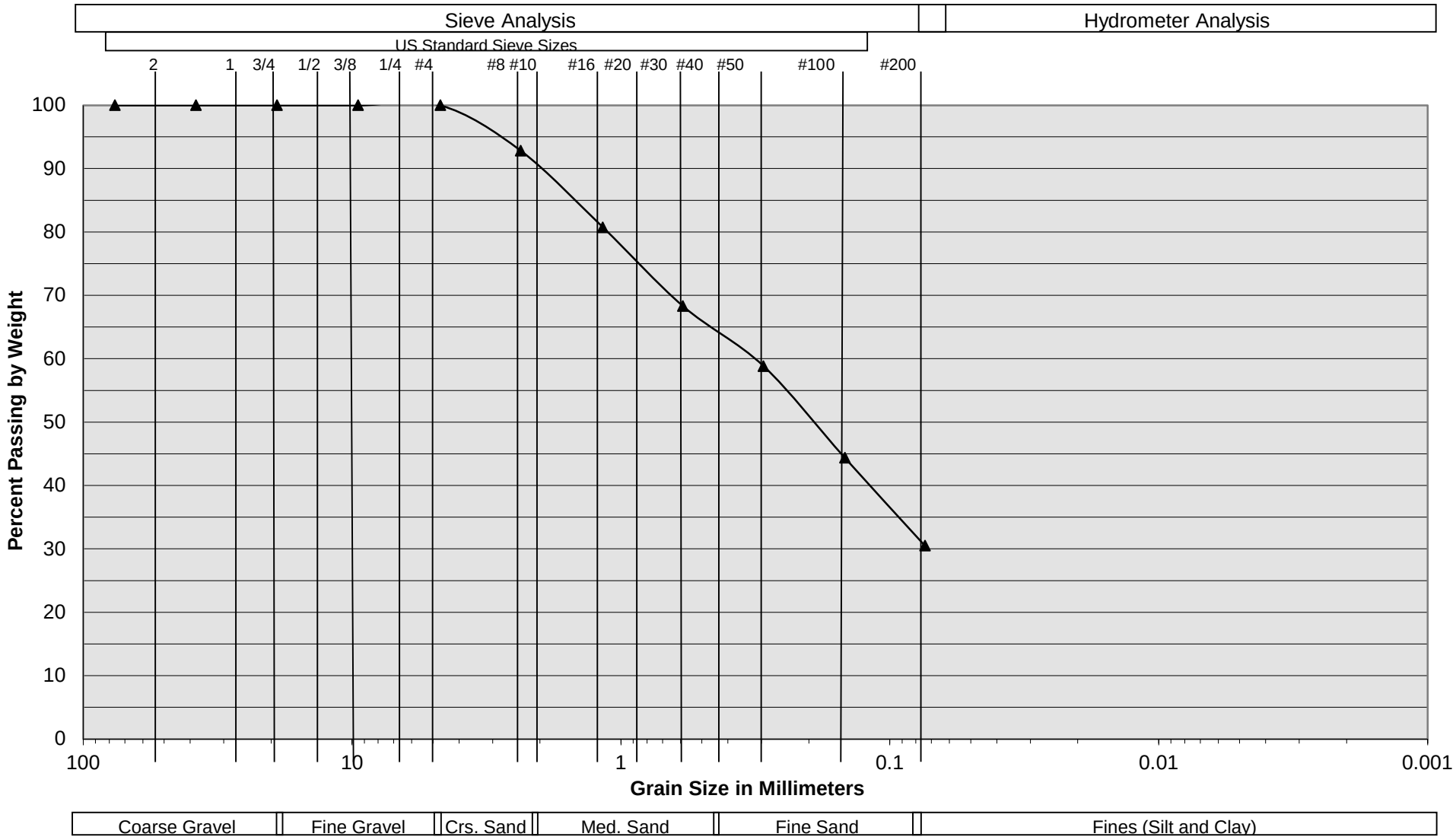


Sample Description	I-6 @ 8½ to 10'
Soil Classification	Brown Silty fine to medium Sand, trace coarse Sand

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

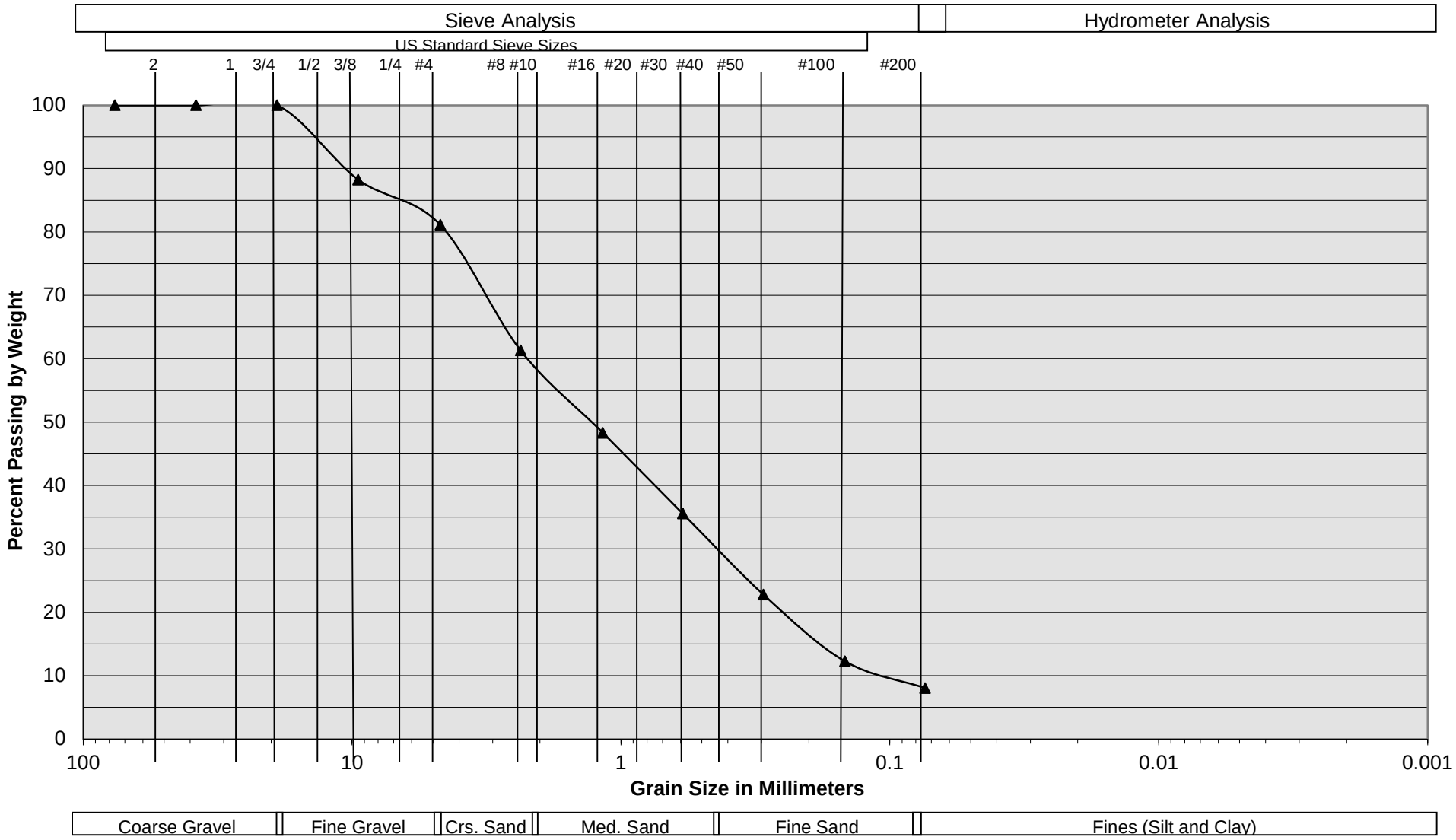


Sample Description	I-7 @ 8½ to 10'
Soil Classification	Brown Silty fine to coarse Sand

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

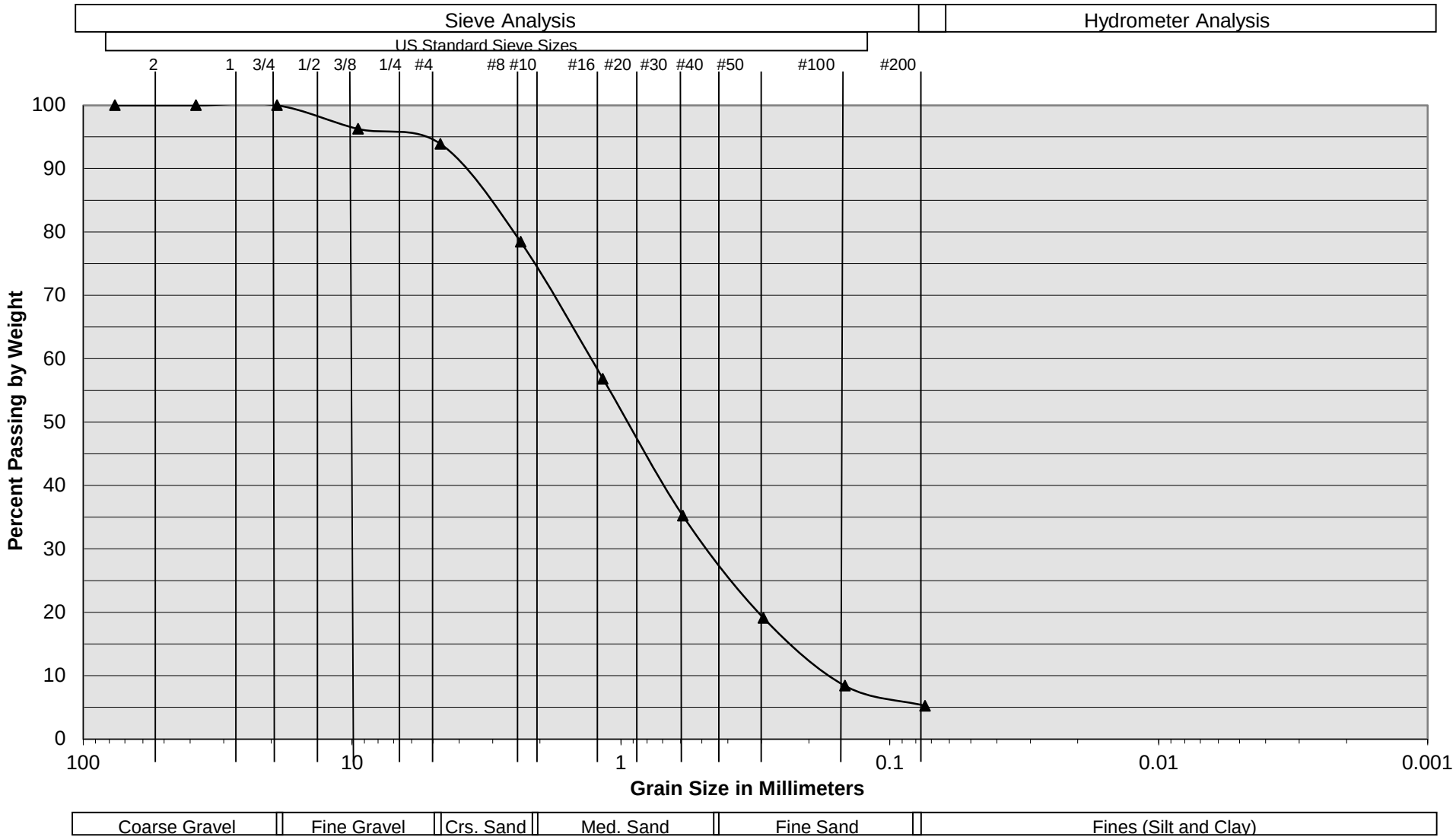


Sample Description	I-8 @ 8½ to 10'
Soil Classification	Brown Gravelly fine to coarse Sand, trace Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 8

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

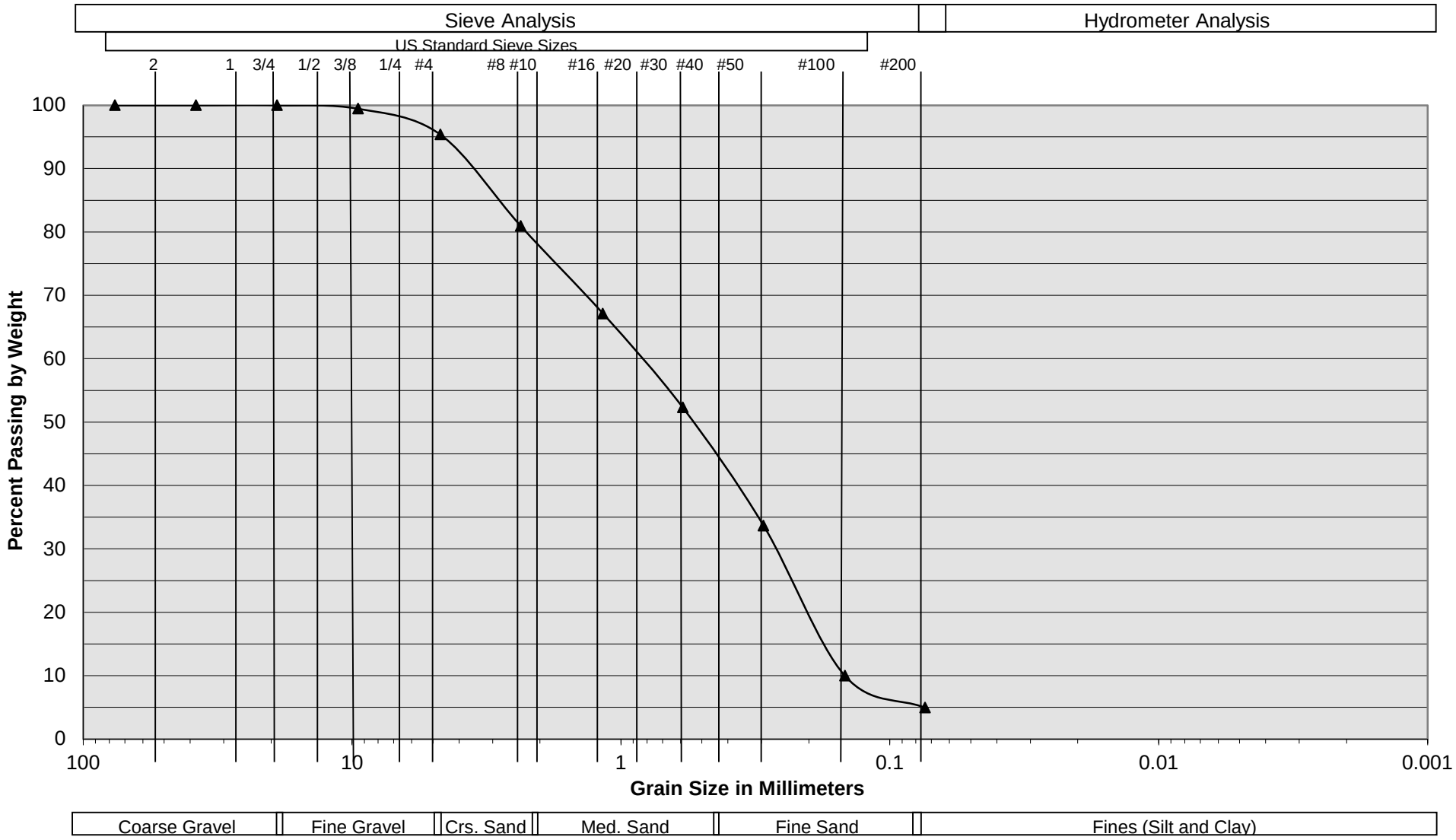


Sample Description	I-9 @ 8½ to 10'
Soil Classification	Brown fine to coarse Sand, trace fine Gravel, trace Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 9

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

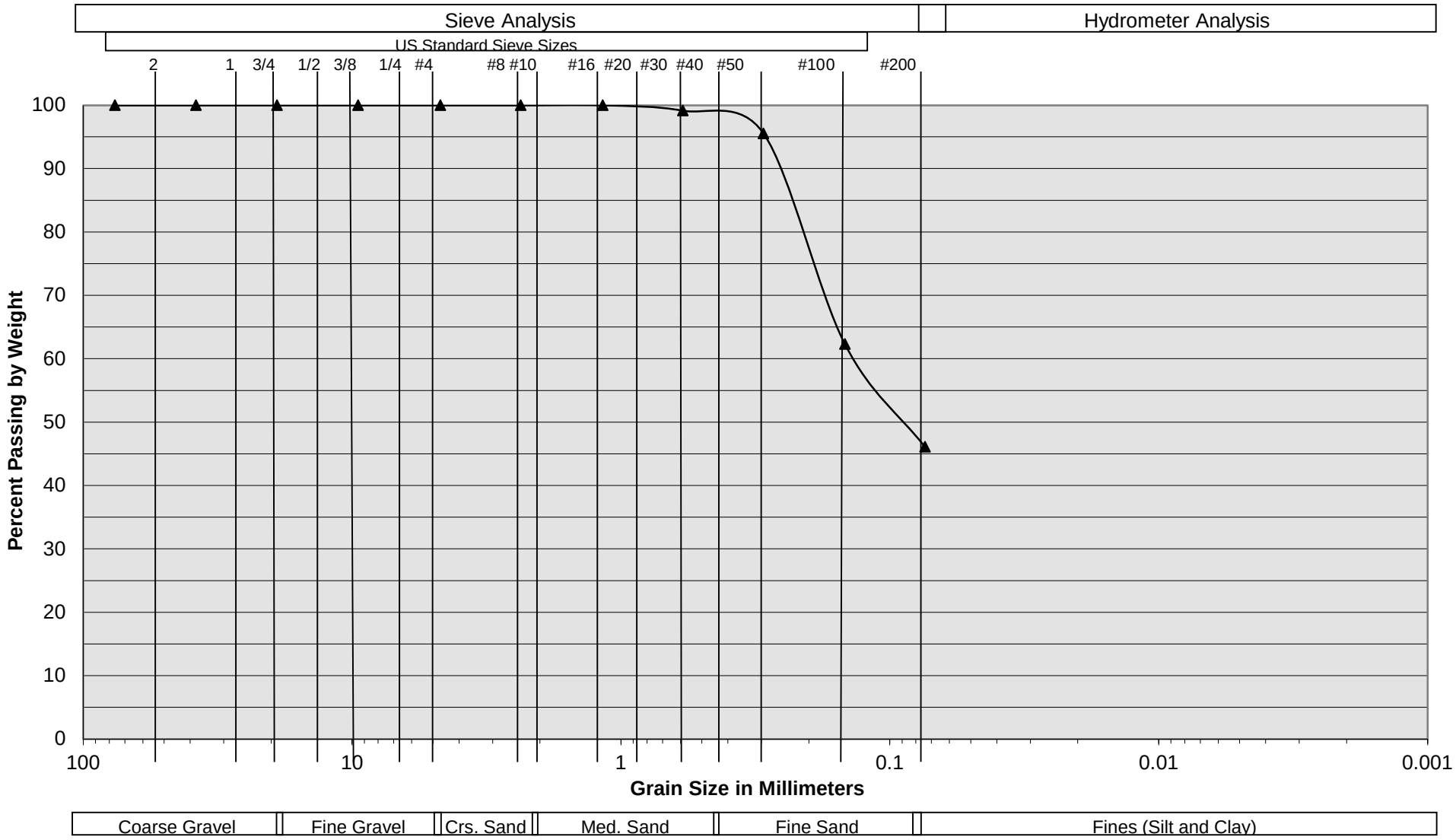


Sample Description	I-10 @ 8½ to 10'
Soil Classification	Brown fine to coarse Sand, trace fine Gravel, trace Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 10

