APPENDIX H2

PRELIMINARY HYDROLOGY REPORT

Preliminary Hydrology Report

Penske Moreno Valley

APN: 297-100-067 (Portion), 297-100-073, 297-100-076, 297-120-002, 297-120-003, 297-120-017, 297-120-018, 297-120-016 (Portion)

November 2021

PREPARED FOR:

Penske Truck Leasing
1711 W. Greentree Dr., Ste. 117
Tempe, AZ 85284

PREPARED BY:

Kimley»Horn

3880 Lemon Street, Suite 420
Riverside, CA 92501
(951) 543-9868

KHA Project # 195305002

Certification by Engineer

11/10/21

Shea-Michael Anti, PE Date

Contents

Appendices

References

Hydrology Manual. Riverside County Flood Control and Water Conservation District, April 1978.

100.0 Introduction

Kimley-Horn and Associates has been retained to prepare a Preliminary Hydrology Report for the proposed Penske Moreno Valley in Moreno Valley, California. The purpose of this report is to demonstrate preliminary analysis of the hydrologic and hydraulic conditions associated with the development of the project site. To do so, the following is the scope of this report:

- Discuss the pre-development discharge patterns and points
- Discuss the post-development discharge patterns and points
- Determine the pre-development onsite flow rates for the 10-year and 100-year events
- Determine the post-development un-mitigated flow rates for the 10-year and 100-year events
- Determine required post-development onsite mitigation for the 100-year event

Even though this report discusses stormwater, this report is not a Stormwater Pollution Prevention Plan (SWPPP), a Groundwater Study, a Geotechnical Report, nor a Water Quality Management Plan (WQMP). Each of these separate reports discusses separate aspects of stormwater. Portions of the Geotechnical Report are utilized and referenced for the purpose of this report. Similarly, the requirements of the WQMP are considered for the stormwater mitigation and sizing of outlet structures for this project.

100.1 Project Description

The existing vacant lot will be developed into the proposed Penske Truck Leasing Center. The proposed development will include a proposed leasing center and maintenance building. Site improvements will include landscaping, concrete hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, concrete and asphalt pavement, landscaping, and irrigation. The project site is approximately 9.12 acres and is located in the City of Moreno Valley, within Riverside County. The APNs for the project site area: 297-100-067 (Portion), 297-100-073, 297-100-076, 297-120-002, 297-120-003, 297-120-017, 297-120-018, and 297-120-016 (Portion). Appendix A contains an aerial photograph that depicts the project location.

100.2 Location

The site is located in the southeast corner of Alessandro Boulevard and Old 215 Frontage Road in the City of Moreno Valley, within Riverside County. The project site is bordered by Old 215 Frontage Road to the west, Alessandro Boulevard to the north, commercial and industrial developments to the east, and the Robertson's concrete facility to the south. For reference see Appendix A for the Location Map.

100.3 Methodology

The hydrologic and hydraulic analyses were completed following the methods outlined in the RCFC & WCD Hydrology Manual. The rational method was used to estimate time of concentrations and peak flow rates generated from the existing and proposed 10-year and 100-year storm events. The synthetic unit hydrograph method was used to determine the onsite existing and proposed hydrographs for the 24-hour duration of the 100-year storm event. The CivilDesign Engineering Software – 2018 Version 9.0 was used to complete the rational method and synthetic unit hydrograph analyses. The results of the rational method analyses are included in Appendix H and the results of the synthetic unit hydrograph analyses are included in Appendix I. Complete onsite and offsite drainage system analyses will be provided in the Final Hydrology Report.

The rainfall data used for the analyses is important for the flow and runoff results. For the rational method analysis, the rainfall data incorporated into CivilDesign from the Riverside County Flood Control and Water Conservation District Hydrology Manual was used. The rainfall data for the Sunnymead-Moreno area was utilized due to the location of the project site. For the synthetic unit

hydrograph analysis, the rainfall data from NOAA Atlas 14 for Moreno Valley, CA was used. See Appendix D and F for rainfall data.

The type of soil and soil conditions are major factors affecting infiltration/detention and resultant storm water runoff. The Natural Resources Conservation Service (NRCS) has classified soil into one general hydrologic soil group for comparing infiltration and runoff rates. The group is based on properties that influence runoff, such as water infiltration rate, texture, natural discharge, and moisture condition. The runoff potential is based on the amount of runoff at the end of a long duration storm that occurs after wetting and swelling of the soil not protected by vegetation. Using the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey online tool and Plate C-1.16 of the Hydrology Manual, it was determined that the hydrologic soil group classification onsite is C. Soil type C is defined as soils having low infiltration rates (high runoff potential). Similarly, per the Geotechnical Engineering Investigation prepared by Krazan and Associates, Inc. dated October 22, 2021 the site is considered to have poor infiltration rates, with the observed average infiltration rate of 0.14 in/hr. See Appendix D and J for the soil information.

In addition, antecedent moisture condition (AMC) II was used to calculate the 10-year peak flows and AMC III was used to calculate the 100-year peak flows based on the hydrology manual. The land use for the proposed drainage subareas were selected based on the characteristics of the proposed development. See Appendix D Plate D-5.6 for the impervious percentages that correspond to each land use. The combination of the soil and coverage type was used as the basis for selecting the appropriate curve numbers used to calculate the soil loss rates. See Appendix I for reference.

100.4 Drainage Characteristics

The site is mainly located in Zone X-unshaded per the Federal Emergency Management Administration (FEMA) Flood Insurance Rate Map (FIRM) panel 06065C0745G, dated August 28, 2008. Flood Zone X-unshaded is defined by FEMA to have minimal flood hazard. No portion of the site is located within the special flood hazard area inundated by the 100-year flood. For reference, see Appendix B, FIRM Map.

100.4.1 Pre-development Condition

The existing site is currently vacant and drains in a northwest direction. The existing site consists of one main drainage area (A-1). The stormwater flows currently pond onsite and then flow northwest to sheet flow offsite to the northwestern parcel. The flows continue northwest and are eventually intercepted by existing catch basins near the intersection of Alessandro Boulevard and Old 215 Frontage Road.

Under existing conditions, the site not only conveys onsite flows, but it also accepts offsite flows. The existing site currently accepts offsite flows from the east and northeast. Offsite flows sheet flow onsite and confluence with onsite flows. The combined onsite and offsite flows discharge northwest of the project site, as described above.

The existing site also includes an existing 24” RCP storm drain pipe that drains southwest and discharges to the offsite existing development across from the Old 215 Frontage Road. Although the existing grading for the site does not currently allow discharge into the existing 24” RCP, the existing pipe is intended to convey the flows tributary to the project site. The constructed development across the Old 215 Frontage Road designed their onsite storm drain systems to accept 32.3 cfs from 15.3 acres of land, per the Proposed Hydrology map received by Thomsen Engineering, Inc.

Table 1 shows a summary of the pre-development flows. See Appendix G for the Existing Drainage Map and Appendix H for the rational method calculations.

Table 1: Pre-Development Flows

Discharge Node ID	Drainage Area (AC)	Q_{10} (cfs)	Q_{100} (cfs)
Node 12	**9.12**	**11.13**	**18.07**

100.4.2 Post-development Condition

The post-development condition consists of one main drainage area which is comprised of three (3) sub-areas. Runoff from the drainage sub-areas is intercepted by proposed curb inlets onsite, which then convey flows into a proposed underground detention system. The proposed detention system is proposed to outlet into the proposed pump that will be used to pump the flows up to the elevation of the existing 24" RCP storm drain pipe onsite. Table 2 shows a summary of the post-development flows without detention for 10 and 100-year storm events.

Similar to existing condition, the onsite not only conveys onsite flows, but it also accepts offsite flows. Under proposed conditions, the project site will not obstruct conveyance of the existing offsite flows. Offsite runoff flows through the site and is eventually intercepted by the proposed onsite inlets and will ultimately be conveyed into the existing 24" RCP that is intended to convey the flows tributary to the project site. The existing 24" RCP storm drain pipe then continues to drain southwest and discharges to the offsite existing development across from the Old 215 Frontage Road. The offsite discharges being conveyed through the site will be determined in the Final Hydrology Report.

Table 2 shows a summary of the post-development flows prior to detention. See Appendix G for the Proposed Drainage Map and Appendix H for the rational method calculations.

Table 2: Post-Development Flows (Without Detention)

Discharge Node ID	Drainage Area (AC)	Q_{10} (cfs)	Q_{100} (cfs)
Node 12	**9.12**	**16.26**	**24.46**

100.5 Stormwater Mitigation

For proposed onsite flows, stormwater mitigation is needed to ensure the proposed flows do not negatively impact the existing downstream drainage facilities. Since the design flow for the existing 24" RCP appears to be based on an undeveloped condition based on the 15.3 acres tributary to the pipe, the proposed flows are anticipated to be mitigated to match the existing flows from the onsite. By the comparing the results from Table 1 and Table 2, the proposed development increases onsite flows discharging from the site. To mitigate the increase in flows, an underground stormwater detention system is proposed.

The required retention volume was governed by the 100-year, 24-hour storm. To estimate the retention volume required for preliminary purposes, the pre-development volume was compared to the post-development volume to determine the increase in volume discharged from the project site. Since the detention system outlet riser structure will be sized in the Final Report, an additional 15% was added to the calculated difference in volume to account for the efficiency of the outlet structure.

The resulting volume is the estimated retention volume for preliminary purposes. Through the mitigation that the underground retention system will provide, the proposed development is not expected to cause a significant impact to downstream systems.

Table 3 shows a summary of the stormwater volumes compared to the underground system volume. See Appendix J for the synthetic unit hydrograph calculations.

Table 3: Stormwater Volumes and Underground System Volume

Area Description	Pre-Development Stormwater Volume (cf)	Post-Development Stormwater Volume (cf)	Stormwater Volume Difference (cf)	Estimated Retention Volume (cf)	Proposed Underground System Volume (cf)
A (onsite)	**114,476**	**126,760**	**12,284**	**14,127**	**49,401**

100.6 Hydraulic Analysis

The calculated peak flows from the analyses discusses above along with the offsite flows will be used to size the onsite drainage devices. All drainage devices will be sized in the Final Hydrology Report.

100.7 Conclusion

In conclusion, the following was covered in this report:

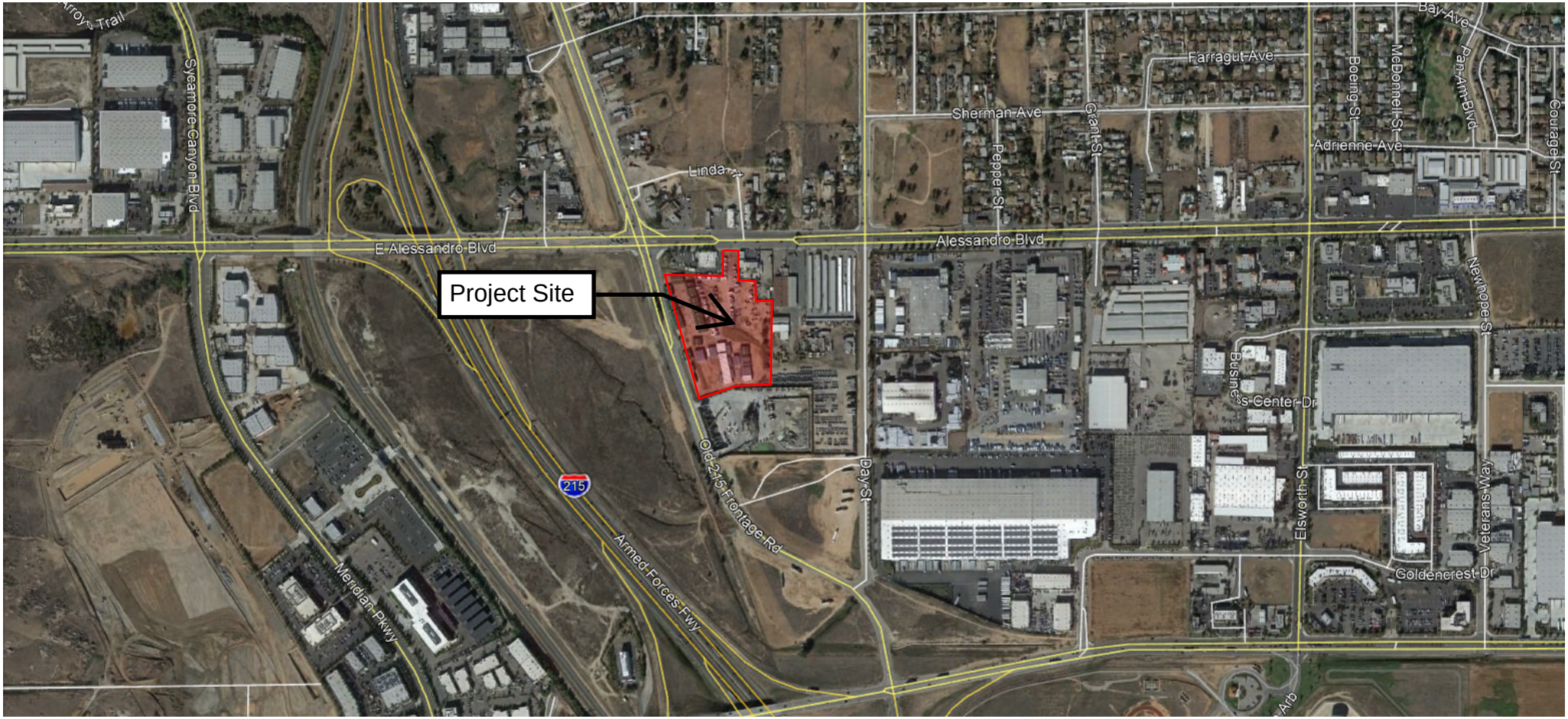
- The pre-development discharge patterns and points were discussed
- The post-development discharge patterns and points were discussed
- The pre-development onsite flow rates for the 10-year and 100-year events were determined
- The post-development un-mitigated flow rates for the 10-year and 100-year events were determined
- The required onsite mitigation for the 100-year event was determined