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SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

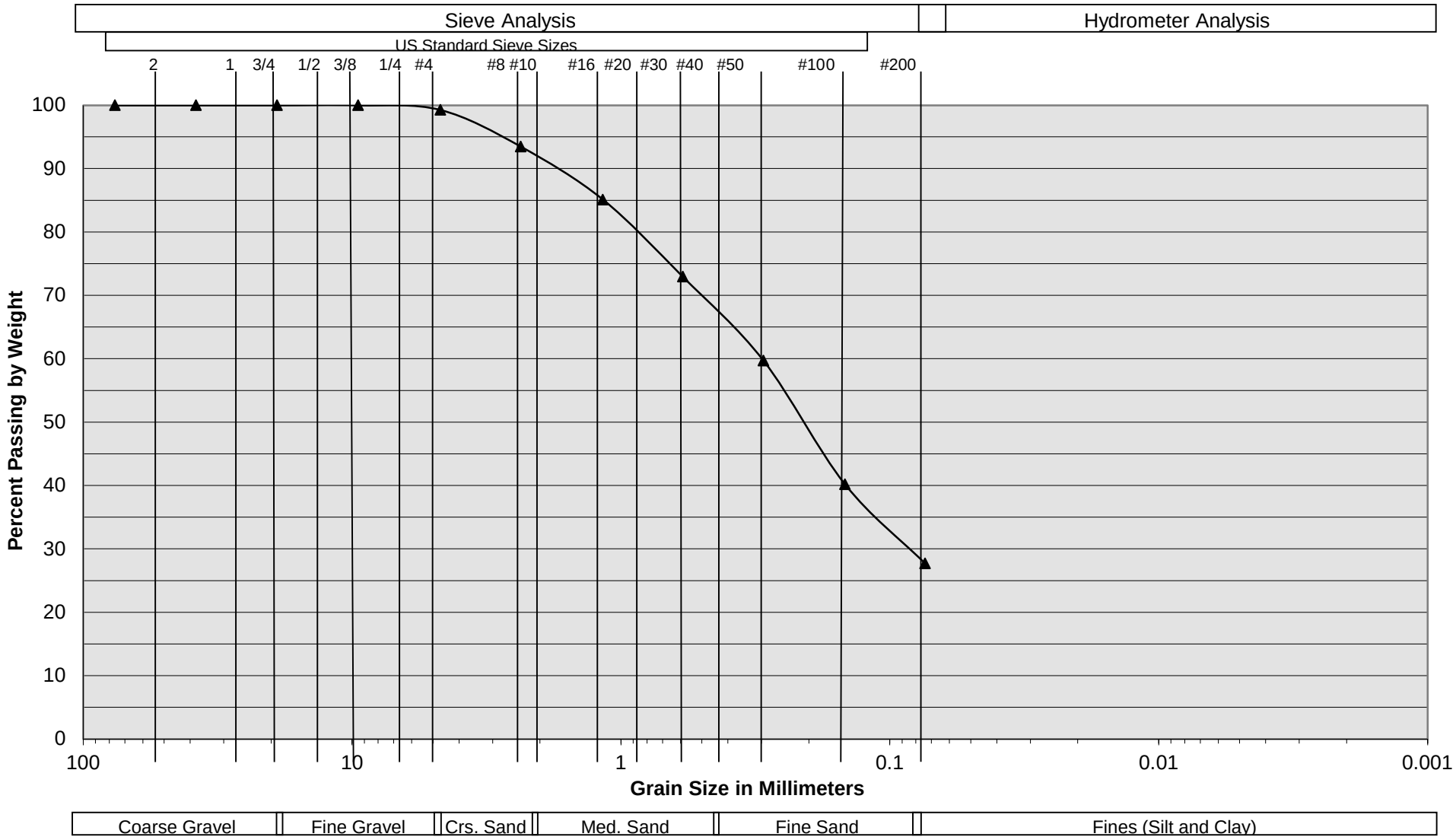


Sample Description	I-11 @ 8½ to 10'
Soil Classification	Light Brown Silty fine Sand

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 11

SoCalGeo
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A California Corporation

Grain Size Distribution

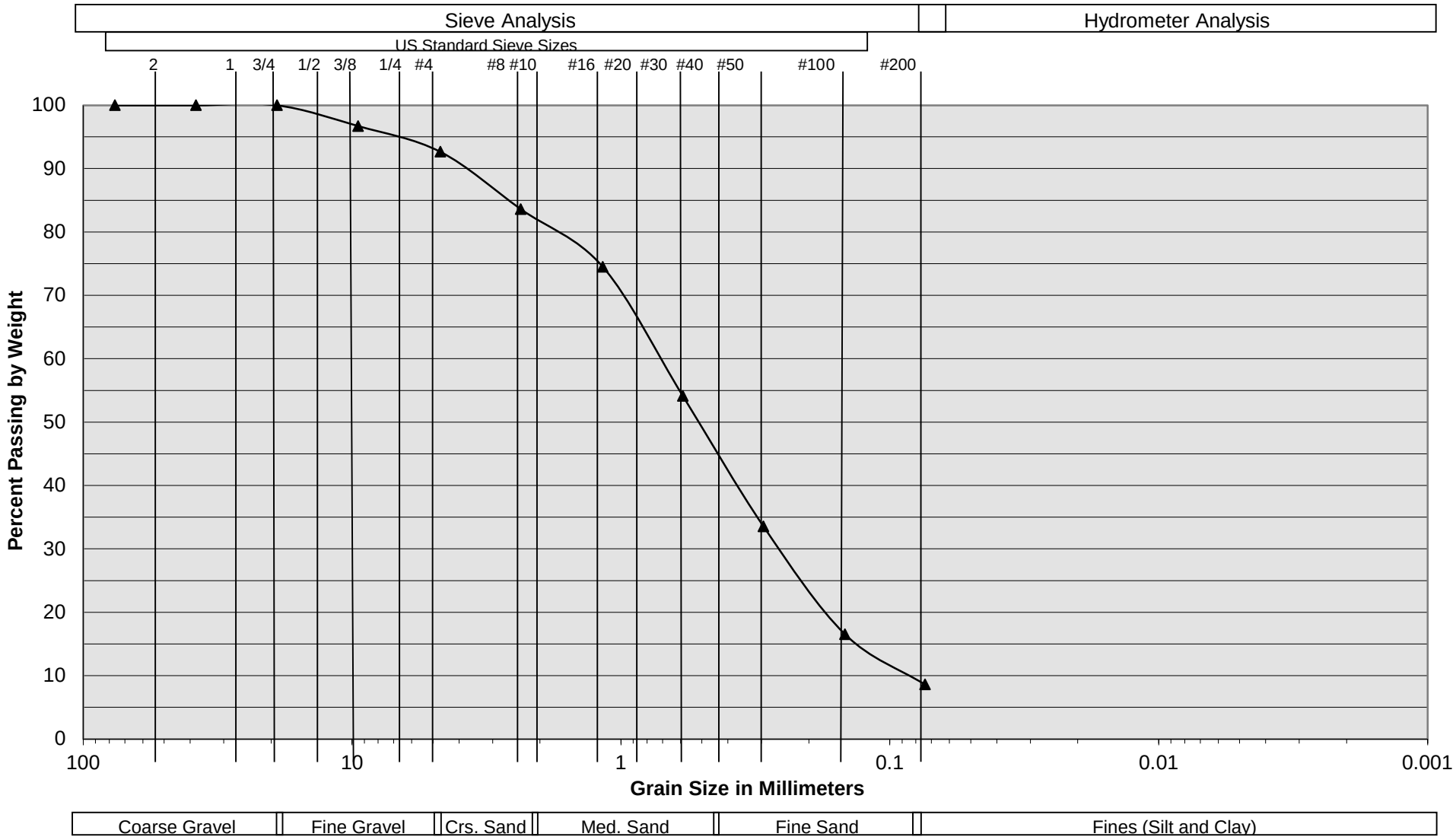


Sample Description	I-12 @ 8½ to 10'
Soil Classification	Brown Silty fine to coarse Sand

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 12

SoCalGeo
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A California Corporation

Grain Size Distribution

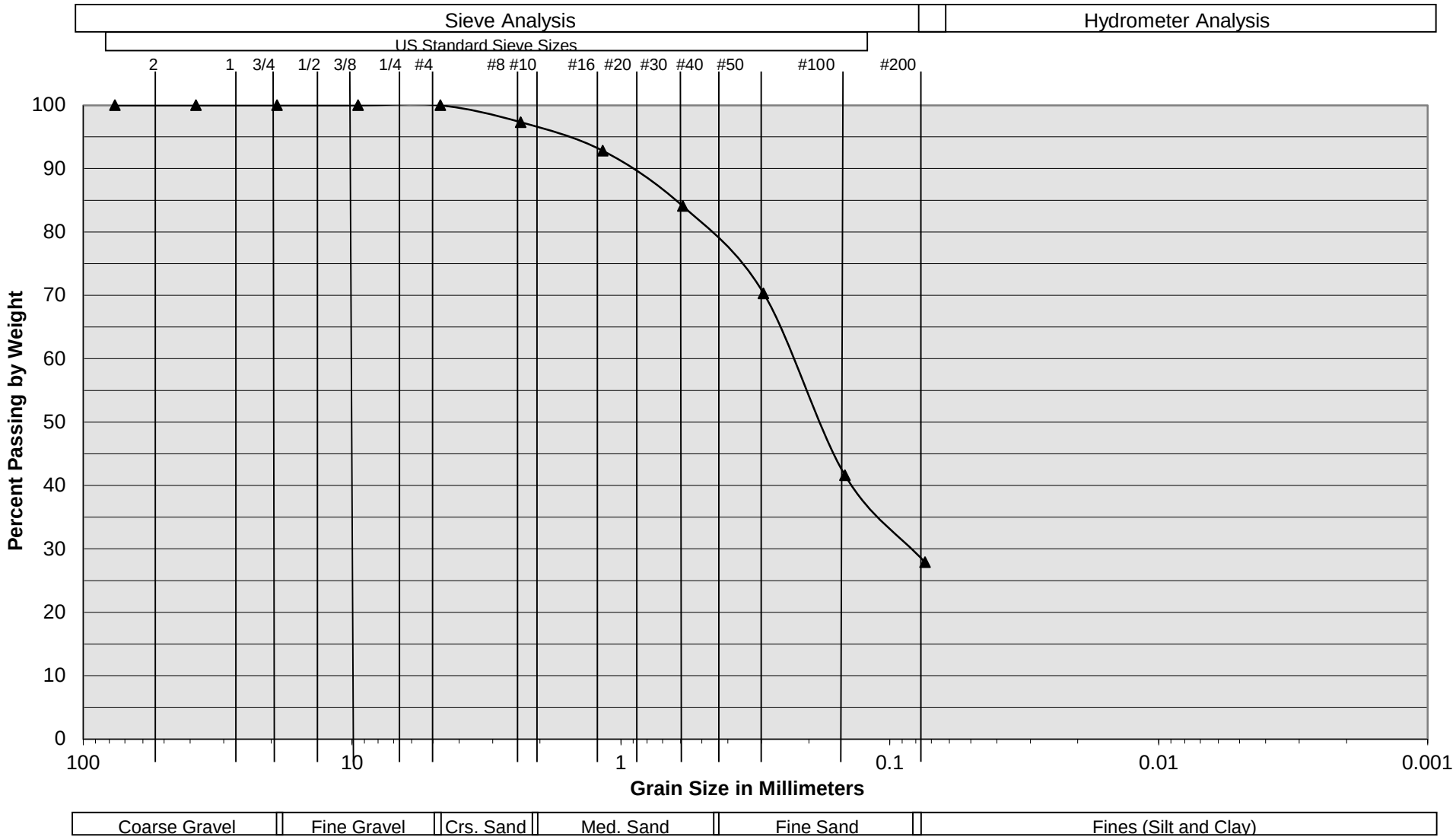


Sample Description	I-13 @ 8½ to 10'
Soil Classification	Brown fine to coarse Sand, trace Silt, trace fine Gravel

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 13

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

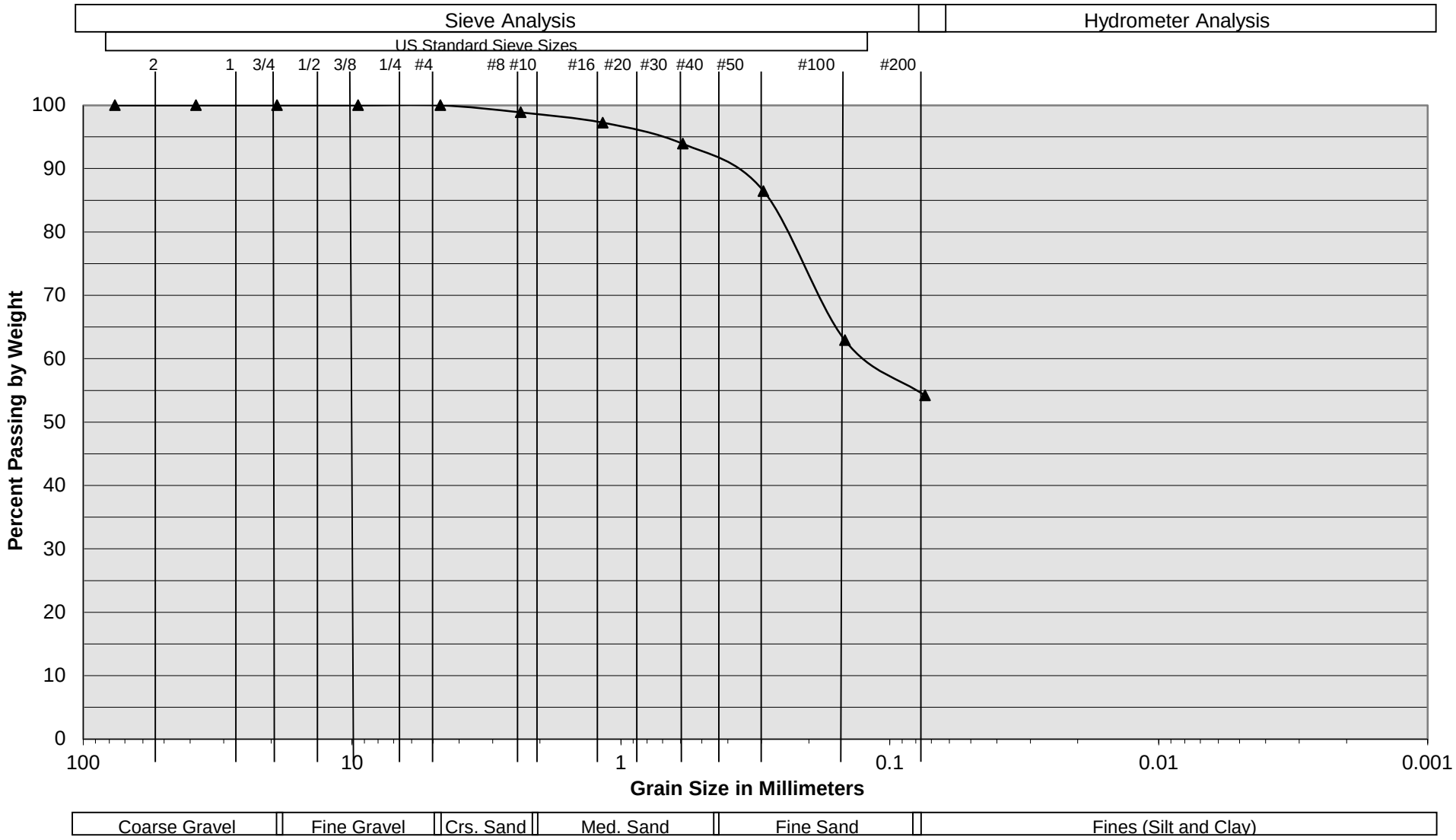


Sample Description	I-14 @ 8½ to 10'
Soil Classification	Brown to Dark Brown Silty fine to medium Sand, trace coarse Sand

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 14

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



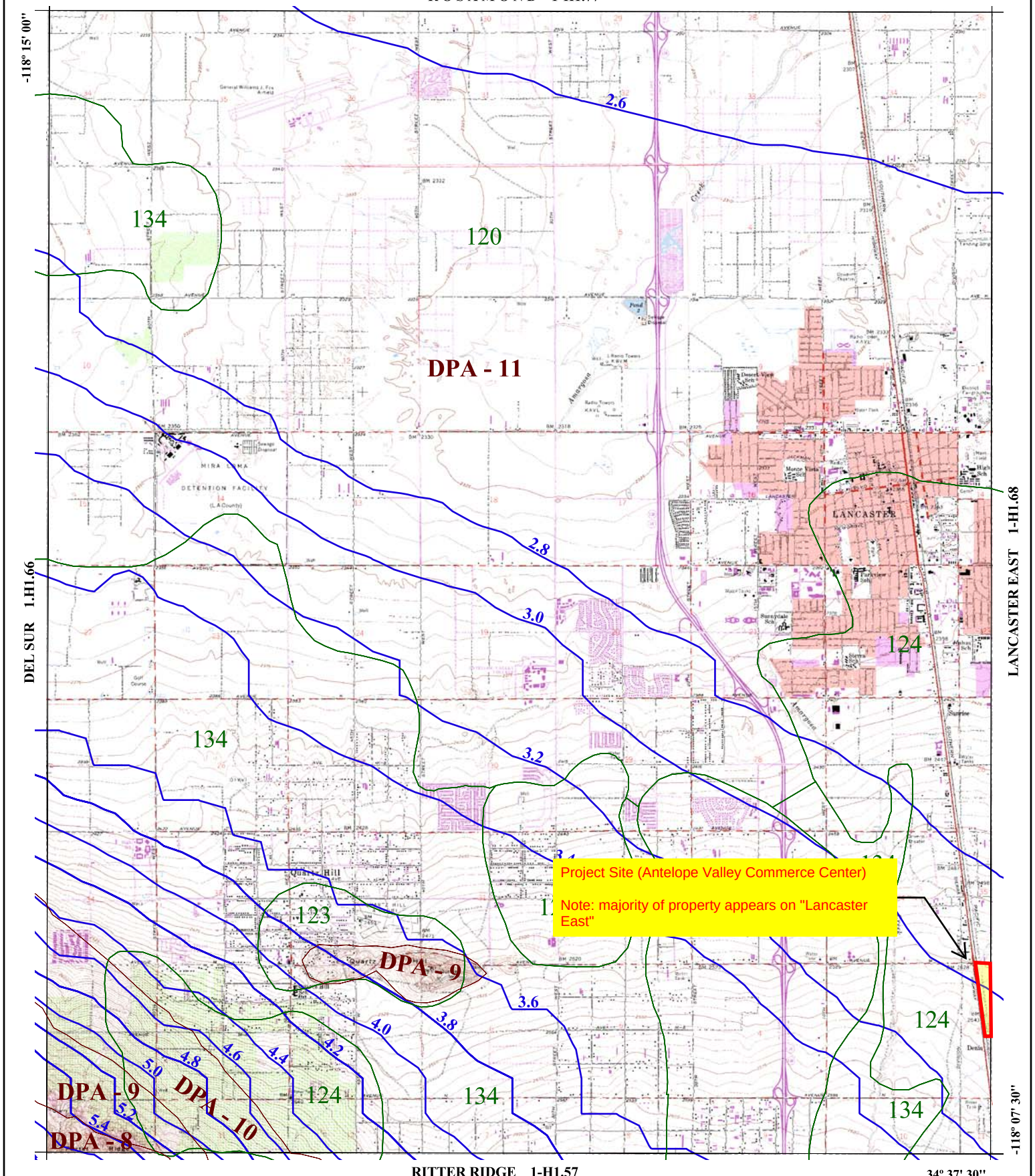
Sample Description	I-15 @ 8½ to 10'
Soil Classification	Brown fine to medium Sandy Silt

Proposed Warehouse: Phase I
Palmdale, California
Project No. 22G143-2
PLATE C- 15

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

EXCERPTS

EXCERPT A: LA COUNTY HYDRAULIC SOILS & RAINFALL DATA MAP



N
W E
S

016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

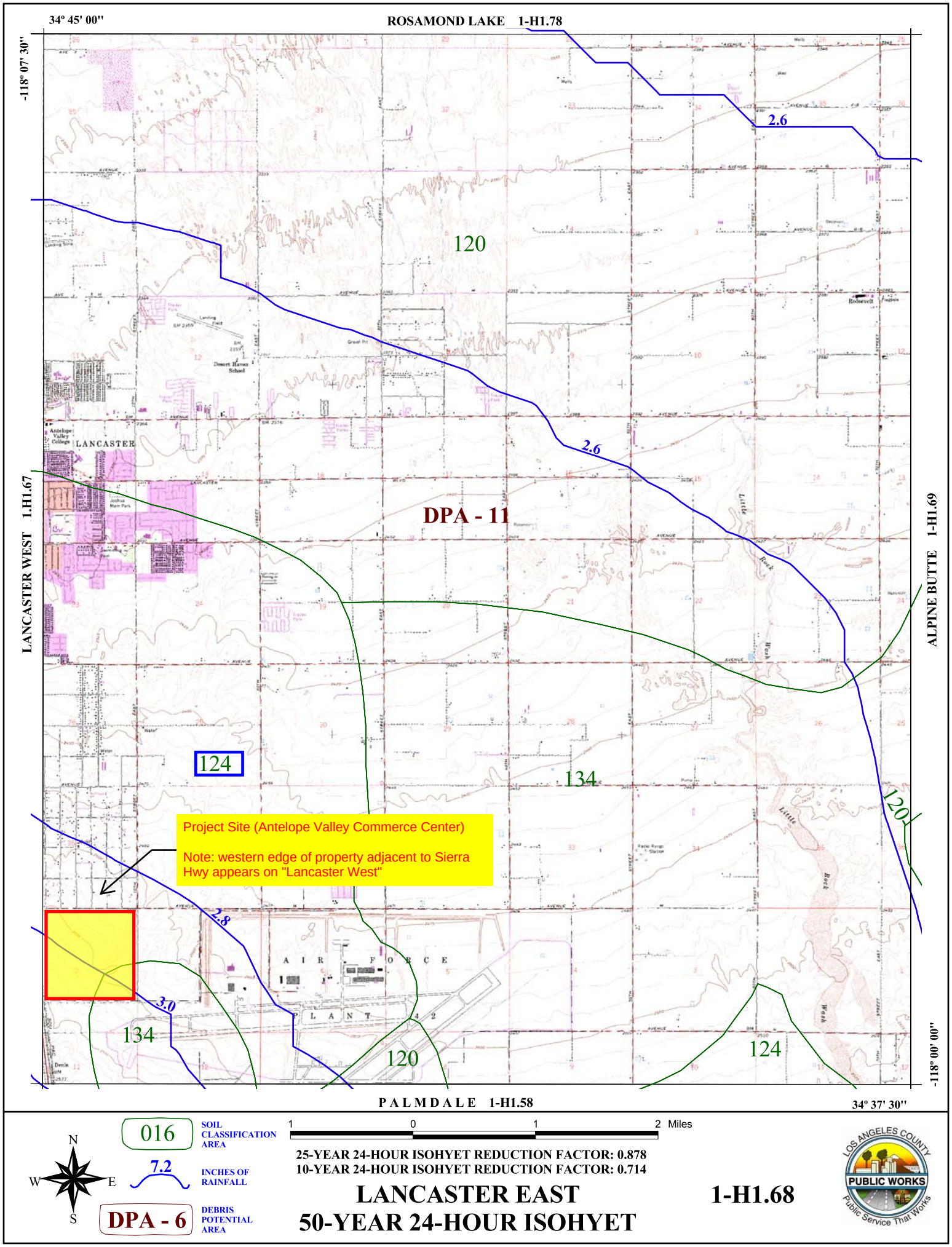
1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

LANCASTER WEST
50-YEAR 24-HOUR ISOHYET

1-H1.67

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

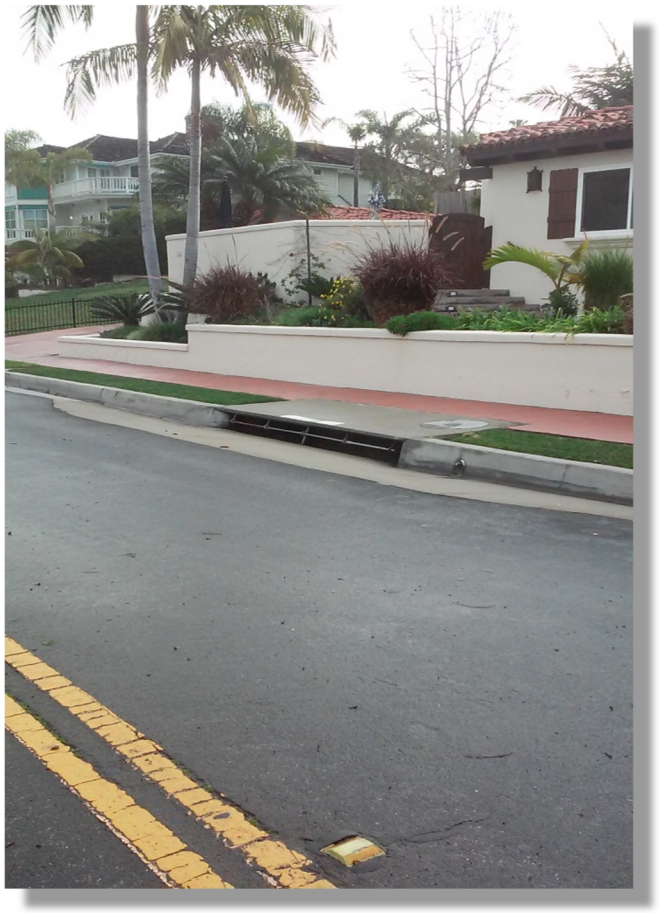

34° 45' 00"
ROSAMOND LAKE 1-H1.78
-118° 07' 30"
LANCASTER WEST 1.H1.67
ALPINE BUTTE 1-H1.69
-118° 00' 00"
PALMDALE 1-H1.58
34° 37' 30"
2.6
120
2.6
DPA - 11
124
134
120
Project Site (Antelope Valley Commerce Center)
Note: western edge of property adjacent to Sierra Hwy appears on "Lancaster West"
2.8
3.0
134
120
124
LANCASTER
A I R F O R C E
P L A N T 4 2
016
SOIL CLASSIFICATION AREA
7.2
INCHES OF RAINFALL
DPA - 6
DEBRIS POTENTIAL AREA
N
W
E
S
1 0 1 2 Miles
25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714
LANCASTER EAST
50-YEAR 24-HOUR ISOHYET
1-H1.68
LOS ANGELES COUNTY
PUBLIC WORKS
Public Service That Works

EXCERPT B: CITY OF LANCASTER MASTER DRAINAGE PLAN MAP



City of Lancaster

Master Plan of Drainage



Prepared
By
Stantec Consulting Services Inc.

May 2019

Stantec Consulting Services Inc.
38 Technology
Irvine, CA 92618
(949) 923-6000

REVISED DECEMBER 3, 2020(b)

CITY OF LANCASTER

MASTER PLAN OF DRAINAGE UPDATE

Revised December 3, 2020(b)

Prepared for:

City of Lancaster
44933 Fern Avenue
Lancaster CA, 93534

Prepared by:

Stantec Consulting Services Inc.
38 Technology Drive
Irvine, CA. 92618

Contact: Roger Chung, P.E.



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APPENDIX C - EXISTING HYDROLOGY

APPENDIX D - SOILS MAP

APPENDIX E - HEC HMS BASIN NETWORK

APPENDIX F - LAD USE MAP

APPENDIX G - CALCULATIONS

EXECUTIVE SUMMARY

The City of Lancaster (City) is located in southern California within Los Angeles County. The City is situated approximately 61 miles north of downtown Los Angeles and approximately 4 miles south of the Kern County line. It is separated from the Los Angeles Basin by the San Gabriel Mountains to the south, and from Bakersfield and the San Joaquin Valley by the Tehachapi Mountains to the west.

The City of Lancaster Master Plan of Drainage Update (MPDU) provides analysis of existing storm drain facilities within the City of Lancaster. Local drainage areas that were situated within the City's boundaries were identified and evaluated. Drainage from the City of Palmdale and unincorporated County of Los Angeles areas are tributary to the local watersheds. These local watersheds generally proceed in the northerly direction via overland flow beyond the City limits to Rosamond Lake.

The goal of the MPDU is to provide recommendations on any flooding issues relating to existing storm drain facilities and propose new facilities to accommodate the anticipated drainage from ultimate condition. To analyze all considered facilities, hydrologic and hydraulic analyses were performed using U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS), and Bentley FlowMaster. These software applications were used to conduct hydrologic and hydraulic modeling. The analyses were based on as-built plans, GIS data obtained from Los Angeles County, GIS data obtained as part of the SR-14 master drainage study conducted in 2016, available topographical maps, field reviews, and the previous version of the City of Lancaster's master plan of drainage.

The Los Angeles County Hydrology Manual was used as the criteria for this MPDU.

The ultimate condition reflects fully developed condition based on the expected land uses as defined in the City of Lancaster General Plan Land Use Map, City of Palmdale General Plan Land Use Map, and Los Angeles County Antelope Valley Land Use Policy. Soil data was based on Soil Survey Geographic Data Base (SSURGO). Flow rates resulting from the hydrologic analyses were used to evaluate the hydraulic capacity of existing drainage facilities and identify adequate and deficient systems. Facility sizes were then developed for proposed facilities intended to address the identified deficiencies. The 25- and 50-year return frequencies were used for local and regional facility evaluations, respectively.

Existing pipe/channel segments were examined to determine their adequacy in carrying the ultimate condition flow rates computed in the MPDU. Bentley Flowmaster was used to compute the capacity of pipes/channels. Pipe/channel segments were identified to be deficient if the computed capacity was shown to be less than the ultimate condition flow rates.

Within the context of the MPDU, these deficiency determinations should be considered preliminary given that normal depth methods were used in the study. The Normal Depth analysis is a basic test of capacity and does not consider pressure flow or momentum in its evaluation. As such, if pipe replacement projects are moved into design, detailed hydraulic analysis of the overall system should be performed as a part of the design process.

Once a pipe deficiency was identified, the construction cost of correcting the deficiency was estimated. The pipe replacement was then prioritized based on the capability to service 10-year and 25-year storm events. Additional areas of concern which are prone to flooding were identified by City of Lancaster staff. These areas were reviewed, and mitigation measures were proposed as part of this MPDU.

Areas located on the extreme west and east sides of the City were determined to be remotely located in relationship to existing drainage infrastructure that could manage and convey runoff from such areas. Within the MPDU, these areas were identified as Natural Floodplain Management Areas. The predominate characteristic of these areas is that natural drainage patterns prevail upstream and downstream of individual parcels of land. Therefore, within these areas, proposed developments shall include floodplain management measures that mitigate the floodplain impacts associated with the development to less-than-significant levels. These measures will typically include the continued acceptance of pre-development flows from upstream areas tributary to the development, the safe conveyance of flow through or around the development without an adverse effect to adjacent properties, and the discharge of flows to downstream areas in a manner consistent with pre-development flow characteristics.

Within Natural Floodplain Management Areas, the City will not take ownership or participate in maintenance of flood management facilities and/or practices implement to mitigate impacts to existing drainage patterns. Areas within a development dedicated to flood mitigation will be encumbered with a drainage and maintenance covenant with the City to ensuring that flood mitigation features will be maintained. The drainage and maintenance covenant agreement will ensure that flood mitigation features remain configured as intended.

Upon the completion of defining the facilities required to manage storm water drainage within the City and unit prices for construction were applied to nominal lengths of the facilities to arrive at a total construction cost per facility reach. Right-of-way costs for open channel facilities were then added to the construction costs in order to account for the acquisition of land required for open channel facilities. Below grade conduits such as reinforced concrete pipes and reinforced concrete boxes were assumed to be located within existing public right-of-way. The total construction cost plus right-of-way was then increased for engineering and City administration costs. The Total Cost for the facility reach was then determined by adding a contingency to the total of the above-stated components. The total cost of MPDU facilities was determined to be $697,281,099.

The proposed drainage impact fee schedule was then calculated by taking the Total Cost for all MPDU facilities and dividing that number by the gross undeveloped acreage in the City. The undeveloped acreage was estimated to be 37,949 acres. This total undeveloped acreage includes the area within the Natural Floodplain Management Areas. Land in those areas will benefit from the MPDU facilities. The resulting cost per acre was the drainage impact fee for residential developments within the residential zoned land. Commercial and industrial drainage impact fees were determined by taking the cost per gross acre and dividing by 43,560 square feet per gross acre to obtain the cost per square foot.

Table E-1 below presents the results of the Fee Schedule as developed for the Master Plan of Drainage Update.

Table E-1
Drainage Impact Fee Schedule

Cost per Acre within Residential Zone	Cost per square foot of gross area of any other development within Commercial, Industrial Zone or any zone not indicated
$18,374	**$0.42**

Implementation of the MPDU will occur through the ministerial approval process in place at the City. Conditions of Approval will be issued that require certain commitments by the developer with respect to MPDU implementation.

Where a frontage(s) of a prosed development interface with a MDPU facility, the developer will typically be conditioned to construct that portion of the MDPU including the dedication of right-of-way required for the facility(s). Other drainage facilities not included in the MDPU may be necessary to convey storm water through the development; these facilities will be the developer's sole responsibility.

Additionally, drainage from a development needs to be properly conveyed downstream to a suitable receiving facility. The receiving facility must have the capacity to convey the flow from the development in a manner deemed satisfactory to the City. If these off-site facilities required of the development are facilities identified in the MDPU, then they may be subject to Drainage Impact Fee credit. Should these facilities not serve the needs of the MDPU, they will be developer's sole responsibility.

Developers that construct PDF may receive a credit against their Drainage Impact Fee. The value of the credit will be limited to the amount of the total fee due for the development. If the cost of the MDPU facilities exceed the total fee due, a fee credit certificate will be issued, which can be used to offset the Drainage Impact Fee associated with a subsequent development.

All developers are required to annex into the Lancaster Drainage Benefit Assessment District to provide for maintenance of facilities whether such facilities are part of the planned facilities or onsite, development-specific drainage facilities. Annexation is required whether drainage facilities are constructed or not. The developer will pay the fees necessary to annex into the district including the first year assessment.

MDPU facilities constructed by the City will be accepted into the Lancaster Drainage Benefit Assessment District for operation and maintenance purposes.

1. INTRODUCTION

The City of Lancaster (City) has retained Stantec Consulting Service, Inc. to provide comprehensive professional engineering services to prepare a Master Plan of Drainage Update for the City. The MPDU will serve as a resource for City officials to develop guidance for future development projects throughout the City and will provide updated recommendations for the assessment of Drainage Impact Fees for forthcoming developments within the City. The MPDU will also serve to identify potential projects and their associated budgets that will improve drainage conditions at specific locations within the City boundaries.

1.1. Location

The MPDU provides analysis of existing storm drain facilities located within the City of Lancaster, California. Lancaster, approximately 60,572 acres in size, is located in Los Angeles County. The City is generally bounded in the north, east and west by unincorporated Los Angeles County territory and by Palmdale to the south. See Figure 1-1 for a Regional Location Map.

1.2. Background

The original citywide MPDU was prepared by Willdan Associates in August 1981. In 1985, the City adopted the Antelope Valley Master Plan of Drainage (for the City of Lancaster portion) prepared by the County of Los Angeles. In 1987 the County revised the plan to increase the size of many of the drainage facilities as a result of the majority of the retention and detention basins being removed from the plan. An updated Master Plan Drainage Facilities supplement along with a revised drainage fee schedule was prepared in October 1992. A subsequent update to the Master Plan of Drainage was prepared in 2005 to address the reduction in drainage flow conveyed to the City of Lancaster from the City of Palmdale due to the construction of drainage facilities in Palmdale. This report also reflects drainage facilities constructed by private developments that differ from the Master Plan or Drainage and the conversion of open channels to closed conduits.

1.3. Purpose of Report

This report presents the analyses and results of a comprehensive study of the watersheds that affect the City of Lancaster.

The report will present the results of watershed delineations that will identify the existing storm drain systems that are deficient, propose new pipe sizes to accommodate the computed ultimate condition flows based on the City's Land Use Map and proposed new drainage facilities.

2. HYDROLOGIC ANALYSIS

The hydrologic analysis for this Master Plan of Drainage Update is comprised of numerous parts including data collection and review, software selection, watershed development and hydrologic modeling, and results analysis.

2.1. Data Collection and Review

Several sources of data were used co compile information about the project area. The sources and information gathered include:

- Los Angeles County LARIAC Data
  - Topographic information, 2-ft contours for portions of the study area
- Los Angeles County Department of Public Works (LACDPW)
  - Rainfall depth distributions for the 10-, 25-, and 50-year storm events
  - Rainfall design storm distribution curve
  - Land use data for Los Angeles County (LAC)
  - Soil data for the Antelope Valley
- City of Lancaster
  - Existing land use data for the City
  - Street centerlines
  - Existing storm drain pipes and channels: locations and construction plans
  - Previous Master Plans of Drainage reports and exhibits
- Soil Survey Geographic Data Base (SSURGO)
  - Soil data
- USGS Quad Maps
  - Additional topographic information for areas outside LARIAC boundaries
- Federal Emergency Management Agency (FEMA)
  - Flood Insurance Study for Los Angeles County

2.2. Software Selection

The hydrology analysis was completed using U.S. Army Corp of Engineers (USACE) Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS). Additionally, ArcGIS was used for geographical calculations and mapping.

WMS, developed by Aquaveo is specified in the Los Angeles County Hydrology Manual as approved software which is fully capable of implementing the MODRAT method for hydrologic modeling. MODRAT (Modified Rational Method) is an LAC specific model for determining peak runoff flow rates and

volumes from a hydrologic network. However, WMS with MODRAT is limited to watersheds less than 999 acres, and times of concentration of 5-30 minutes (TC values grater than this limit are reduced to 30 minutes). Due to the nature of this project area, many of the watersheds do not need the limitations and cannot be modeled with this program. Moreover, limiting times of concentration to 30 minutes does not realistically portray the runoff conditions, and subdividing watersheds into areas that would meet this time limit tends to result in overly conservative values. For these reasons, the hydrologic network was modeled using HEC-HMS.