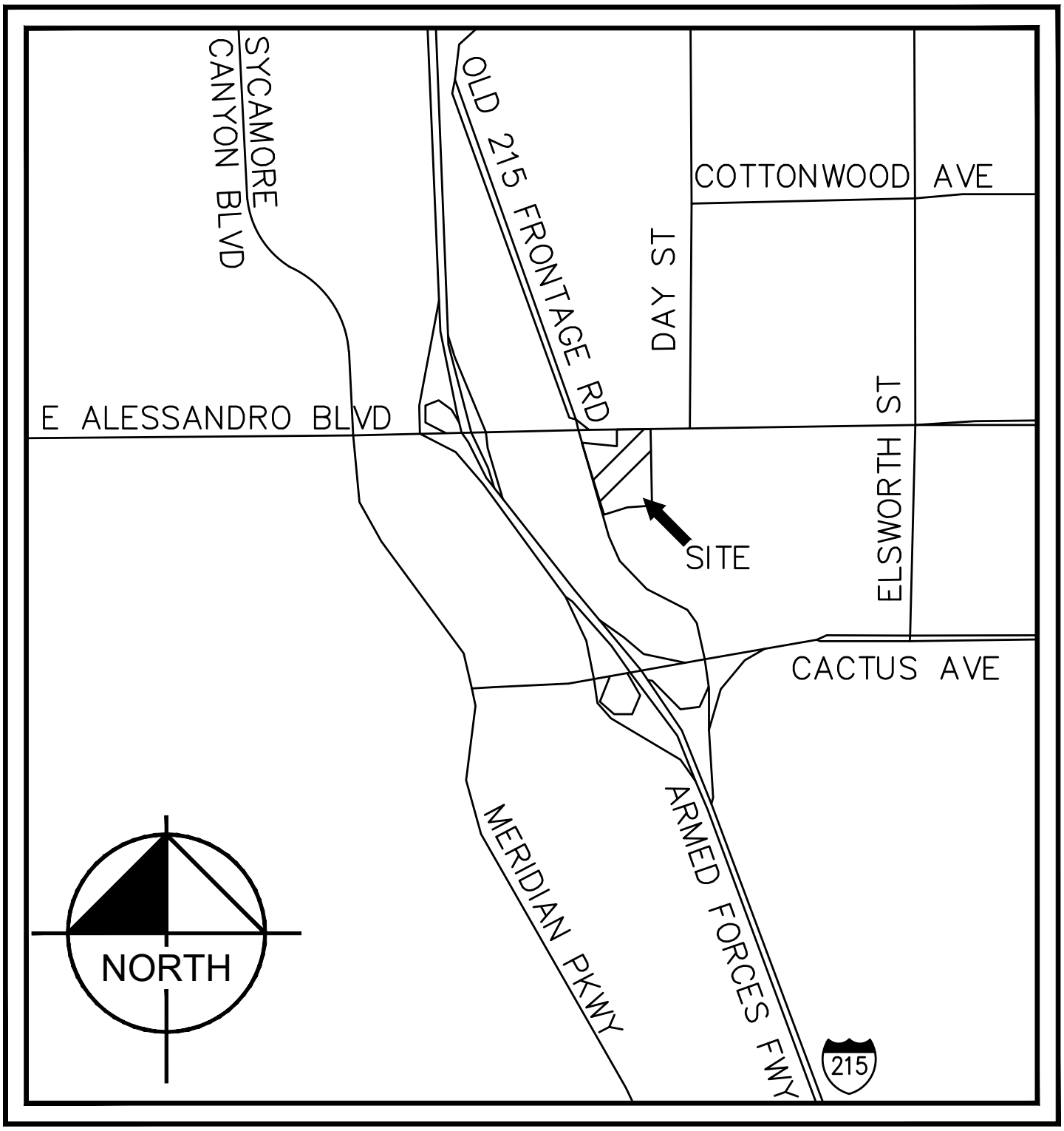
As discussed in the contents of this report, the development of the existing vacant site into the proposed development is not expected to cause a significant impact to downstream systems for storms up to the 100-year condition.

Appendix A

Location Map

Location Map





VICINITY MAP

NTS

Appendix B

FIRM Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

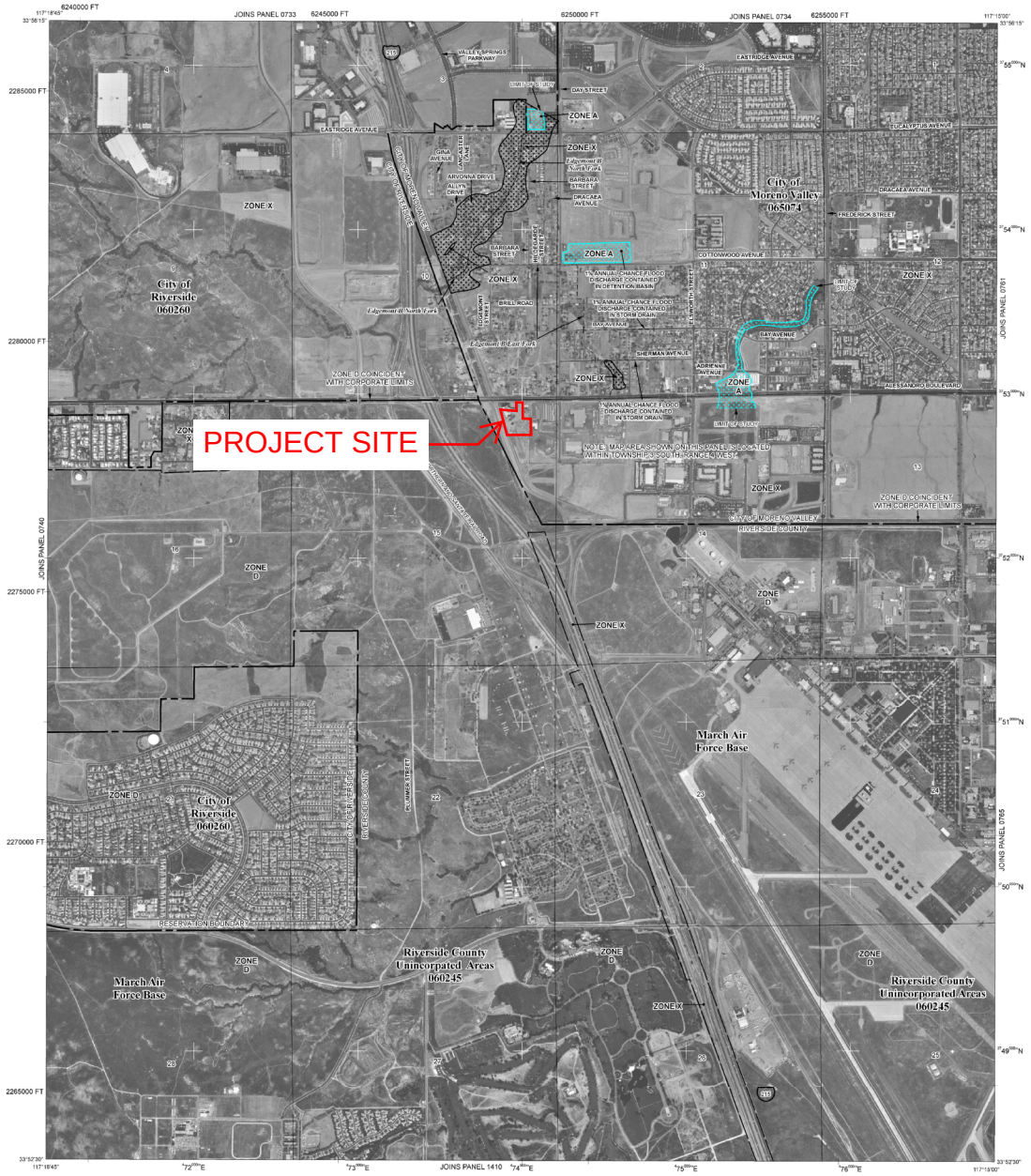
This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued **Letters** of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 3776000mN — 1000-meter Universal Transverse Mercator grid values, zone 11N
- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0745G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 745 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
MORENO VALLEY, CITY OF	060074	0745	G
RIVERSIDE COUNTY	060245	0745	G
RIVERSIDE, CITY OF	060260	0745	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