Developed and maintained by the USACE, HEC-HMS is a widely accepted model for hydrologic analysis which can incorporate a variety of calculation methods and routing options. HEC-HMS features a completely integrated work environment including a database, data entry utilities, computation engine and result reporting tools. The components of HEC-HMS include a basin model, meteorological model, and control specifications. This modeling software has no constructions on watershed size or time of concentration.

2.3. Watershed Development and Hydrologic Modeling

In order to estimate flow rates, five main steps were followed:

1. Watershed delineation for drainage areas within the City of Lancaster and within City of Palmdale and County of Los Angeles tributary to the City of Lancaster drainage.

2. Determination of the longest path of travel for each watershed (lag line) and the path of travel between connecting watersheds (reach).

3. Estimation of necessary model parameters for each watershed using collected data including:

    a. Basin area
    b. Rainfall depth
    c. Percent imperviousness
    d. Average curve number based on soil type and land use
    e. Lag line and reach geometry
    f. Time of concentration for each watershed and watershed connection

4. Development and execution of HEC-HMS models.

5. Verification, comparison, and reporting of modeling results.

2.3.1. Watershed Delineation

Watersheds were delineated for the drainage areas within the City of Lancaster and Unincorporated County of Los Angeles by assessing topographic information. Watersheds were delineated for the drainage areas within the City of Palmdale by referencing the City of Palmdale

Master Plan of Drainage Update dated August 1996 and assessing topographic information. These watersheds were subdivided at points where two or more points of concentration coincided.

2.3.2. Lag Lines and Reaches

Lag lines represent path of travel from the most hydrologic remote part of a watershed to the watershed outlet or concentration point. Reaches represent the path between concentration points of hydrologically connected watersheds. Both of these paths were determined by analyzing topographic information.

2.3.3. Model Parameters

As outlined in Section 2.2, several data sources were utilized for the collection of data necessary for the model. Data includes topographic information, land use, soil type, and rainfall distributions. GIS was used to perform geographical calculations, such as calculating an area weighted average, to determine the model parameters.

2.3.3.1. Watershed Areas

The delineated watershed boundaries were digitized and used to determine the area for each watershed.

2.3.3.2. Rainfall Depth

The precipitation depth for a given storm can vary widely from one area to another due to the unique topography and climate of the Antelope Valley, in particular the surrounding mountain ranges and high desert climate. LACDPW has developed rainfall depth distribution and 50-year, 24-hour isohyetal mapping for the entirety of Los Angeles County. This information was used to determine the average rainfall depth for each watershed for the 50-year storm event. The 10-year and 25-year storm event precipitation depths were extrapolated from the 50-year event utilizing rainfall frequency multiplication factors also developed by LACDPW, as noted in the Los Angeles County Hydrology Manual.

2.3.3.3. Percent Imperviousness

An area-weighted average percent impervious value was determined for each watershed utilizing land use data collected from the City of Lancaster, City of Palmdale and the County of Los Angeles and referencing Appendix D of the Los Angeles County Hydrology Manual.

In order to estimate the percent impervious for each watershed, the land use data was manipulated to group similar uses together and to clarify uses in order to assign a percent impervious to each area. Some land use clarifications included separating “Government” land uses into uses such as “Channel”, “Public Park” or “Government Building” as needed. Areas which had no land use assigned were given a land use based on visual inspection via Google Earth. Residential areas were classified into different densities (e.g. Low, Medium, High) based on the current zoning maps. Residential zones which are currently undeveloped were classified as “Vacant”.

Following this reclassification, each land use type was matched with a land use category and percent impervious as listed in Appendix D of the Los Angeles County Hydrology Manual. From here the area-weighted average percent impervious was estimated for each watershed.

2.3.3.4. Average Curve Number

An average curve number value was developed for each watershed basin within the study area. A curve number is a numerical value that is used to determine the expected runoff from an area. These values were developed using the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Curve Number Method as outlined in NRCS Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds. The curve numbers were assigned based on land use and the Hydrologic Soil Group (HSG) of the underlying soil within the watershed. Soils are classified as having a HSG of “A”, “B”, “C”, or “D” which corresponds to the particular soil’s ability to infiltrate runoff.

The land use categories as previously determined were each assigned a corresponding curve number for each possible HSG. This assignment was made by relating each land use category to one of the options outlined in TR-55 based on description and percent imperviousness.

Using GIS, the curve numbers were assigned to each unique land use and soil type combination. This information was then used to determine an area weighted average curve number for each watershed.

2.3.3.5. Lag Line and Reach Geometry

The developed lag times and reaches were digitized and used to determine the overall length and average slope of

each path. Additionally, the primary type of pathway (e.g. channel, piped, overland) was determined for each reach.

2.3.3.6. Time of Concentration

Time of concentration (Tc) represents the time required for a drop of water that falls on the most hydrologically remote portion of a watershed to reach the watershed outlet or concentration point. There are multitude of methods for calculating Tc. For this project, the method outlined in the NRCS TR-55 method and the U.S. Bureau of Reclamation Method (USBR Lag) method were used for the HEC-HMS modeling.

The LAC Hydrology Manual method uses the watershed size, soil type, percent impervious, rainfall depth, lag line length, and lag line slope in iteration to determine the Tc. However, this calculation is only valid for a Tc between 5 and 30 minutes. Due to limitations of the LAC method for determining Tc, the NRCS TR-55 and USBR Lag methods were utilized for modeling with HEC-HMS. The NRCS TR-55 method estimates runoff through the watershed using the concepts of sheet flow, shallow concentrated flow, open channel flow, or a combination of these. This method is applicable for watersheds less than one square mile in area. For watersheds greater than one square mile and/or with average basin slopes greater than 10%, the USBR Lag method was used. The USBR Lag method utilizes basin geometry, slope and roughness to estimate runoff travel times.

2.3.4. HEC-HMS Modeling

The HEC-HMS basin model is comprised of ten hydrologic trees. The main hydrologic tree connects the watersheds and reaches from west and central Lancaster to a single outlet at Pond 2 near Avenue G. The remaining nine hydrologic trees drain northerly or easterly and outlet at the north City boundary. Within the HEC-HMS model; time of concentration values were not truncated as the software was designed without limits on basin size or time of concentration length.

Within the tributary areas HEC-HMS modeling was performed without accounting for basin detention. Basin performance is unknown and assumed to operate on small storms. However, the facilities affected by this assumption are relatively few.

After verifying that all parameters were inputted, basin models were computed for 10-year, 25-year, and 50-year storm event scenarios. Supporting data to complete the modeling is included within the appendix for reference.

2.4. Hydrologic Modeling Results

Following the computation of the basins modeling for each of the 10-year, 25-year and 50-year storm event scenarios; the results were compiled and tabulated for verification, comparison and reporting measures. All of the results for each of the storm event scenarios for HEC-HMS modeling are located within the appendix for reference and review.

2.4.1. HEC-HMS Results

Table 1 HEC-HMS Discharges, below, outlines and compares modeling results between existing and ultimate conditions. The existing condition takes into consideration land use at the time this report is prepared. The proposed condition takes into consideration the fully developed land use based on the general plan from the City of Lancaster, City of Palmdale and the County of Los Angeles.

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
A0	225	325.6	411.9	339.2	453.8	549.1
A1	37	56.8	70.8	48.2	68.5	82.8
A1-2	37	56.8	70.8	48.1	68.4	82.6
A10	105	150.7	181.2	104.8	150.7	181.2
A10-11	113	151.7	188.3	112.5	151.7	188.3
A10/11	291	420.8	537.7	291.3	420.8	537.7
A11	271	387.7	490.4	271.3	387.7	490.4
A11-12	290	419.8	535.6	290.2	419.8	535.6
A11/14	448	646.4	818.5	448.0	646.4	818.5
A12	89	122.8	151.6	88.9	122.8	151.6
A13	86	112.3	128.5	85.7	112.3	128.5
A14	191	250.8	300.0	190.8	250.8	300.0
A14-15	447	646.0	817.1	447.4	646.0	817.1
A15	275	350.2	395.2	275.3	350.2	395.2
A15-19	6376	9339.3	11569.5	7252.6	10221.8	12465.1
A16	3146	4223.5	5015.3	3261.6	4336.8	5125.2
A16-17	3143	4220.1	5010.7	3259.1	4333.0	5120.8
A16/17	3223	4341.2	5168.7	3353.8	4470.3	5295.4
A17	148	219.8	283.0	182.4	255.7	319.6
A17-18	3210	4325.4	5149.9	3341.5	4454.3	5277.5
A17/18	3245	4396.5	5256.2	3368.9	4509.5	5357.5
A18	162	275.7	375.8	147.5	209.8	278.9
A18-19	3236	4384.2	5240.9	3359.4	4496.7	5343.1
A18/19	6906	10381.3	13036.7	7976.7	11417.9	14060.0
A19	196	279.0	329.9	263.3	343.8	392.9

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
A19-20	6902	10374.6	13030.7	7971.1	11411.3	14054.7
A19/20	6980	10485.9	13175.2	8086.3	11568.9	14244.7
A1/2	99	142.4	177.3	132.6	178.9	215.0
A2	75	105.0	129.8	100.5	132.1	157.9
A2-3	97	140.4	175.8	130.4	176.1	212.8
A20	332	457.3	560.2	529.6	656.0	757.2
A21	585	880.6	1134.5	761.3	1068.6	1328.4
A21/22	671	1023.3	1314.1	948.9	1318.1	1616.9
A22	87	144.0	181.1	192.3	254.9	293.9
A22-23	671	1023.1	1313.8	948.7	1318.0	1616.6
A22/23	699	1061.1	1359.9	992.7	1372.6	1679.1
A23	77	103.0	123.0	121.8	147.5	166.8
A23-POND2	7660	11504.7	14467.2	9067.1	12902.5	15868.2
A2/3	5944	8690.9	10718.7	6797.8	9531.3	11593.2
A3	136	188.1	230.2	164.4	214.5	255.2
A3-9	5937	8680.6	10702.7	6787.7	9519.8	11582.2
A4	155	223.6	272.0	154.9	223.6	272.0
A4-5	154	222.7	270.7	154.1	222.7	270.7
A5	41	54.4	65.5	41.0	54.4	65.5
A5/6	250	370.2	456.6	243.4	357.0	439.7
A6	112	165.1	202.7	103.8	150.5	183.8
A6-8	250	369.6	456.2	242.9	356.5	439.0
A6/8	374	541.2	666.9	386.0	548.1	672.1
A7	155	199.6	235.7	155.0	199.6	235.7
A8	101	137.9	168.9	121.6	160.7	193.2
A8-9	374	540.4	666.2	385.3	547.4	671.2
A8/9	6182	9052.2	11161.5	7055.4	9910.9	12059.2
A9	126	166.1	190.5	125.8	166.1	190.5
A9-15	6182	9045.0	11159.7	7053.7	9901.5	12046.7
A9/15	6477	9489.7	11731.7	7360.5	10360.4	12641.7
B0	1855	2533.2	3053.4	2037.9	2715.5	3234.0
B1	433	556.7	658.1	441.9	565.4	666.2
B1-B2	405	558.9	675.7	439.4	542.9	664.1
B10	25	33.2	39.3	25.5	34.2	40.3
B10-11	24	33.0	38.9	25.4	34.0	39.9
B10/11	52	72.7	88.6	63.3	84.1	99.9
B11	31	44.0	54.3	42.2	55.1	65.3
B11-12	51	72.3	88.2	62.8	83.3	99.0
B11/12	86	121.1	149.9	108.7	143.2	171.5
B12	39	54.2	67.7	50.4	64.8	77.8
B12-15	139	201.2	259.3	231.9	306.7	373.0

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
B12/15	464	640.9	800.2	528.9	701.2	859.9
B13	126	180.4	232.4	217.9	284.9	345.7
B13-14	125	179.1	230.3	215.8	283.0	343.5
B13/14	135	192.9	249.6	227.3	298.6	362.8
B14	30	40.5	50.2	29.8	40.5	50.2
B14-15	134	192.5	248.8	226.2	297.6	360.9
B14/15	140	201.5	260.8	233.7	307.7	373.3
B15	35	47.3	56.5	35.0	47.3	56.5
B15-21	464	637.7	798.3	527.2	700.6	856.7
B16	160	212.6	249.4	166.1	218.3	254.9
B16-17	158	210.9	246.6	164.4	216.5	251.9
B17	63	87.2	104.1	58.3	80.5	96.0
B17/19	304	422.1	504.4	306.2	421.6	502.2
B18	28	36.8	43.2	29.3	38.1	44.3
B19	153	209.1	247.8	152.9	209.1	247.8
B19-20	303	420.9	503.1	305.3	420.4	500.9
B19/20	357	493.2	592.6	386.5	522.2	621.7
B2	1343	1852.9	2216.0	1411.8	1921.2	2282.6
B20	62	83.6	102.8	89.4	112.9	133.5
B20-21	355	489.3	587.2	379.8	513.8	611.6
B20/21	744	1027.7	1262.7	820.1	1098.1	1333.6
B21	76	102.4	122.3	75.8	102.4	122.3
B21-33	742	1019.7	1259.3	815.7	1097.0	1327.6
B22	128	172.5	203.5	107.9	149.2	179.0
B22-23	128	171.5	203.0	107.6	148.8	178.0
B22/23	213	291.0	347.9	199.0	273.3	328.4
B23	113	150.8	179.7	122.8	159.6	187.7
B24	63	89.6	107.6	75.7	104.7	123.7
B24-27	225	306.1	366.2	271.5	350.7	408.7
B24/28	494	681.9	821.8	563.8	751.0	891.0
B25	79	106.2	125.2	82.9	109.7	128.5
B25-26	79	105.6	124.3	82.9	109.0	127.8
B26	47	66.3	79.4	58.2	76.7	89.2
B26/27	227	307.8	367.5	271.8	351.0	409.1
B27	121	158.8	188.7	153.4	190.5	219.3
B28	33	47.5	61.5	56.7	75.1	91.5
B28-31	493	679.8	822.8	562.1	748.0	886.8
B29	30	43.2	54.6	47.3	60.5	71.8
B29-30	68	94.7	118.0	68.3	94.7	118.0
B29/30	98	137.5	171.9	115.6	154.8	189.1
B2/3	2259	3113.7	3735.3	2382.9	3236.6	3855.0

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
B3	939	1276.4	1515.6	990.4	1326.5	1564.4
B3-4	2222	3067.7	3680.3	2344.8	3188.1	3797.9
B30	69	95.9	119.4	69.3	95.9	119.4
B30-31	98	136.9	171.5	115.0	154.3	188.6
B31	124	166.3	203.7	152.8	197.4	235.8
B31-32	20	29.7	36.3	24.9	33.8	40.1
B31/32	683	951.5	1162.1	804.4	1070.8	1278.6
B32	20	29.8	36.5	25.1	34.1	40.4
B32-33	680	948.3	1159.3	802.8	1070.2	1278.5
B32/33	1422	1977.0	2435.8	1593.6	2178.1	2622.8
B33	21	32.5	42.8	27.5	37.8	47.1
B33-34	1420	1970.3	2430.3	1592.7	2171.1	2618.4
B33/34	1433	1994.4	2460.1	1613.6	2205.3	2658.9
B34	31	46.1	57.1	48.7	66.4	78.8
B34-POND1	1421	1991.9	2437.2	1603.8	2191.8	2641.2
B35	57	76.5	89.4	57.4	76.5	89.4
B3/4	2488	3483.9	4212.6	2646.4	3646.2	4375.6
B4	560	814.8	992.2	643.1	900.6	1078.9
B5	326	440.3	543.0	297.7	399.3	492.5
B5-15	325	439.7	542.4	297.2	398.8	491.9
B5/12	326	440.3	543.0	297.7	399.3	492.5
B7	319	421.3	493.0	336.8	438.0	509.0
B7-8	315	417.3	488.9	332.8	433.9	504.8
B7/8	346	461.5	543.4	374.2	488.2	569.4
B8	31	44.2	54.5	41.4	54.3	64.6
B8-12	347	458.0	537.7	373.8	484.6	562.4
B9	46	62.4	75.0	46.2	62.4	75.0
B9-12	0	0.0	0.0	0.0	0.0	0.0
B9/12	460	623.4	744.5	511.2	672.6	792.1
C1	53	77.5	94.5	61.6	84.8	101.0
D1	426	549.7	646.0	436.2	559.7	655.5
D1-2	425	549.4	645.8	435.9	559.5	655.4
D10	113	147.7	174.7	112.6	147.7	174.7
D11	39	50.5	57.8	40.6	51.5	58.8
D11-12	39	50.2	57.5	40.4	51.2	58.4
D11/12	64	82.7	96.0	65.0	83.7	97.0
D12	25	32.8	38.9	25.0	32.8	38.9
D12-13	63	80.4	93.6	63.5	81.5	94.5
D12/13	82	106.7	124.8	83.1	107.9	126.0
D13	20	26.3	31.2	20.0	26.5	31.4
D14	105	137.2	161.5	130.5	146.8	170.8

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
D14-15	105	136.5	160.5	129.8	145.9	169.9
D14/15	128	168.2	197.8	153.3	177.8	207.2
D15	28	37.4	43.8	27.6	37.4	43.8
D16	86	113.4	134.2	112.5	139.4	159.6
D17	578	759.4	920.3	661.9	846.5	1008.9
D17-18	942	1232.7	1474.6	1071.8	1351.6	1592.4
D17/18	1508	2005.2	2409.2	1667.3	2151.6	2554.6
D18	182	258.5	325.9	205.6	283.3	351.1
D18-19	1495	1995.6	2401.3	1655.8	2142.9	2548.0
D18/21	1851	2512.2	3053.5	2012.4	2660.7	3202.9
D19	28	38.8	48.3	28.0	38.8	48.3
D1/2	441	571.0	673.1	453.9	583.2	684.6
D2	48	63.0	76.6	52.7	67.4	80.5
D2-3	441	570.9	672.3	453.8	582.7	683.3
D20	40	57.1	72.4	39.8	57.1	72.4
D21	17	25.0	31.9	18.5	26.3	33.1
D21-D22	1820	2507.1	3043.1	1988.2	2641.7	3192.0
D22	117	184.4	235.5	209.4	295.0	356.2
D2/3	485	639.6	759.9	500.0	653.5	772.9
D3	82	117.0	140.4	81.7	117.0	140.4
D3-4	484	639.3	758.2	499.1	653.0	770.9
D3/4	484	639.3	758.2	499.1	653.0	770.9
D4	26	36.4	44.7	25.5	36.4	44.7
D4-8	301	442.6	544.4	301.4	442.6	544.4
D4/8	326	477.8	587.7	326.0	477.8	587.7
D5	19	23.7	28.2	18.7	23.7	28.2
D5-6	19	23.7	28.1	18.6	23.7	28.1
D5/6	92	120.5	140.6	92.4	120.5	140.6
D6	74	96.8	112.4	73.7	96.8	112.4
D6-7	92	120.2	140.2	92.1	120.2	140.2
D6/7	174	236.5	284.1	174.0	236.5	284.1
D7	82	116.3	143.9	81.9	116.3	143.9
D7-8	173	235.5	283.1	173.2	235.5	283.1
D7/8	303	444.8	546.8	303.3	444.8	546.8
D8	130	209.3	263.7	130.1	209.3	263.7
D8/17	943	1236.9	1479.4	1074.5	1355.2	1598.2
D9	36	45.5	52.1	35.8	45.8	52.4
D9-10	35	44.8	51.5	35.6	45.1	51.6
D9/10	147	192.2	225.7	147.5	192.5	226.0
E1	110	171.3	218.1	110.4	171.3	218.1
E1-2	110	171.1	217.6	110.3	171.1	217.6

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
E1/2	119	184.6	234.9	119.4	184.6	234.9
E2	32	44.8	53.7	32.2	44.8	53.7
E2-3	119	184.4	234.4	119.3	184.4	234.4
E3	184	235.1	276.9	183.5	235.1	276.9
E3/4	262	343.2	415.7	269.6	351.1	423.5
E4	11	17.5	23.2	19.2	25.8	31.4
F1	76	103.6	124.0	76.1	103.6	124.0
F1-2	76	103.1	123.5	75.9	103.1	123.5
F1/2	244	377.7	478.9	273.9	411.3	514.5
F2	230	356.0	450.5	259.7	389.6	486.1
F2-3	244	377.6	478.8	273.7	411.2	514.2
F3	24	31.9	39.0	37.5	47.4	55.4
F3-5	146	202.1	249.5	271.7	345.8	401.3
F3/5	430	640.7	806.8	575.8	800.7	979.6
F4	54	82.5	102.9	118.2	152.5	175.6
F4-5	54	82.4	102.7	117.9	152.0	174.8
F4/5	147	205.6	253.4	275.3	348.6	404.9
F5	127	170.1	206.7	212.8	265.8	308.2
F5-6	430	637.0	802.2	574.5	799.8	977.5
F5/6	439	649.3	816.3	587.3	815.8	995.5
F6	35	46.3	53.4	46.9	58.9	66.1
F6-7	437	643.8	814.2	583.5	809.8	989.2
F6/7	453	667.8	841.7	605.7	843.1	1026.6
F7	94	123.2	141.3	115.8	145.7	163.6
F7-POND2	449	664.2	838.4	603.2	840.3	1023.6
F8	84	128.7	168.2	84.1	128.7	168.2
G0	6238	8197.9	9624.5	6464.2	8411.4	9830.3
G0-1	6237	8196.8	9623.3	6462.7	8410.8	9827.4
G0/1	7043	9273.4	10918.2	7228.9	9439.4	11071.6
G1	2333	3042.7	3610.3	2192.1	2877.7	3432.8
G1-2	7041	9271.4	10918.0	7226.9	9437.1	11070.5
G10	43	54.3	61.4	42.5	54.3	61.4
G11	74	92.4	103.5	73.9	92.4	103.5
G12	25	31.2	34.9	24.9	31.2	34.9
G12-13	7271	9584.6	11297.2	7544.2	9843.5	11545.9
G12/13	7273	9587.2	11300.1	7546.3	9846.1	11548.8
G13	20	27.9	32.5	20.4	27.9	32.5
G13-14	7273	9585.4	11299.6	7544.4	9844.8	11548.7
G13/14	7281	9596.4	11312.5	7552.5	9855.7	11561.6
G14	57	73.0	82.6	57.0	73.0	82.6
G14-15	7279	9595.7	11309.9	7552.3	9854.5	11559.2

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
G15	6	8.2	9.7	6.8	9.2	10.7
G15/16	7295	9617.7	11336.8	7567.8	9876.5	11586.6
G16	97	128.4	147.5	97.1	128.4	147.5
G17	19	27.0	31.7	24.9	32.7	37.5
G17-20	7294	9615.3	11336.4	7566.4	9875.0	11585.4
G17/20	7329	9664.6	11394.6	7602.0	9925.5	11644.7
G18	69	88.3	99.9	71.2	90.3	101.9
G18-19	69	88.2	99.7	70.9	90.1	101.7
G18-20	145	185.4	209.9	148.7	189.1	213.8
G18/19	146	185.9	210.3	149.2	189.7	214.1
G19	82	104.3	118.0	83.6	106.2	119.8
G1/2	7127	9389.5	11063.6	7319.1	9561.1	11221.8
G2	314	421.5	516.1	350.8	454.1	545.0
G2-3	7123	9385.5	11059.0	7315.6	9557.1	11216.6
G20	92	120.1	137.1	91.9	120.1	137.1
G20-23	7326	9663.5	11391.9	7600.8	9922.2	11642.6
G20/23	7331	9690.1	11437.7	7606.7	9951.1	11688.4
G21	12	17.3	20.2	13.2	18.0	21.0
G22	201	255.0	296.1	200.9	255.0	296.1
G23	135	171.7	200.0	134.7	171.7	200.0
G24	38	50.2	59.8	46.3	58.5	67.8
G2/3	7143	9409.5	11087.3	7335.8	9581.1	11244.9
G3	136	172.9	204.6	135.9	172.9	204.6
G3-4	7143	9408.6	11086.4	7334.9	9579.9	11243.8
G3/4	7195	9479.7	11170.8	7420.2	9687.2	11365.9
G4	202	276.1	327.9	367.4	457.2	517.1
G4-5	7194	9478.5	11169.3	7419.5	9686.1	11364.6
G5	4	7.5	10.2	16.9	20.9	24.1
G5/7	7222	9517.6	11218.6	7476.8	9757.4	11448.0
G6	42	59.8	75.1	114.7	139.7	159.6
G6-7	42	59.5	74.5	114.6	139.1	158.6
G6/7	56	82.7	105.9	160.5	200.1	231.7
G7	38	58.8	76.9	112.7	139.6	161.1
G7-9	7221	9516.4	11217.9	7476.2	9756.4	11447.1
G7/9	7263	9573.7	11286.5	7535.6	9833.1	11535.4
G8	125	161.5	186.0	146.6	183.3	207.8
G8-9	125	160.8	185.7	146.2	182.7	207.0
G8/9	139	184.1	217.2	198.8	253.4	291.0
G9	29	44.2	58.2	107.7	133.4	153.9
G9-11	7263	9572.5	11285.6	7534.6	9832.1	11534.8
G9/11	7272	9584.9	11299.5	7544.4	9844.5	11548.8

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
H1	118	156.2	180.2	183.1	229.0	256.6
H1-2	116	154.5	178.2	181.2	226.7	252.2
H1/2	159	222.5	262.9	311.6	394.6	444.3
H2	122	172.1	204.2	248.3	314.9	355.0
H2-3	156	220.3	261.2	311.0	392.8	443.1
H2/3	274	391.0	465.7	429.6	564.7	647.3
H3	150	207.2	243.3	150.4	207.2	243.3
H3-4	272	389.2	461.9	425.5	561.6	642.9
H3/6	553	757.5	896.5	816.6	1058.5	1214.7
H4	205	260.7	303.6	207.2	262.9	305.9
H5	6	8.9	11.2	24.9	31.2	34.9
H5-6	6	8.9	11.1	24.7	31.0	34.7
H5/6	93	131.5	156.1	211.6	265.0	297.0
H6	91	128.9	153.1	202.2	252.9	283.3
H6-7	547	749.9	889.5	807.6	1049.3	1206.5
H6/7	705	962.8	1145.9	1081.8	1391.3	1602.2
H7	175	236.7	285.5	309.4	382.9	438.3
H7-8	695	955.3	1134.2	1070.5	1386.6	1594.1
H7/8	754	1035.9	1232.1	1185.5	1525.0	1750.5
H8	59	80.6	97.8	115.1	139.4	157.6
I0	65	111.8	153.3	245.5	306.8	356.2
I0-1	65	111.6	152.8	244.9	305.9	355.5
I0/1	73	125.1	169.8	288.0	362.2	414.6
I1	40	69.5	88.8	153.2	191.6	214.6
I1-2	73	124.7	169.6	285.9	358.8	411.5
I1/2	115	209.8	286.1	388.7	507.1	590.3
I2	114	159.1	187.6	114.4	159.1	187.6
I2-3	115	208.1	283.6	387.9	505.7	588.9
I2/3	241	334.5	426.3	422.3	555.2	647.7
I3	171	234.4	274.9	170.6	234.4	274.9
I3-4	238	331.9	423.5	421.6	554.4	645.9
I3/4	330	468.2	595.2	562.4	752.8	885.3
I4	141	197.5	242.8	229.4	294.8	345.3
J1	279	422.9	548.0	848.3	1033.2	1181.1
J1-2	278	421.6	546.1	845.4	1030.1	1177.3
J1/2	287	438.4	567.9	883.3	1077.5	1232.1
J2	27	48.4	62.6	114.8	143.6	160.8
J2-3	287	437.7	567.1	882.4	1076.4	1230.3
J2/3	333	508.5	660.8	967.0	1194.2	1374.0
J3	133	182.6	222.5	174.1	229.9	273.9
J3-4	332	508.1	660.0	966.2	1192.5	1372.9

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
J3/4	340	517.9	670.6	976.6	1206.7	1390.5
J4	35	49.7	61.9	60.7	78.7	92.7
K0	237	359.1	445.5	324.9	443.6	526.6
K00	492	683.2	846.8	537.0	727.9	891.0
K00-0	491	681.4	844.0	535.8	725.9	887.9
K00-5	561	789.5	982.0	641.1	890.1	1086.9
K00/0	563	793.5	985.6	645.3	894.6	1092.7
K1	1055	1376.9	1602.1	1098.8	1418.1	1641.4
K1-2	1050	1371.7	1595.7	1093.2	1411.9	1634.7
K10	50	75.3	91.9	123.5	154.5	173.1
K10-11	2568	3601.6	4396.7	3425.5	4504.5	5326.9
K11	83	114.2	148.2	197.1	262.4	314.7
K11/13	2590	3647.6	4464.5	3545.1	4680.2	5542.3
K12	55	90.3	114.8	247.1	309.1	346.2
K12-13	55	89.1	112.6	246.4	305.7	343.8
K13	55	81.4	106.1	103.2	141.2	172.1
K13-14	2582	3638.2	4458.2	3523.4	4650.8	5512.5
K13/14	2582	3638.9	4459.5	3528.3	4662.9	5533.0
K14	91	127.8	156.8	108.3	143.8	171.7
K1/3	1900	2557.0	3031.4	2032.0	2682.7	3152.8
K2	320	420.0	507.2	377.6	474.7	558.8
K3	791	1081.5	1277.4	830.3	1119.9	1314.7
K3-4	1897	2553.0	3025.4	2028.2	2680.2	3145.5
K4	428	576.9	705.6	551.6	707.2	839.2
K4/6	2532	3501.4	4267.3	3157.2	4096.1	4830.9
K5	295	423.9	515.7	639.8	801.0	908.7
K6	766	989.3	1180.2	1055.9	1290.3	1485.7
K6-7	2525	3493.9	4229.4	3127.6	4063.1	4797.0
K6/7	2561	3555.3	4310.3	3326.8	4324.8	5095.4
K7	87	135.8	170.8	223.8	283.6	323.4
K7-8	2540	3529.6	4290.3	3243.2	4238.2	4999.7
K7/8	2580	3608.8	4392.3	3434.0	4496.6	5310.0
K8	189	297.3	371.4	710.2	888.2	995.0
K8-9	2567	3595.6	4383.2	3394.5	4452.1	5265.5
K9	67	99.8	120.9	153.1	191.5	214.5
K9/10	2569	3603.2	4398.0	3437.0	4511.0	5335.0
L1	795	1114.5	1331.3	867.8	1186.2	1401.5
L1-2	794	1113.6	1330.2	867.0	1185.8	1400.0
L10	115	194.4	260.7	546.4	661.8	748.3
L11	103	163.2	212.2	111.0	159.2	199.9
L1/2	849	1193.1	1426.9	917.9	1258.5	1490.2

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
L2	173	242.0	288.9	156.4	219.6	263.4
L2-3	845	1186.9	1419.4	912.7	1252.3	1481.8
L2/5	2061	3115.5	3874.2	3292.6	4472.8	5284.5
L3	705	1002.0	1207.4	940.9	1234.8	1435.2
L4	461	676.8	859.1	612.4	824.4	1001.7
L5	800	1225.2	1511.0	1596.2	2154.7	2505.1
L5-7	2052	3101.2	3857.7	3277.6	4453.5	5260.7
L5/7	2296	3552.2	4480.4	4044.1	5467.4	6474.2
L6	798	1142.5	1433.8	1081.0	1422.4	1707.5
L6-7	791	1132.9	1421.7	1071.7	1410.2	1692.6
L6/7	833	1212.7	1528.3	1202.8	1591.0	1906.1
L7	152	257.6	326.7	541.2	676.9	758.3
L7-10	130	214.8	283.4	587.6	717.6	813.3
L7-8	2287	3539.8	4462.6	4029.1	5445.8	6450.5
L7/11	2446	3959.2	5032.9	4940.2	6625.0	7820.3
L8	165	302.4	394.2	640.1	830.0	945.8
L9	159	254.6	316.9	224.6	315.6	375.2
L9-10	141	238.4	302.9	223.9	308.8	367.3
L9/10	141	240.9	308.9	591.5	722.3	818.5
M1	1521	2352.1	3073.2	1599.2	2280.5	2889.1
N1	4583	6281.4	7589.1	5005.8	6707.7	8011.7
N1-2	4581	6278.4	7585.5	5003.5	6704.4	8008.0
N1/2	5077	7121.6	8722.9	6197.0	8291.0	9911.1
N2	527	898.2	1209.5	1377.2	1780.7	2107.5
O1	28	48.9	66.0	42.9	64.7	82.4
POND1	5811	8494.0	10470.8	6631.6	9296.3	11303.8
POND2	14848	21164.7	26005.5	16599.8	22914.0	27758.7
POND2_JUNC	7660	11504.7	14467.2	9067.1	12902.5	15868.2
P1	110	187.0	250.8	288.0	373.2	441.1
Q1	432	818.8	1081.1	732.2	1154.3	1432.3
Q1-2	431	816.6	1078.4	730.3	1151.1	1428.4
Q1/2	437	847.3	1134.3	771.6	1237.2	1544.9
Q2	108	193.4	265.1	344.5	441.5	519.6
R1	24	39.2	51.3	33.9	49.4	61.8
S1	86	123.9	153.7	88.8	121.8	148.3
T1	20	26.4	31.0	21.5	27.4	31.9
T1-2	20	26.4	31.0	21.4	27.3	31.8
T1/2	35	44.1	50.9	36.2	45.0	51.7
T2	21	24.9	28.1	20.6	24.9	28.1
T2-3	23	29.4	34.4	23.9	30.3	35.2
T2/3	137	183.7	219.3	213.6	259.2	293.5

Hydrologic	Existing Condition			Proposed Condition		
Element	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)
T3	134	178.9	213.3	209.3	253.5	286.6
Y1	2131	2926.5	3560.1	2258.3	3054.3	3687.5
Y1-2	2120	2910.9	3541.3	2246.0	3038.2	3668.1
Y1/2	2187	3045.7	3743.5	2333.7	3199.5	3900.6

3. HYDRAULIC ANALYSIS

The hydraulic analysis was completed using the FlowMaster Version 7.0 (FlowMaster) Computer Program developed by Haestad Methods, Inc. The input parameters for the storm drain pipe and channel modeling process include discharge, roughness coefficient, channel slope, diameter (for circular pipes), height and bottom width (for box pipes), left side/right side slopes and bottom width (for channels).

Where available, existing condition models were developed based on available GIS data provided by the City, GIS data collected by Stantec as part of the State Route 14 Drainage Study and as-built information. In areas where GIS data and as-built information were not available, Google Earth and site visits were used in determining hydraulic configurations.

Hydraulic analyses were performed for regional and lateral storm drain systems. The regional storm drain system is defined as the major trunk lines that convey flow between City boundaries. The regional storm drain lines are sized based on the 50-year storm event. The lateral storm drain lines are lines that collect significant portions of the City area and are sized to convey the 25-year flowrates.

Assumptions were required in the preparation of the hydraulics calculation for the slope of the storm drain lines. Where information on the slope of the storm drain line was not available, it was assumed that the storm drain line followed the grade of the roadway. The road gradient was computed from the 2-ft contours obtained from the Los Angeles County LARIAC Data.

Utilizing the results from the hydrology analysis, the hydraulic analysis was conducted to identify the existing storm drain systems that are adequate or deficient. If a storm drain system was found to be deficient, a new pipe size was determined to accommodate the computed ultimate condition flow and the new system was propose as a Master Plan Drainage Update facility.

4. PROPOSED DRAINAGE FACILITIES

4.1. Proposed Drainage Facilities

Proposed storm drain pipes were limited to 120-inches in the sizing analysis. The intent was to keep the storm drain pipes at a realistic depth. Reinforced concrete boxes (RCBs) are proposed where the required storm drain size exceeded 120-inches. Caltrans Standard Plan D81 and D83A were used as guidelines in determining the span and height of the RCBs.

Proposed earthen channels were assumed to have a 3:1 side slope for the purpose of estimating capacity and cost.

4.1.1 Natural Floodplain Management Areas

Natural Floodplain Management Areas have been designated in areas where existing flood management infrastructure is limited. In these areas, storm water flow is characterized by alluvial fan flow, or incised riverine conveyances prone to scour, erosion, and/or lateral migration. Development in these areas will typically not have an ability to discharge to an engineered flood control facility.

Natural Floodplain Management boundaries were identified at the easterly and westerly ends of the City. The westerly Natural Floodplain Management Area boundary is aligned along 70th St. W and follows the city boundary from the northerly limits to midway between 70th St. W and 80th St. W, then proceeds south to W Ave. K-4, then along W Ave. K-4 to midway between 80th St. W and 85th St. W, and then south to the southerly city boundary along W Ave. M. The easterly Natural Floodplain Management boundary extends along 55th St. E from the north City limit to the south City limit.

Within the Natural Floodplain Management Areas, no new drainage facilities are proposed. In these areas, proposed developments shall include floodplain management measures that mitigate the floodplain impacts associated with the development to less-than-significant levels. These measures shall include, but not be limited to, the continued acceptance of pre-development flows from upstream areas tributary to the development, the safe conveyance of flow through or around the development without an adverse effect to adjacent properties, and the discharge of flows to downstream areas in a manner consistent with pre-development flow characteristics.

Alternatively, developments in Natural Floodplain Management Areas may intercept flows from upstream areas tributary to the development and convey the flow downstream to an existing and suitable downstream engineered flood control facility, if one exists and is adequate for the

acceptance of flow. Such a conveyance of flow shall be in an engineered flood control conveyance that is acceptable to the City including provisions for longitudinal and other access need and provide for maintenance by an appropriate entity acceptable to the City.

Certain types of developments may cause an increase in the peak discharge for given return frequencies ranging from the 2-year to the 50-year storm. In the absence of a downstream engineered flood control facility that has been designed to accept the increased peak discharge from the development, development in Natural Floodplain Management Areas shall be required to mitigate increases in peak discharges to at least 90% of pre-development levels.