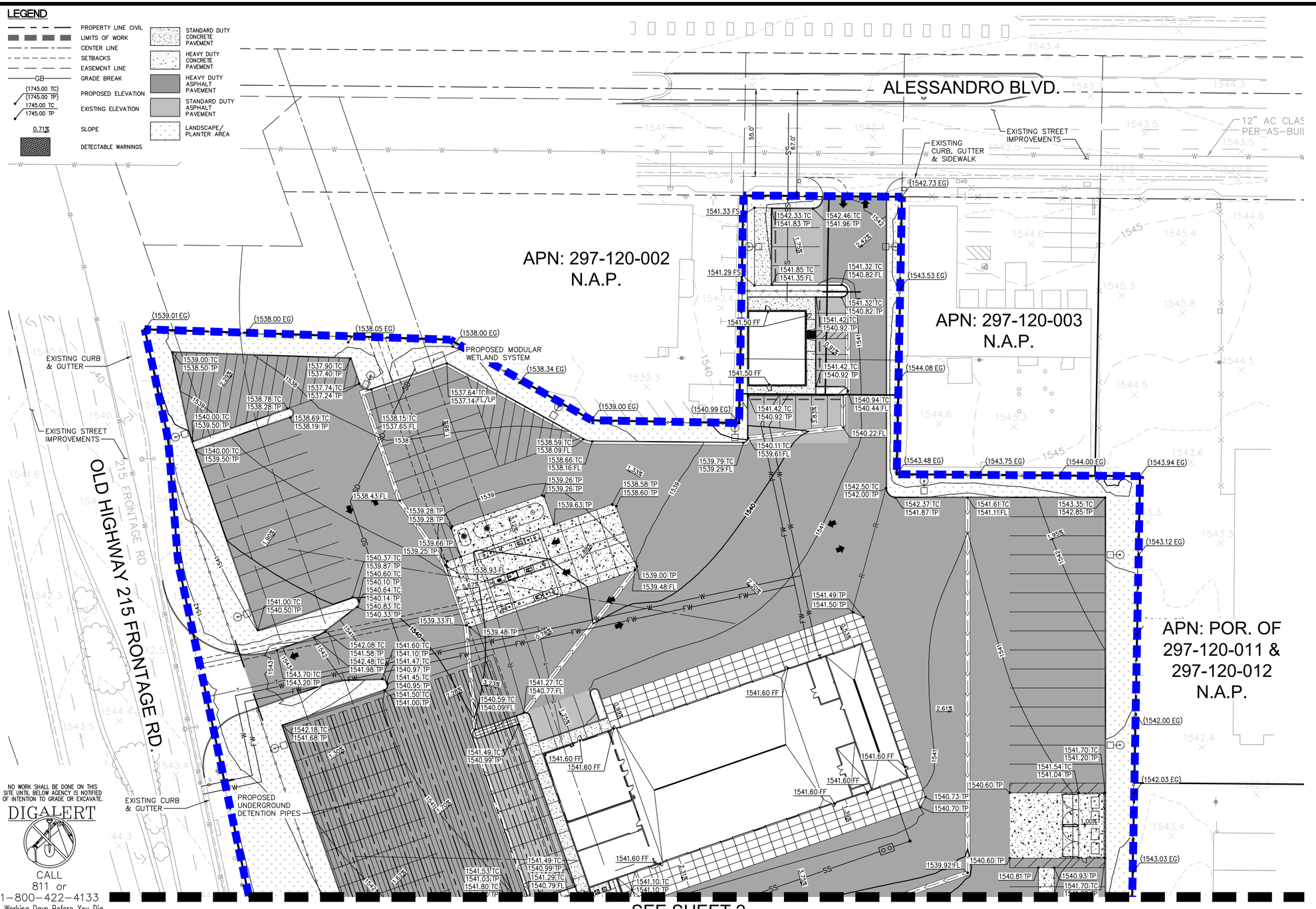
MAP NUMBER
06065C0745G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

Appendix C

Preliminary Plans



NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

DIGALERT

CALL 811 or 1-800-422-4133 2 Working Days Before You Dig

WWW.CALL811.COM

ABBREVIATIONS:

EG	EXISTING GROUND
FF	FINISHED FLOOR ELEVATION
FS	FINISH SURFACE
FG	FINISH GROUND
FL	FLOW LINE
GB	GRADE BREAK
HP	HIGH POINT
LP	LOW POINT
N.A.P	NOT A PART
TC	TOP OF CURB
TG	TOP OF GRATE
TP	TOP OF PAVEMENT

SITE INFORMATION

PARCEL NUMBERS: 297-120-002, 297-120-003, 297-100-073, 297-100-076, 297-100-066 (PORTION), 297-120-017, 297-120-018, 297-120-016 (PORTION)