Natural Floodplain Management Areas have been designated in areas where existing flood management infrastructure is limited. In these areas, storm water flow is characterized by alluvial fan flow, or incised riverine conveyances characterized by their propensity for scour, erosion, and/or lateral migration. Development in these areas will typically not have an ability to discharge to an engineered flood control facility. However, these areas will still be subject to the Drainage Impact Fee and its associated requirements given that they will benefit from the MPDU facilities.

4.2 Prioritization

All proposed improvements have been prioritized within the entire project area. The goal of this prioritization is to determine the projects with the greatest importance based upon the magnitude of flooding in the existing condition.

The proposed drainage facilities were prioritized into three categories:

1. High Priority – Identified as existing storm drain lines that do not have sufficient capacity to service computed 10-year ultimate condition flows.

2. Medium Priority – Identified as existing storm drain lines that do not have sufficient capacity to service computed 25-year ultimate condition flows.

3. Low Priority – New proposed facilities.

4.3. Cost Estimates

Cost estimates were created for the proposed storm drain improvements. Estimates were based on quantity estimates of proposed facility length, facility size and facility type. The estimation of probable construction cost for the proposed improvements was created by applying unit cost data, as collected during recent construction activities, or as published in current cost data manuals, to the estimated quantities. Unit costs for reinforced concrete pipes and reinforced concrete boxes are specified per linear foot. Unit costs for earthen channels are specified per cubic yard. Included in the unit cost are costs for

excavation, shoring, bedding, backfill, compaction, removal of excess material, and trench resurfacing.

Right-of-way costs for open channel facilities were then added to the construction costs in order to account for the acquisition of land required for open channel facilities. Below grade conduits such as reinforced concrete pipes and reinforced concrete boxes were assumed to be located within existing public right-of-way. The total construction cost plus right-of-way was then increased for engineering and City administration costs. The Total Cost for each facility was then determined by adding a contingency to the total of the above-stated components.

The total cost of all MPDU facilities was determined to be $697,281,099.

5. AREAS OF CONCERN

The City has identified the following areas of concern in which drainage issues has occurred previously under existing conditions:

5.1. W Avenue M between 60th Street W and 65th Street W

5.1.1 Drainage Issue

Areas along W. Ave. M between 60th St. W and 65th St. W have flooded downstream areas in the past.

5.1.2 Assessment and Proposed Mitigation

Palmdale Master Plan of Drainage show the runoff from this subarea enters the Lancaster city boundary at the north extension of Kensington Circle. Field visit observed that the north side of Avenue M has an earthen berm and runoff directed east to 60th St. W. Data from Los Angeles County shows that a 48-inch RCP has been installed on Avenue M between 60th St. W and 62nd St. W. The flooding issue can be mitigated by installing a drainage facility at the low point / where flooding has occurred in the past and connect to the 48-inch RCP. Based on the hydrology and hydraulics calculations, the 48-inch RCP is adequate for the tributary area.

5.2. 5th Street E between E Avenue L and E Avenue K

5.2.1 Drainage Issue

The pipe section starts off on E Ave. L with a large diameter pipe and culminates at Lance's Camper south of E Ave. K-8 in a much smaller pipe that is prone to blockage.

5.2.2 Assessment and Proposed Mitigation

GIS data and Lancaster's Drainage Master Drainage Plan show that under existing condition, there is a 96-inch RCP on 5th St. E. from E. Ave. L to E. Ave. K-12. The pipe changes to a 24-inch RCP on Ave. E. K-12 and terminates at Lance's Camper. A separate 24-inch RCP begins on E. Ave. K-4 and terminates on E. Ave. K. There is no drainage pipe connecting the 24-inch RCP between Lance's Camper and E. Ave. K-4.

Based on results of the hydrology and hydraulics calculations, this master plan proposes to install a new 60-inch RCP from E. Ave. M to E. Ave. L. It is proposed that the existing 24-inch RCP and 96-inch RCP be removed, and the storm drain system continue to be 60-inch RCP between E. Ave. L and E. Ave. K.

5.3. E. Avenue K between 11th St. E and Carpenter Dr.

5.3.1 Drainage Issue

There is inadequate drainage between 11th St. E and Carpenter Dr. that either traps water at a bubble-up filling upstream catch basins with water and debris or floods the intersection of Challenger Way and E. Ave. K during storm events.

5.3.2 Assessment and Proposed Mitigation

There is an earthen corridor between 11th St. E and Carpenter Dr. that is servicing an existing 54-inch CIP. The 54-inch CIP extends north from north of E. Ave. L and services the residential tracts east of the pipe. The 54-inch CIP terminates near E. Ave. K-6 on the south end of the corridor. The corridor is moderately vegetated with brush. No drainage structure was observed on the north end or the corridor adjacent to E. Ave. K during site assessment.

It is proposed to construct an 18-inch storm drain lateral (SD D-4J) to pick up runoff from the corridor to alleviate impact to the drainage facilities upstream and downstream. This line will be connected to the existing storm drain on E. Ave. K. Further detailed investigation and assessment will need to be performed to determine the appropriate drainage structure to be installed.

6. PROPOSED DRAINAGE IMPACT FEE SCHEDULE

6.1. Basis of Fee Determination

The proposed drainage impact fee schedule calculated by taking the Total Cost for all MPDU facilities as reported in Section 4.3 and dividing that number by the gross undeveloped acreage in the City. The gross undeveloped acreage was estimated to be 37,949 acres. This total undeveloped acreage includes the area within the Natural Floodplain Management Areas since properties in those areas will benefit from the MPDU facilities. The result determined the cost per acre of residential development. Commercial and industrial drainage impact fees were determined by taking the cost per gross acre and dividing by 43,560 square feet per gross acre to obtain the cost per square foot.

Table 9-1 below presents the results of the Fee Schedule as developed for the Master Plan of Drainage Update.

Table 6-1
Drainage Impact Fee Schedule

Cost per Acre within Residential Zone	Cost per square foot of gross area of any other development within Commercial, Industrial Zone or any zone not indicated
$18,374	**$0.42**

6.2. Implementation

Implementation of the MPDU will occur through the ministerial approval process in place at the City. Conditions of Approval will be issued that require certain commitments by the developer with respect to MPDU implementation.

Where a frontage(s) of a prosed development interface with a MDPU facility, the developer will typically be conditioned to construct that portion of the MDPU including the dedication of right-of-way required for the facility(s). Other drainage facilities not included in the MDPU may be necessary to convey storm water through the development; these facilities will be the developer’s sole responsibility.

Additionally, drainage from a development needs to be properly conveyed downstream to a suitable receiving facility. The receiving facility must have the capacity to convey the flow from the development in a manner deemed satisfactory to the City. If these off-site facilities required of the development are facilities identified in the MDPU, then they may be subject to Drainage Impact

Fee credit. Should these facilities not serve the needs of the MDPU, they will be developer's sole responsibility.

Developers that construct PDF may receive a credit against their Drainage Impact Fee. The value of the credit will be limited to the amount of the total fee due for the development. If the cost of the MDPU facilities exceed the total fee due, a fee credit certificate will be issued, which can be used to offset the Drainage Impact Fee associated with a subsequent development.

6.3 Maintenance

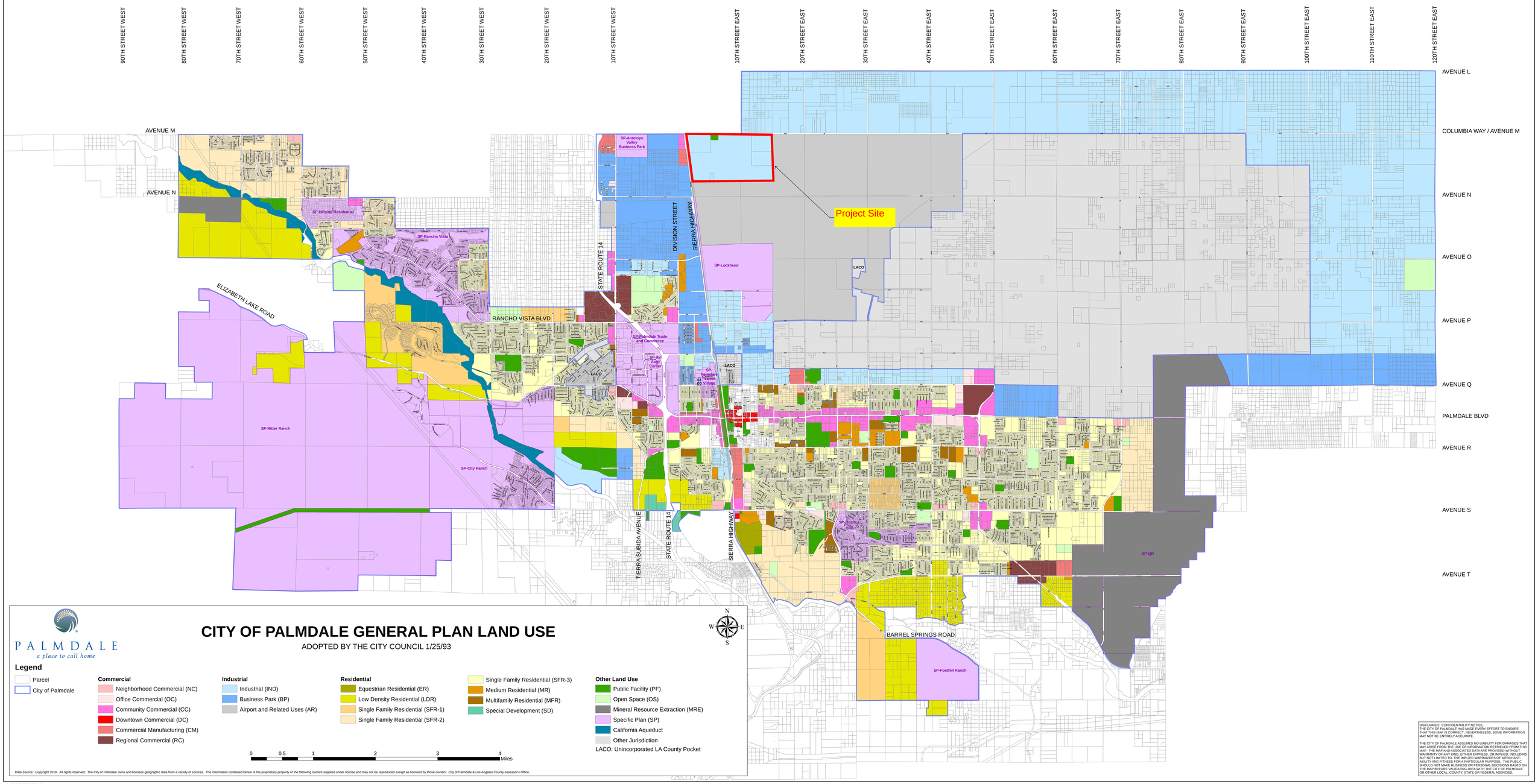
All developers are required to annex into the Lancaster Drainage Benefit Assessment District to provide for maintenance of facilities whether such facilities are part of the planned facilities or onsite, development-specific drainage facilities. Annexation is required whether drainage facilities are constructed or not. The developer will pay the fees necessary to annex into the district including the first year assessment.

MDPU facilities constructed by the City will be accepted into the Lancaster Drainage Benefit Assessment District for operation and maintenance purposes.

6.4 Recommended Design Requirements

The design of drainage facilities shall be in accordance with the latest City of Lancaster Engineering Design Guidelines. Additionally, the City may require that other criteria be met in order to accommodate design conditions that are unique to any given facility.

EXCERPT C: CITY OF PALMDALE GENERAL PLAN LAND USE MAP



PALMDALE
a place to call home

CITY OF PALMDALE GENERAL PLAN LAND USE

ADOPTED BY THE CITY COUNCIL 1/25/93

N
W E
S

Legend

- Parcel
- City of Palmdale

Commercial
- Neighborhood Commercial (NC)
- Office Commercial (OC)
- Community Commercial (CC)
- Downtown Commercial (DC)
- Commercial Manufacturing (CM)
- Regional Commercial (RC)

Industrial
- Industrial (IND)
- Business Park (BP)
- Airport and Related Uses (AR)

Residential
- Equestrian Residential (ER)
- Low Density Residential (LDR)
- Single Family Residential (SFR-1)
- Single Family Residential (SFR-2)
- Single Family Residential (SFR-3)
- Medium Residential (MR)
- Multifamily Residential (MFR)
- Special Development (SD)

Other Land Use
- Public Facility (PF)
- Open Space (OS)
- Mineral Resource Extraction (MRE)
- Specific Plan (SP)
- California Aqueduct
- Other Jurisdiction

LACO: Unincorporated LA County Pocket

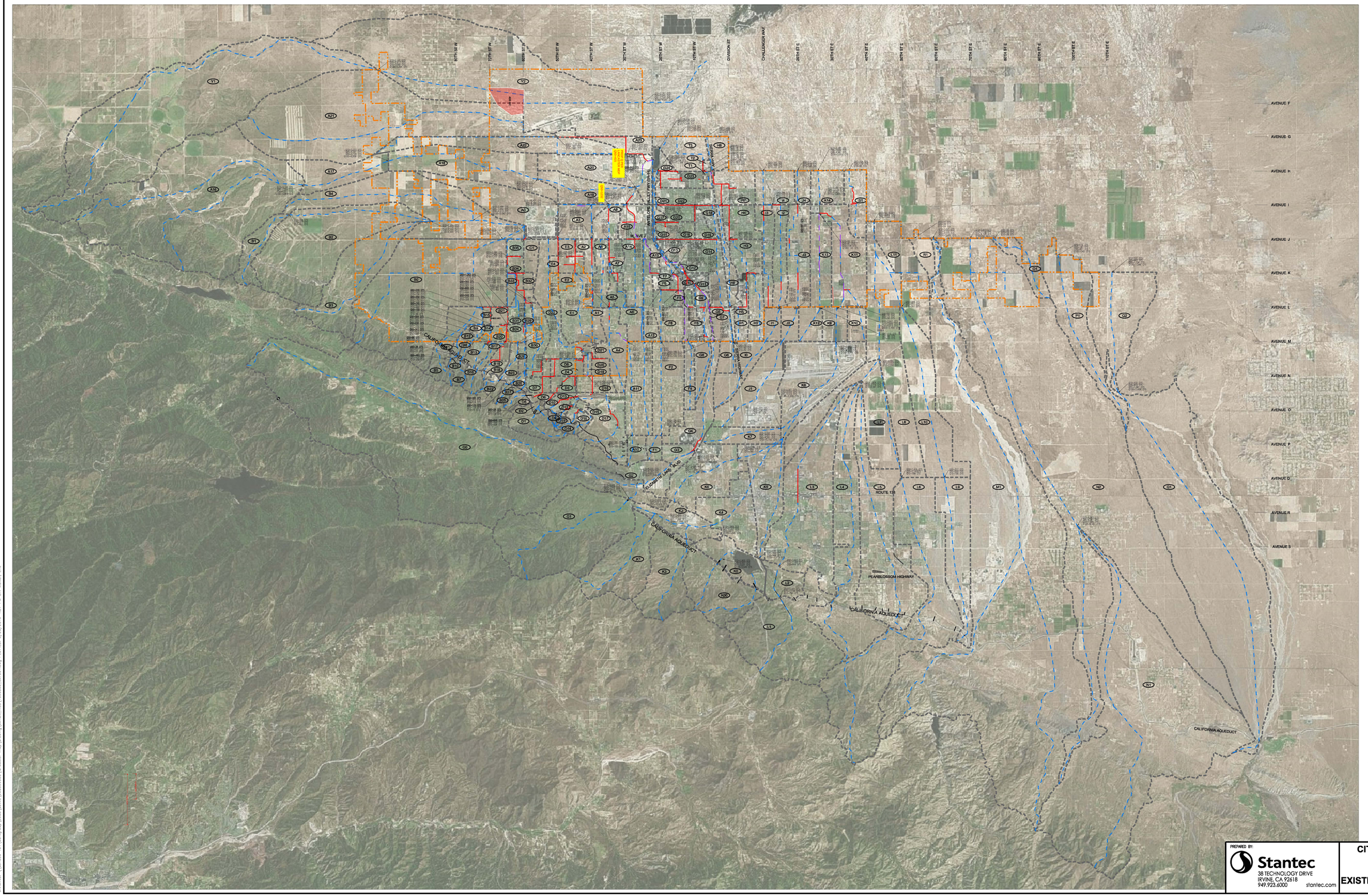
0 0.5 1 2 3 4 Miles

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DISCLAIMER: CONFIDENTIALITY NOTICE.
THE CITY OF PALMDALE HAS MADE EVERY EFFORT TO ENSURE THAT THIS MAP IS CORRECT; NEVERTHELESS, SOME INFORMATION MAY NOT BE ENTIRELY ACCURATE.