ADDRESS: 21839 AND 21921 ALESSANDRO BLVD., MORENO VALLEY, CA 92553

SITE AREA: ±9.1 ACRES

GRADING NOTES

1. CONTRACTOR TO VERIFY ALL EXISTING TOPOGRAPHY AND STRUCTURES ON THE SITE AND IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO STARTING WORK.
2. ALL PAVEMENT SPOT GRADE ELEVATIONS AND RIM ELEVATIONS WITHIN OR ALONG CURB AND GUTTER REFER TO FLOW LINE ELEVATIONS UNLESS OTHERWISE NOTED.
3. ALL ELEVATIONS SHOWN DEPICT FINISHED GRADE OR EDGE OF PAVEMENT UNLESS OTHERWISE NOTED. GENERAL CONTRACTOR TO COORDINATE WITH EXCAVATION, LANDSCAPE AND PAVING SUBCONTRACTORS REGARDING TOPSOIL THICKNESS FOR LANDSCAPE AREAS AND PAVEMENT SECTION THICKNESS FOR PAVED AREAS TO PROPERLY ENSURE ADEQUATE CUT TO ESTABLISH SUBGRADE ELEVATIONS.
4. NO EARTHEN SLOPE SHALL BE GREATER THAN 2:1, UNLESS OTHERWISE NOTED.
5. MAXIMUM SLOPE IN ACCESSIBLE PARKING SPACES AND LOADING ZONES SHALL NOT EXCEED 2.0% IN ALL DIRECTIONS.
6. MAXIMUM RUNNING SLOPE SHALL NOT EXCEED 5% AND CROSS SLOPE SHALL NOT EXCEED 2% ON ALL SIDEWALKS AND ACCESSIBLE ROUTES.
7. MATCH EXISTING ELEVATIONS AT THE PROPERTY LIMITS.
8. REFER TO STORM DRAIN PLANS FOR INLET SIZE AND LOCATION.
9. EARTHWORK AND PAVING SPECIFICATION PER GEOTECHNICAL REPORT.
10. A GRADING PERMIT FROM THE CITY OF MORENO VALLEY WILL BE REQUIRED PRIOR TO COMMENCEMENT OF WORK.
11. ALL WORK DETAILED ON THESE PLANS TO BE PERFORMED, EXCEPT AS OTHERWISE STATED OR PROVIDED HEREON, SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF MORENO VALLEY STANDARDS AND SPECIFICATIONS.

BASIS OF BEARINGS

THE BEARING OF NORTH 01°03'46" EAST BEING THE CENTERLINE OF DAY STREET, AS SHOWN ON PARCEL MAP NO. 33152-1, FILE IN BOOK 229, PAGES 39 THROUGH 41, OF PARCEL MAPS, RECORDS OF RIVERSIDE COUNTY, STATE OF CALIFORNIA, WAS USED AS THE BASIS OF BEARINGS FOR THIS MAP.

BENCHMARK

NATIONAL GEODETIC SURVEY BENCHMARK PID "DX3794"
ELEVATION: 1669 (FEET) [DATUM: NAVD 88]
DESCRIBED AS: CGS TRIANGULAR STATION DISK STAMPED "SYCAMORE 1964" CEMENTED IN A DRILL HOLE IN THE WESTERLY SIDE OF THE TOP OF A LARGE BOULDER THAT MEASURES 7 FEET BY 4 FEET AND PROJECTS 1-1/2 FEET ABOVE THE GROUND SURFACE. IT IS ABOUT 3 FEET HIGHER IN ELEVATION THAN THE STATION MARK.

LOCATION: TO REACH FROM THE INTERSECTION OF U.S. HIGHWAY 60 AND 395 WHICH IS 5 MILES SOUTHEAST OF RIVERSIDE, GO SOUTH ON U.S. HIGHWAY 395 FOR 1.0 MILE TO A SIDE ROAD RIGHT JUST AFTER PASSING A RAILROAD DEPOT, TURN RIGHT AND GO WEST ON A TRACK ROAD FOR 0.75 MILE TO A FORK, KEEP LEFT AND CONTINUE WESTERLY ON A TRACK ROAD FOR 0.3 MILE TO A CROSSROAD, CONTINUE WESTERLY ON THE TRACK ROAD FOR 0.3 MILE TO THE TOP OF A LOW HILL AND A SIDE ROAD RIGHT, TURN RIGHT AND GO NORTHERLY ON A WINDING TRACK ROAD FOR 0.4 MILE TO A SMALL WOODEN BUILDING ON THE LEFT, CONTINUE NORTH ACROSS COUNTRY 0.1 MILE TO THE AZIMUTH MARK ON THE LEFT IN A LARGE ROUND BOULDER. FROM HERE PICK WAY NORTH, WEST, NORTH AND EAST AROUND A CULTIVATED FIELD FOR 0.5 MILE TO A LOW ROCKY KNOLL AND THE STATION JUST NORTH OF THE HIGHEST POINT.

ESTIMATED EARTHWORK QUANTITIES

CUT: 6,338 CY

FILL: 6,408 CY

NET: 70 CY FILL

NOTE: THE ABOVE QUANTITIES ARE APPROXIMATE IN PLACE VOLUMES CALCULATED FROM THE EXISTING GROUND TO THE PROPOSED FINISHED GRADE. EXISTING GROUND IS DEFINED BY THE CONTOURS AND SPOT GRADES ON THE BASE SURVEY. PROPOSED FINISHED GRADE IS DEFINED AS THE FINAL GRADE AS INDICATED ON THE GRADING PLAN(S).

THE EARTHWORK QUANTITIES ABOVE ARE FOR PERMIT PURPOSES ONLY. THEY HAVE NOT BEEN FACTORED TO ACCOUNT FOR CHANGES IN VOLUME DUE TO BULKING, CLEARING AND GRUBBING, SHRINKAGE, OVER- EXCAVATION AND RE-COMPACTION, AND CONSTRUCTION METHODS. NOR DO THEY ACCOUNT FOR THE THICKNESS OF PAVEMENT SECTIONS, FOOTINGS, SLABS, REUSE OF PULVERIZED MATERIALS THAT WILL UNDERLIE NEW PAVEMENTS, ETC. THE CONTRACTOR SHALL RELY ON THEIR OWN EARTHWORK ESTIMATES FOR BIDDING PURPOSES.

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60
1" = 30'
WHEN PRINTED AT FULL SIZE (24" BY 36")

PEN21-0025

BENCHMARK	BASIS OF BEARING
SEE SHEET 1 FOR BENCHMARK AND BASIS OF ELEVATION.	SEE SHEET 1 FOR BENCHMARK AND BASIS OF ELEVATION.