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EXCERPT D: CITY OF LANCASTER MASTER DRAINAGE PLAN HYDROLOGY MAP



LEGEND

- CITY BOUNDARY
- EXISTING STORM DRAIN
- EXISTING FLOWLINE
- SUBAREA BOUNDARY
- XX — SUBAREA DESIGNATION
- EXISTING BASIN

GRAPHIC SCALE

4000 0 2000 4000 8000 16000

(IN FEET)
1 inch = 4000ft.

lancaster ca
it's positively clear

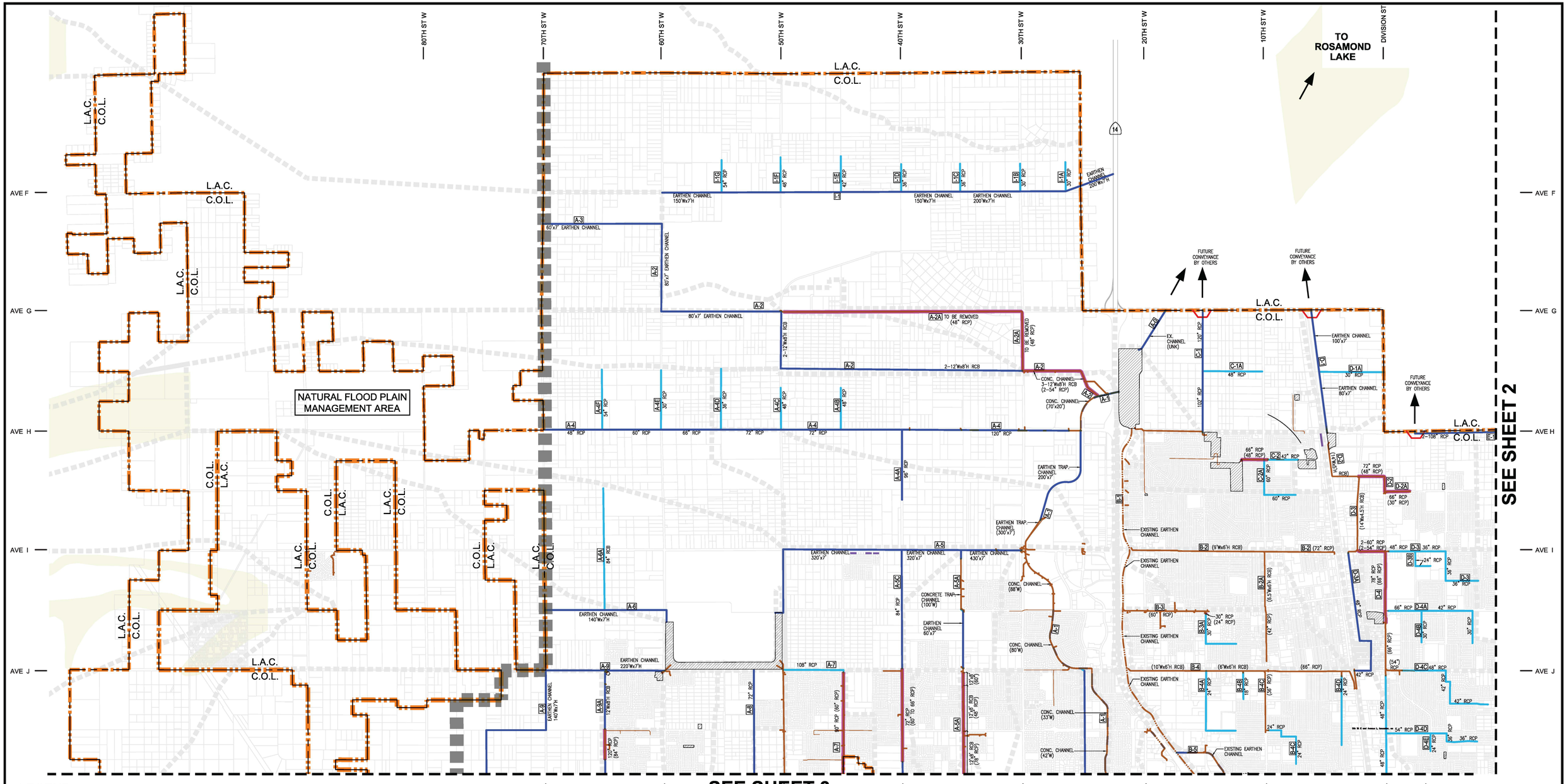
PREPARED BY:
Stantec
38 TECHNOLOGY DRIVE
IRVINE, CA 92618
949.923.6000 stantec.com

CITY OF LANCASTER MASTER PLAN OF DRAINAGE EXISTING HYDROLOGY MAP

DATE: 3/20/2019
SHEET 1 OF 1
JOB NO. 2064 139000

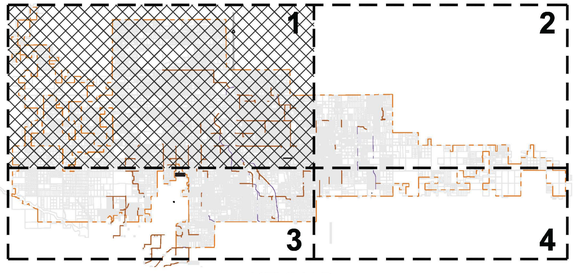
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EXCERPT E: **CITY OF LANCASTER MASTER DRAINAGE PLAN EXISTING FACILITIES MAP**



LEGEND

- CITY BOUNDARY
- SUBAREA BOUNDARY
- NATURAL FLOODPLAIN MANAGEMENT BOUNDARY
- EXISTING STORM DRAIN
- EXISTING STORM DRAIN – DEFICIENT
- PROPOSED REGIONAL STORM DRAIN, SIZED FOR 50-YEAR STORM EVENT
- PROPOSED STORM DRAIN, SIZED FOR 25-YEAR STORM EVENT
- FEMA 100-YEAR FLOODPLAIN
- A-8 — STORM DRAIN DESIGNATION
- 42" — PROPOSED STORM DRAIN PIPE SIZE
- (36") — EXISTING STORM DRAIN PIPE SIZE
- EXISTING BASIN
- PROPOSED OUTLET/ENERGY DISSIPATOR



KEYMAP
SCALE: 1"=15,000'

ABBREVIATIONS

C.O.L.	CITY OF LANCASTER
C.O.P.	CITY OF PALMDALE
L.A.C.	LOS ANGELES COUNTY

GRAPHIC SCALE

2000 0 1000 2000 4000 8000

(IN FEET)
1 inch = 2000ft.

lancaster ca
it's positively clear

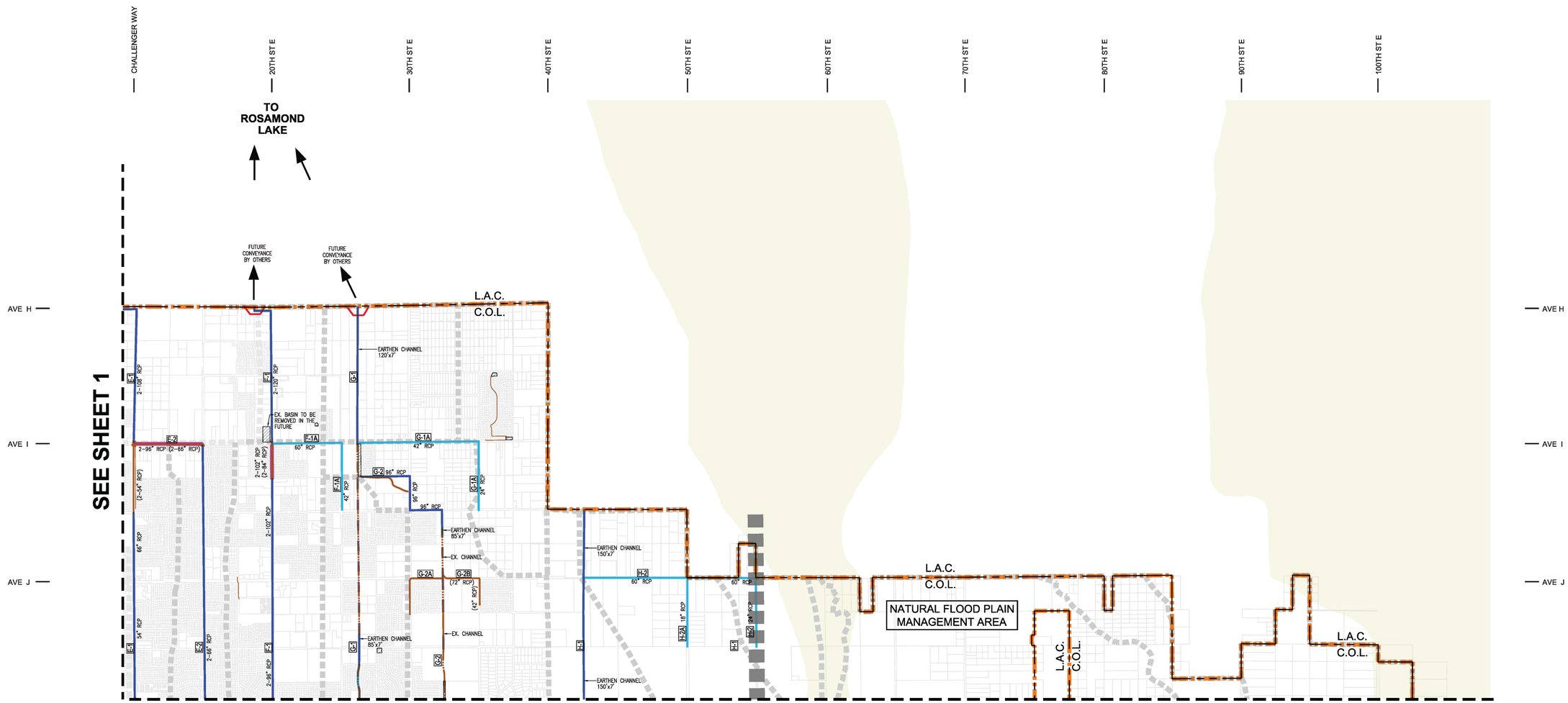
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38 TECHNOLOGY DRIVE
IRVINE, CA 92618
949.923.6000 stantec.com

CITY OF LANCASTER

PROPOSED MASTERPLAN FACILITIES MAP

DATE: 12/01/20
SHEET 1 OF 4
JOB NO. 2064 139000

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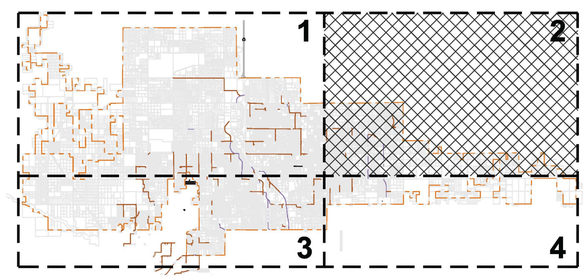
LEGEND

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- PROPOSED STORM DRAIN, SIZED FOR 25-YEAR STORM EVENT
- FEMA 100-YEAR FLOODPLAIN
- A-6 STORM DRAIN DESIGNATION
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- EXISTING BASIN
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ABBREVIATIONS

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GRAPHIC SCALE
2000 0 1000 2000 4000 8000
(IN FEET)
1 inch = 2000ft.



KEYMAP
SCALE: 1"=15,000'

lancaster ca it's positively clear

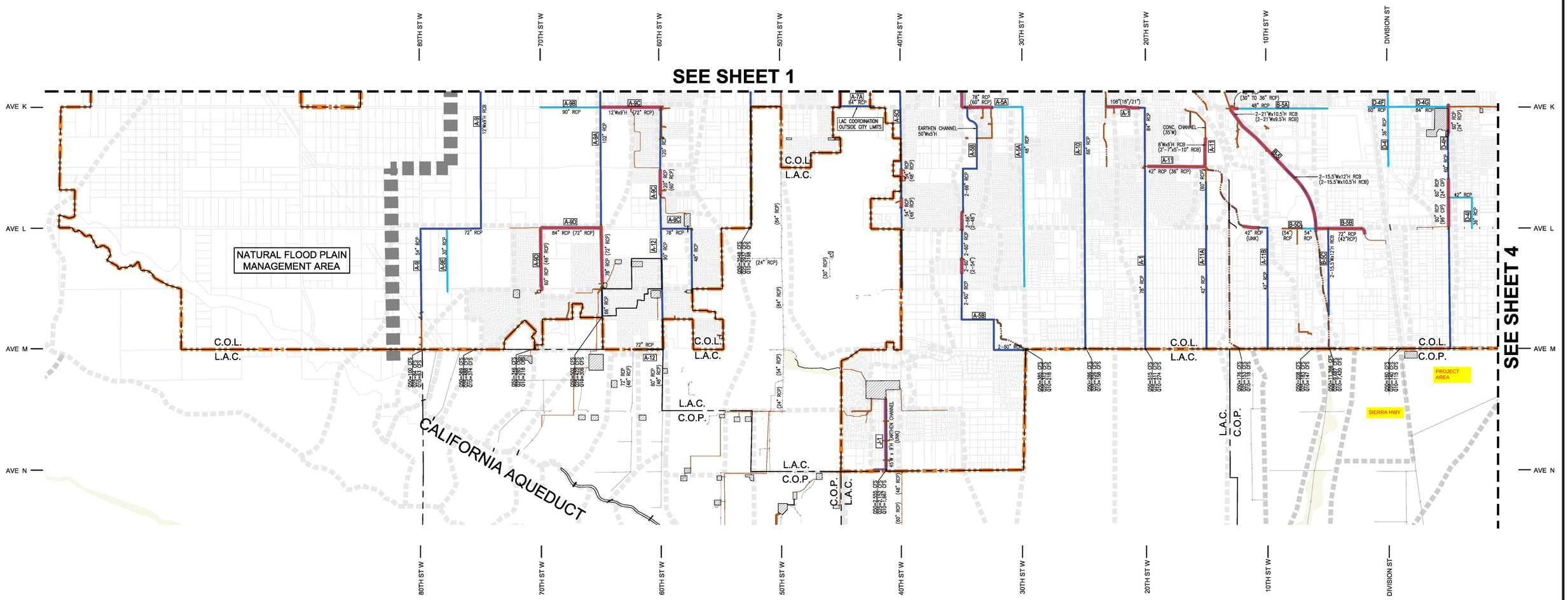
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CITY OF LANCASTER

PROPOSED MASTERPLAN FACILITIES MAP

DATE: 12/01/20
SHEET 2 OF 4
JOB NO. 2064 139000

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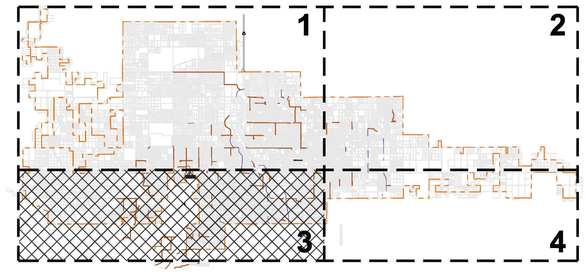
LEGEND

- LANCASTER CITY BOUNDARY
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- SUBAREA BOUNDARY
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GRAPHIC SCALE
2000 0 1000 2000 4000 8000
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KEYMAP
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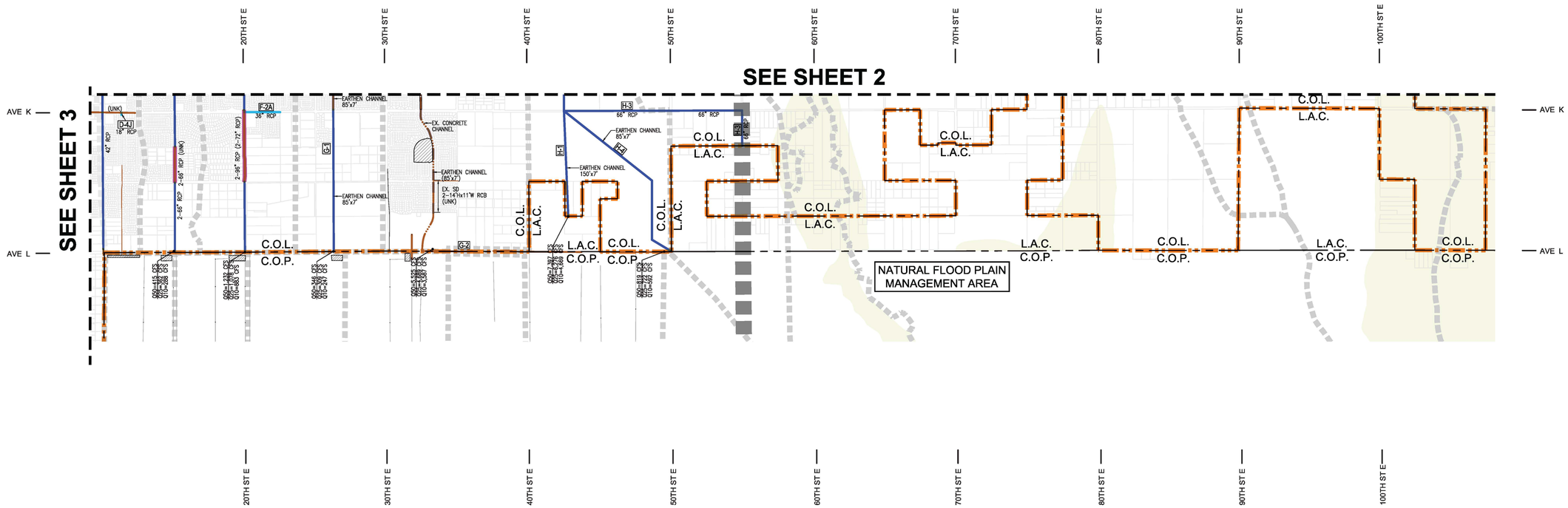
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CITY OF LANCASTER

PROPOSED MASTERPLAN FACILITIES MAP

DATE: 12/01/20
SHEET 3 OF 4
JOB NO. 2064 139000

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LEGEND

- CITY BOUNDARY
- SUBAREA BOUNDARY
- NATURAL FLOODPLAIN MANAGEMENT BOUNDARY
- EXISTING STORM DRAIN
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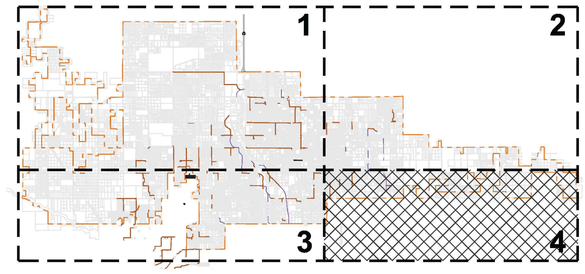
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L.A.C.	LOS ANGELES COUNTY

GRAPHIC SCALE

2000 0 1000 2000 4000 8000

(IN FEET)
1 inch = 2000ft.



KEYMAP
SCALE: 1"=15,000'

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CITY OF LANCASTER

PROPOSED MASTERPLAN FACILITIES MAP

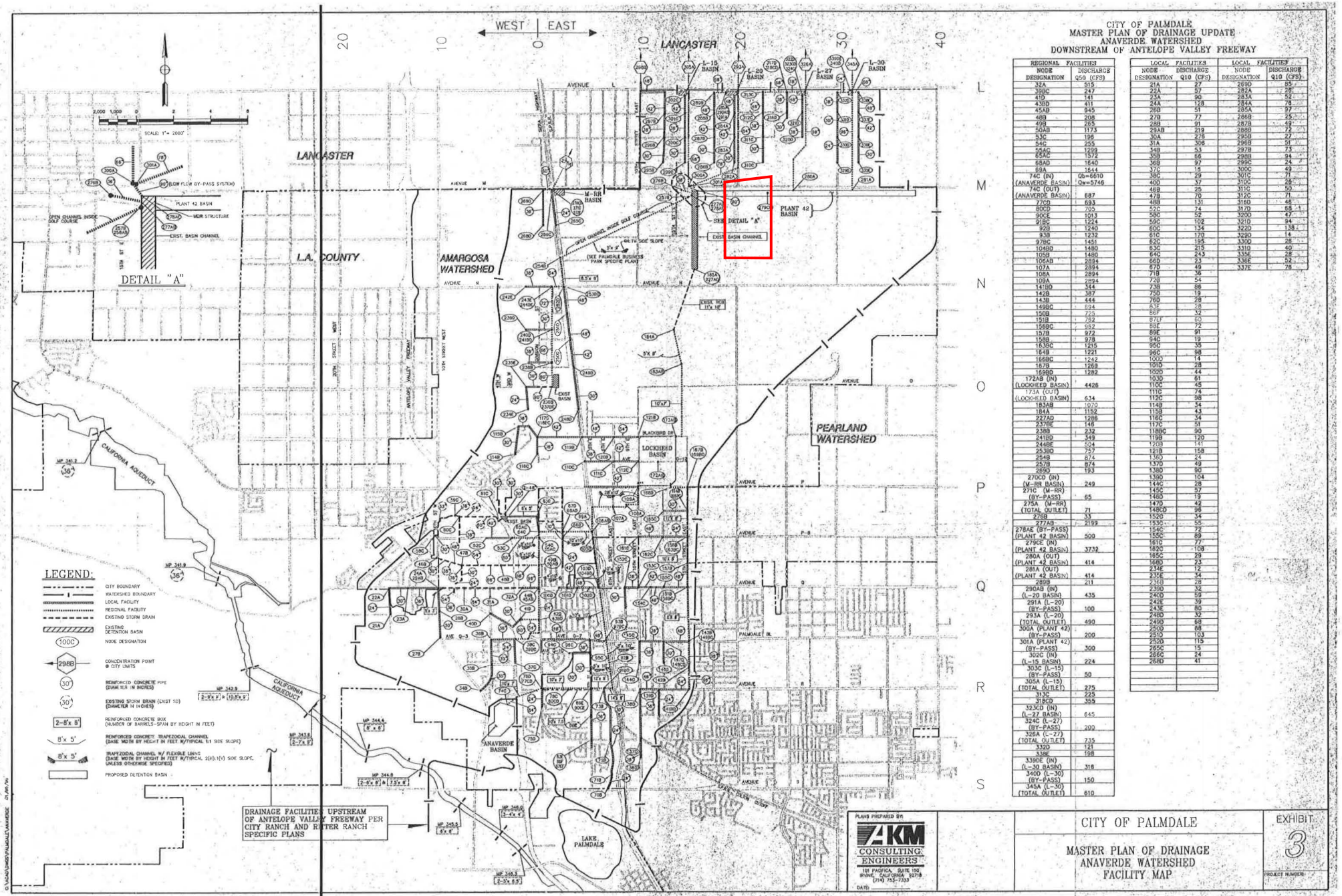
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EXCERPT F: CITY OF PALMDALE MASTER DRAINAGE PLAN MAP