REVIEW BY CITY STAFF

OFFICE	INITIAL	DATE
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PRGM		

MARK	DATE	INITIAL	DESCRIPTION	REC	APPR	DATE
		EOR	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MICHAEL D. LLOYD, PE — DATE
ENGINEERING DIVISION MANAGER/ ASSISTANT CITY ENGINEER
RCE 69563

APPROVED:

MICHAEL L. WOLFE, PE — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
RCE 65623

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — SHEA-MICHAEL ANTI — RCE NO. 78274 — STATE OF CALIFORNIA — CIVIL

Kimley»Horn

3880 LEMON STREET SUITE 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

UNDER THE SUPERVISION OF:

SHEA-MICHAEL ANTI — 11/10/21
RCE C78274 — DATE

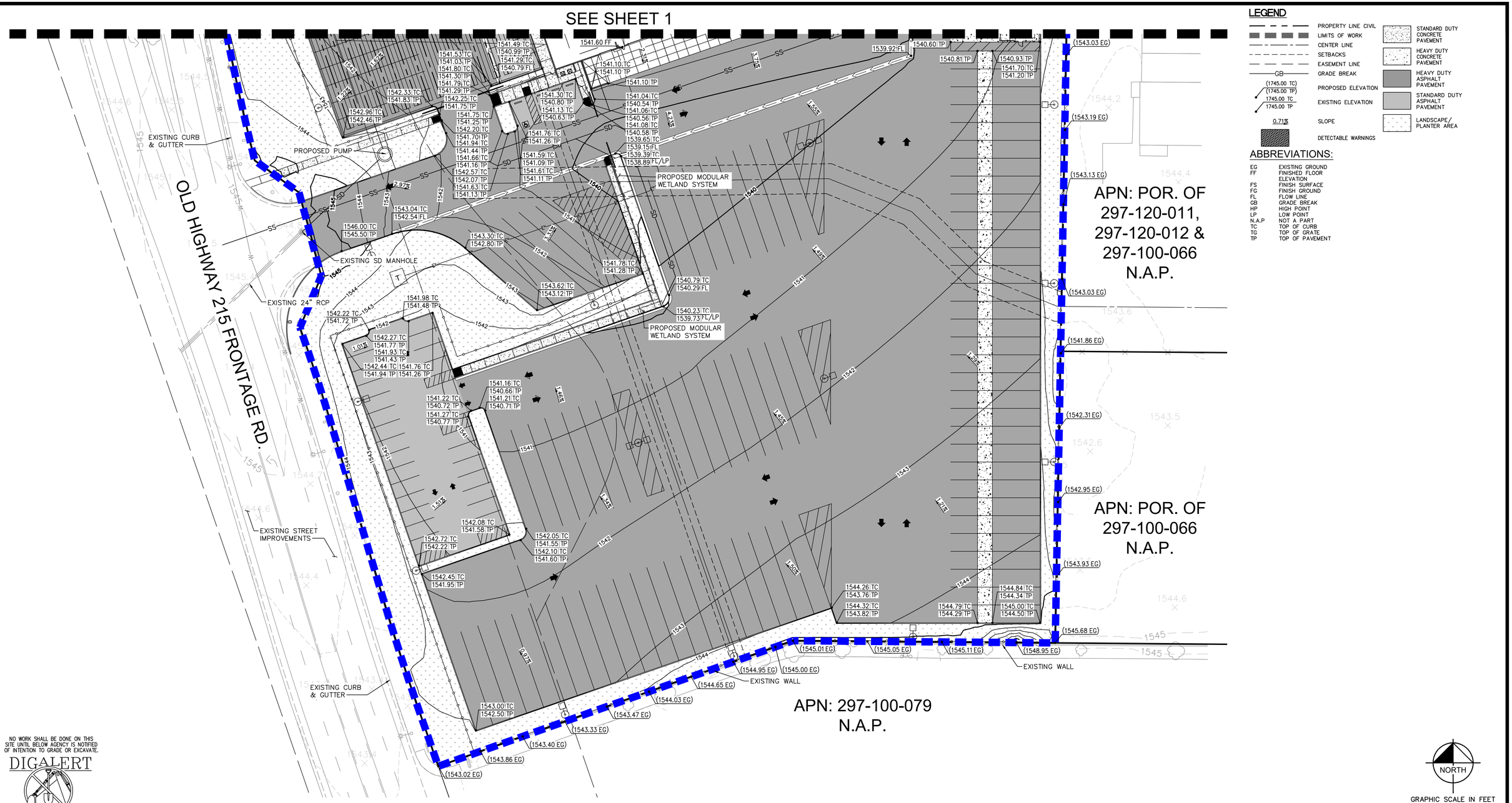
CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN

PENSKE MORENO VALLEY

SHEET 1 OF 2

CITY ID No. LGRXX-XXXX



LEGEND

- PROPERTY LINE CIVIL
- LIMITS OF WORK
- CENTER LINE
- SETBACKS
- EASEMENT LINE
- GB — GRADE BREAK
- (1745.00 TC) / (1745.00 TP) / 1745.00 TC / 1745.00 TP — PROPOSED ELEVATION / EXISTING ELEVATION
- 0.71% — SLOPE
- DETECTABLE WARNINGS
- STANDARD DUTY CONCRETE PAVEMENT
- HEAVY DUTY CONCRETE PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- STANDARD DUTY ASPHALT PAVEMENT
- LANDSCAPE/ PLANTER AREA

ABBREVIATIONS:

EG	EXISTING GROUND
FF	FINISHED FLOOR ELEVATION
FS	FINISH SURFACE
FG	FINISH GROUND
FL	FLOW LINE
GB	GRADE BREAK
HP	HIGH POINT
LP	LOW POINT
N.A.P	NOT A PART
TC	TOP OF CURB
TG	TOP OF GRATE
TP	TOP OF PAVEMENT

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

DIGALERT

CALL
811 or
1-800-422-4133
2 Working Days Before You Dig
WWW.CALL811.COM

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60
1" = 30'
WHEN PRINTED AT FULL SIZE (24" BY 36")

PEN21-0025

BENCHMARK	BASIS OF BEARING
SEE SHEET 1 FOR BENCHMARK AND BASIS OF ELEVATION.	SEE SHEET 1 FOR BENCHMARK AND BASIS OF ELEVATION.

REVIEW BY CITY STAFF

OFFICE	INITIAL	DATE
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PRGM		

MARK	DATE	INITIAL	DESCRIPTION	REC	APPR	DATE
		EOR	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MICHAEL D. LLOYD, PE — DATE
ENGINEERING DIVISION MANAGER/ ASSISTANT CITY ENGINEER
RCE 69563

APPROVED:

MICHAEL L. WOLFE, PE — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
RCE 65623