CITY OF PALMDALE
MASTER PLAN OF DRAINAGE UPDATE
ANAVERDE WATERSHED
DOWNSTREAM OF ANTELOPE VALLEY FREEWAY

REGIONAL FACILITIES NODE DESIGNATION	DISCHARGE Q50 (CFS)
32A	515
39DC	247
41D	141
43BD	411
45AB	945
48B	208
49B	265
50AB	1173
53C	196
54C	255
55AC	1299
65AC	1572
68AD	1640
69A	1644
74C (IN) (ANAVERDE BASIN)	Qb=6610 Qw=5746
74C (OUT) (ANAVERDE BASIN)	687
77CD	693
80CD	705
90CE	1013
91BC	1224
92B	1240
93B	1232
97BC	1451
104BD	1480
105B	1480
106AB	2894
107A	2894
108A	2894
109A	2894
141BD	344
142B	387
143B	444
149BC	694
150B	725
151B	782
156BC	952
157B	972
158B	978
163BC	1215
164B	1221
166BC	1242
167B	1269
168BD	1282
172AB (IN) (LOCKHEED BASIN)	4426
173A (OUT) (LOCKHEED BASIN)	634
183AB	1070
184A	1152
227AD	1288
237BE	146
238B	232
241BD	349
244BE	504
253BD	757
254B	874
257B	874
269D	193
270CD (IN) (M-RR BASIN)	249
271C (M-RR) (BY-PASS)	65
275A (M-RR) (TOTAL OUTLET)	71
276B	33
277AB	2199
278AE (BY-PASS) (PLANT 42 BASIN)	500
279CE (IN) (PLANT 42 BASIN)	3732
280A (OUT) (PLANT 42 BASIN)	414
281A (OUT) (PLANT 42 BASIN)	414
289B	211
290AB (IN) (L-20 BASIN)	435
291A (L-20) (BY-PASS)	100
293A (L-20) (TOTAL OUTLET)	490
300A (PLANT 42) (BY-PASS)	200
301A (PLANT 42) (BY-PASS)	300
302C (IN) (L-15 BASIN)	224
303C (L-15) (BY-PASS)	50
305A (L-15) (TOTAL OUTLET)	275
313C	225
318CD	355
323CD (IN) (L-27 BASIN)	645
324C (L-27) (BY-PASS)	200
326A (L-27) (TOTAL OUTLET)	735
332D	121
339E	198
339DE (IN) (L-30 BASIN)	318
340D (L-30) (BY-PASS)	150
345A (L-30) (TOTAL OUTLET)	610

LOCAL FACILITIES NODE DESIGNATION	DISCHARGE Q10 (CFS)
21A	27
22A	57
23A	90
24A	128
26B	51
27B	77
28B	91
29AB	218
30A	276
31A	306
34B	53
35B	66
36B	97
37C	18
38C	29
40D	57
46B	25
47B	70
48B	131
52C	74
58C	52
59C	102
60C	134
61C	170
62C	195
63C	215
64C	243
66D	23
67D	49
71B	36
72B	54
73B	86
75D	19
76D	28
77F	28
86F	32
87LF	60
88E	72
89E	91
94C	19
95C	35
96C	98
100D	14
101D	28
102D	44
103D	61
110C	45
111C	74
112C	98
114B	34
115B	43
116C	34
117C	51
118BC	90
119B	120
120B	141
121B	158
136D	24
137D	49
138D	90
139D	104
144C	28
145C	57
146D	19
147D	42
149CD	96
152D	34
153C	55
154C	72
155C	89
161C	77
162C	108
165C	29
168D	23
234E	12
235E	34
236B	28
239D	32
240D	59
242E	39
243E	80
248D	32
249D	68
250D	88
251D	103
252D	115
265C	15
266C	24
268D	41

PLANS PREPARED BY:
AKM CONSULTING ENGINEERS
101 PACIFICA, SUITE 150
IRVINE, CALIFORNIA 92618
(714) 753-7333
DATE:

CITY OF PALMDALE

MASTER PLAN OF DRAINAGE
ANAVERDE WATERSHED
FACILITY MAP

EXHIBIT 3

PROJECT NUMBER:

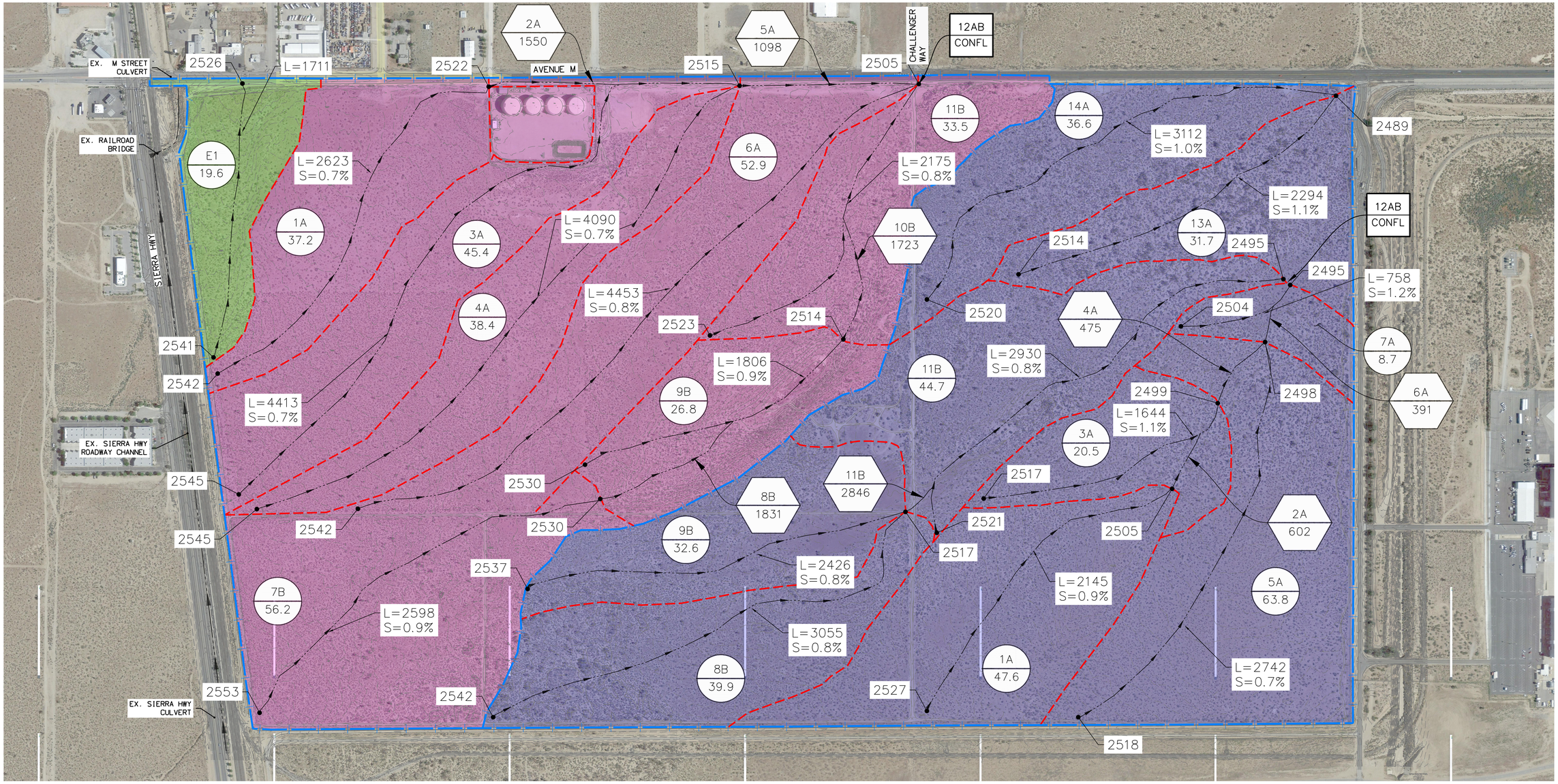
EXHIBITS

EXHIBIT A: PRELIMINARY MODRAT PRE-PROJECT HYDROLOGY MAP

ANTELOPE VALLEY COMMERCE CENTER

IN THE CITY OF PALMDALE, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

PRE-PROJECT CONDITION SITE HYDROLOGY MAP



LEGEND

AREA 1

AREA 2

AREA 3

WSHED BDRY

SUBAREA BDRY

FLOWLINE

HYDRO CALC INPUT

XX / XXX — SUBAREA ID AREA

XXXX — SURFACE ELEVATION

L=XXXX — FLOWPATH LENGTH SURFACE FLOW

WMS ROUTING INPUT

2A / 430

[2'] — PIPE DIAMETER

6AB / CONFL — CONFLUENCE NUMBER

SCALE 1"=300'

300 150 0 300

SCALE: 1"=300'

JLC Engineering & Consulting, Inc.
41660 IVY ST.
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "A"

ANTELOPE VALLEY C.C.

PRE-PROJECT CONDITION SITE HYDROLOGY MAP

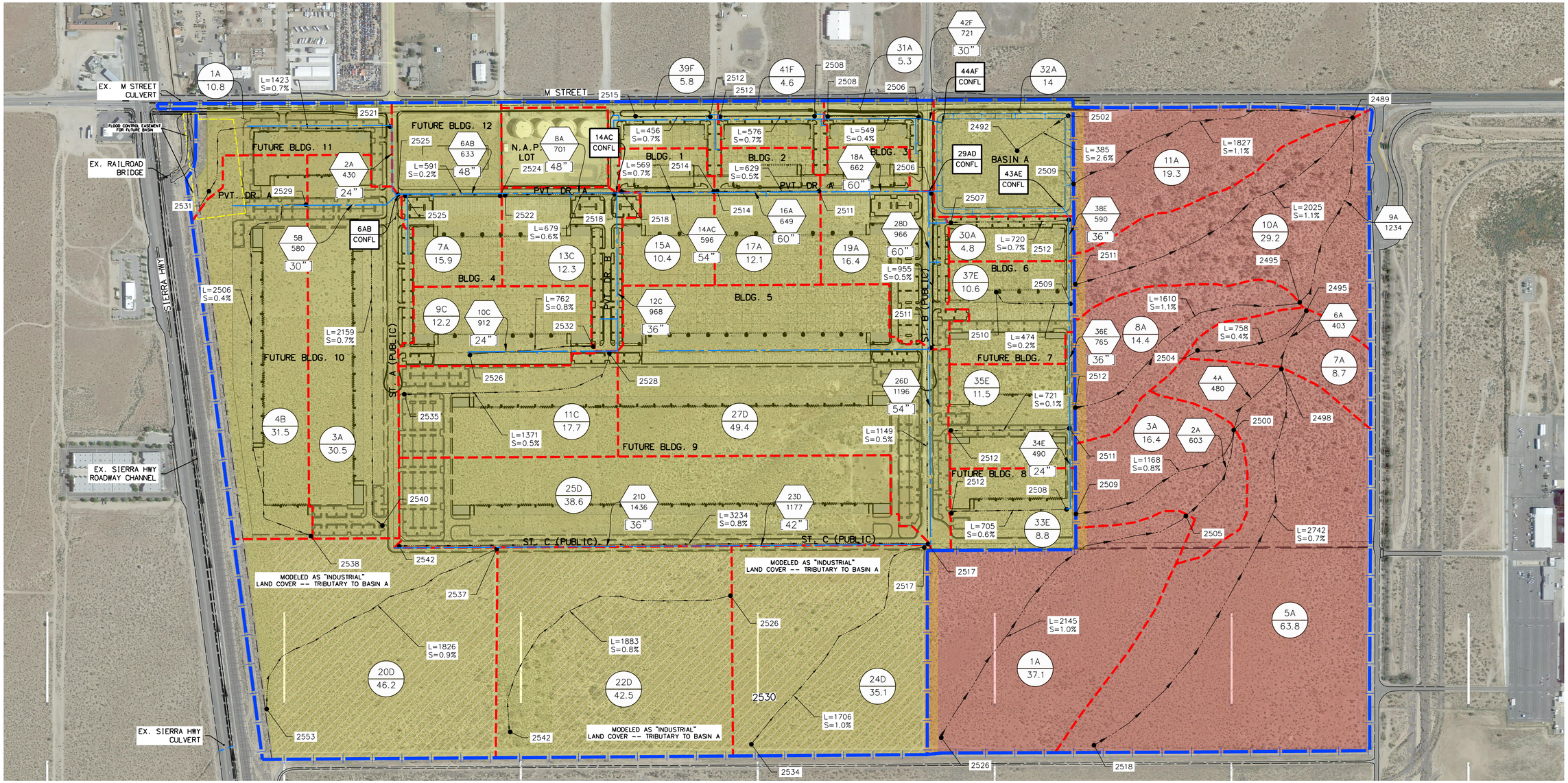
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Last Opened: Oct 12, 2023 - 1:33pm by pe

EXHIBIT B: PRELIMINARY MODRAT POST-PROJECT HYDROLOGY MAP

ANTELOPE VALLEY COMMERCE CENTER

IN THE CITY OF PALMDALE, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

POST-PROJECT CONDITION SITE HYDROLOGY MAP



LEGEND

AREA 1

AREA 2

WSHED BDRY

SUBAREA BDRY

FLOWLINE

EASEMENT

HYDRO CALC INPUT

XX / XXX — SUBAREA ID AREA

XXXX — SURFACE ELEVATION

L=XXXX — FLOWPATH LENGTH SURFACE FLOW

WMS ROUTING INPUT

2A / 430 — STORM DRAIN REACH PIPE LENGTH

[2'] — PIPE DIAMETER

6AB / CONFL — CONFLUENCE NUMBER

SCALE 1"=300'

300 150 0 300

SCALE: 1"=300'

JLC Engineering & Consulting, Inc.
41660 IVY ST.
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "B"

ANTELOPE VALLEY C.C.

POST-PROJECT CONDITION SITE HYDROLOGY MAP

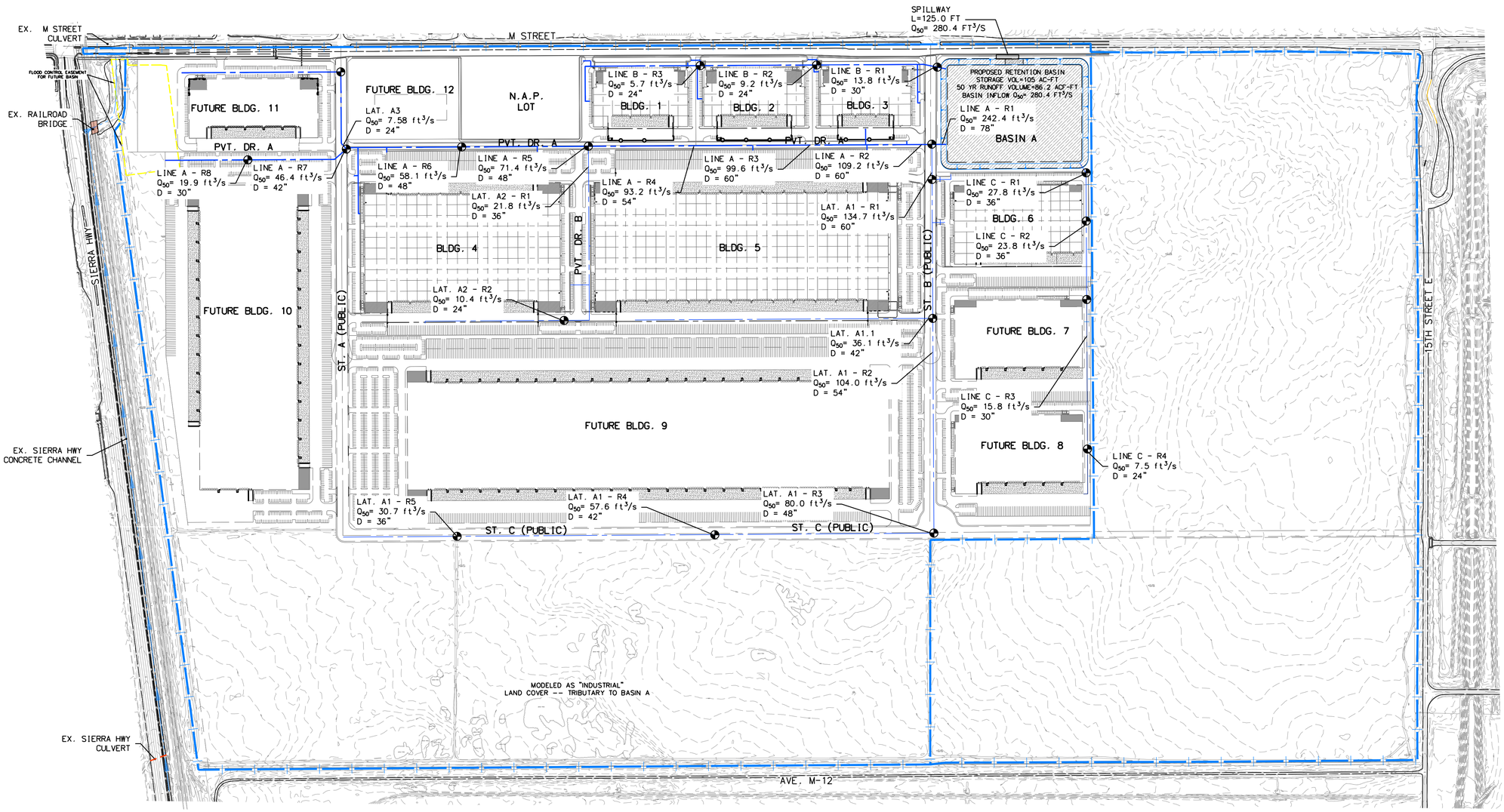
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Last Opened: Jun 08, 2023 - 2:17pm by jacob

EXHIBIT C: DRAINAGE FACILITIES MAP

ANTELOPE VALLEY COMMERCE CENTER

IN THE CITY OF PALMDALE, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

DRAINAGE FACILITIES MAP



LEGEND

LINE "X" - R"X" Q_{50}= XX.X ft³/s D = XX"	PROPOSED STORM DRAIN LABEL
	WSHED BDRY
	PROPOSED STORM DRAIN
	CHANGE OF FLOW
	EASEMENT

SCALE 1"=300'

300 150 0 300

SCALE: 1"=300'

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EXHIBIT "C"

ANTELOPE VALLEY C.C.

DRAINAGE FACILITIES MAP