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — SHEA-MICHAEL ANTI — RCE NO. 78274 — CIVIL — STATE OF CALIFORNIA

Kimley»Horn

3880 LEMON STREET SUITE 420, RIVERSIDE, CA 92501
PHONE: 951-543-9868

UNDER THE SUPERVISION OF:
SHEA-MICHAEL ANTI — 11/10/21 — DATE
RCE C78274

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN

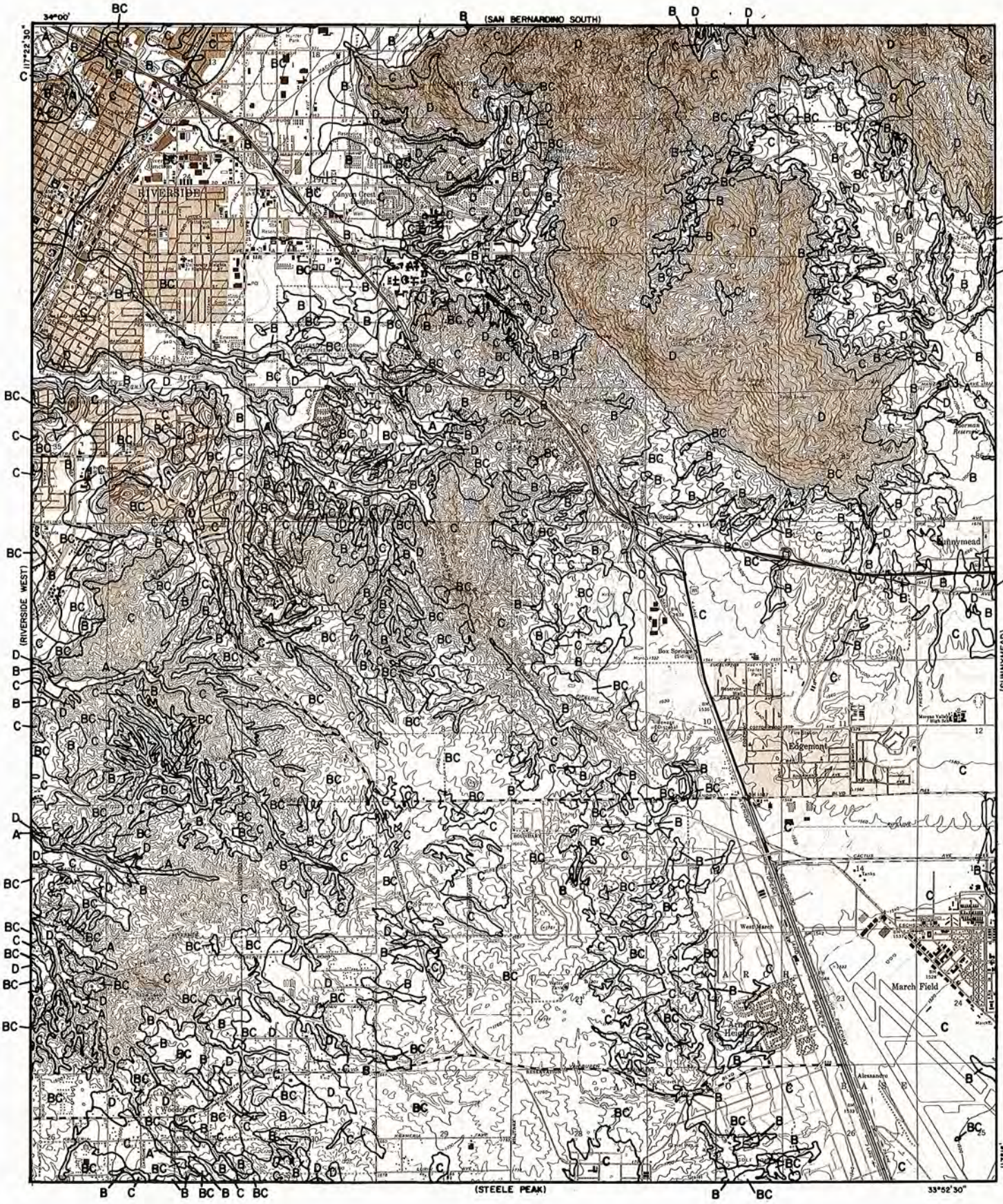
PENSKE MORENO VALLEY

SHEET 2 OF 2

CITY ID No.
LGRXX-XXXX

Appendix D

Hydrology Manual and Other Reference Material



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR RIVERSIDE–EAST

PLATE C–1.16

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

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HYDROLOGY MANUAL

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

ACTUAL IMPERVIOUS COVER

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

Notes:

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

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

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

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IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6

RUNOFF COEFFICIENT CURVE DATA

The data in the following tables may be used to develop runoff coefficient (C) curves for any combination of runoff index (RI) number and antecedent mositure condition (AMC). For an RI number with an AMC of II (from Plate D-5.5) enter the tables on the following pages and plot the "C" curve data directly on Plate D-5.8. "C" curve data is given for even RI numbers only, but values may easily be interpolated for odd RI numbers.

For an AMC of I or III enter the tabulation on this page with the RI for AMC II, and read the appropriate RI for AMC I or III. Use this revised RI to enter the tables on the following pages to determine "C". For example if RI = 40 for AMC II, then RI = 22 for AMC I and RI = 60 for AMC III.

AMC ADJUSTMENT RELATIONSHIPS

RI FOR AMC II	RI FOR OTHER AMC CONDITIONS: AMC I	AMC III	RI FOR AMC II	RI FOR OTHER AMC CONDITIONS: AMC I	AMC III
10	--	22	55	35	74
11	--	24	56	36	75
12	--	25	57	37	75
13	--	27	58	38	76
14	--	28	59	39	77
15	--	30	60	40	78
16	--	31	61	41	78
17	--	33	62	42	79
18	--	34	63	43	80
19	--	36	64	44	81
20	--	37	65	45	82
21	10	38	66	46	82
22	10	39	67	47	83
23	11	41	68	48	84
24	11	42	69	50	84
25	12	43	70	51	85
26	12	44	71	52	86
27	13	46	72	53	86
28	14	47	73	54	87
29	14	49	74	55	88
30	15	50	75	57	88
31	16	51	76	58	89
32	16	52	77	59	89
33	17	53	78	60	90
34	18	54	79	62	91
35	18	55	80	63	91
36	19	56	81	64	92
37	20	57	82	66	92
38	21	58	83	67	93
39	21	59	84	68	93
40	22	60	85	70	94
41	23	61	86	72	94
42	24	62	87	73	95
43	25	63	88	75	95
44	25	64	89	76	96
45	26	65	90	78	96
46	27	66	91	80	97
47	28	67	92	81	97
48	29	68	93	83	98
49	30	69	94	85	98
50	31	70	95	87	98
51	31	70	96	89	99
52	32	71	97	91	99
53	33	72	98	94	99
54	34	73	99	97	--

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

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

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RUNOFF INDEX NUMBERS FOR PERVIOUS AREAS

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

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

Notes:

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

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

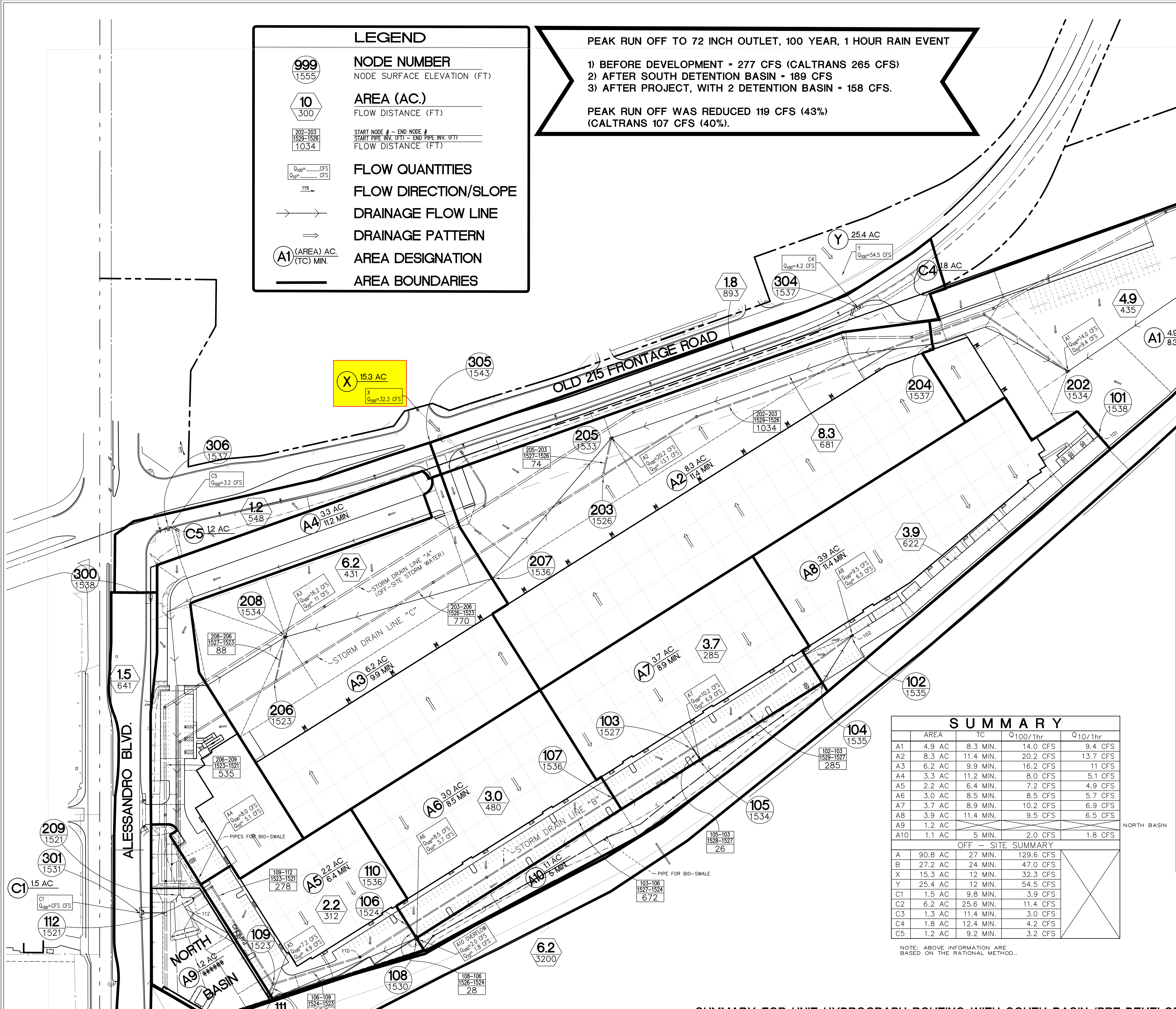
3. See Plate C-2 for a detailed description of cover types.

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

5. Reference Bibliography item 17.

Appendix E

Reference Plans

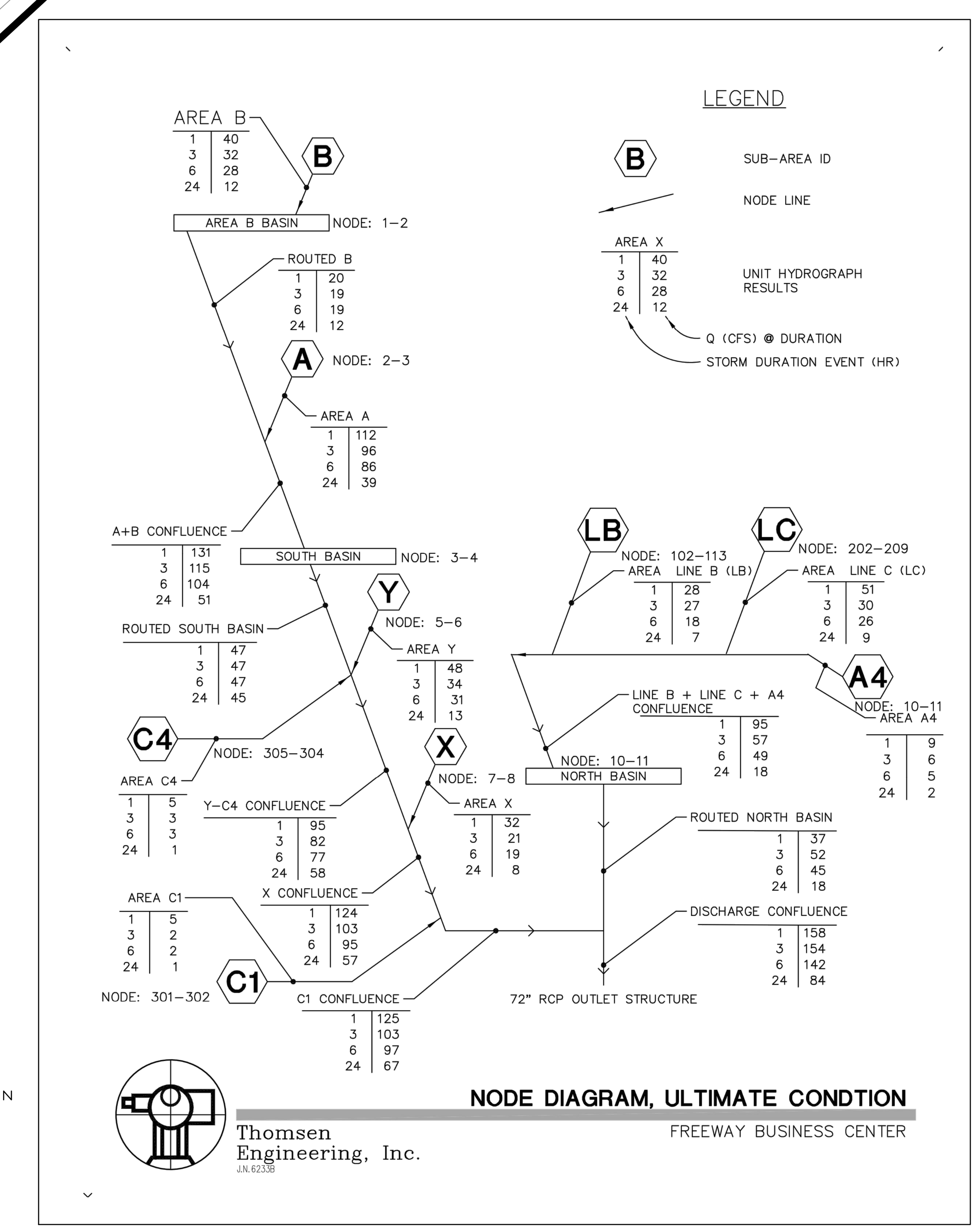


SUMMARY

	AREA	TC	$Q_{100/1hr}$	$Q_{10/1hr}$
A1	4.9 AC	8.3 MIN.	14.0 CFS	9.4 CFS
A2	8.3 AC	11.4 MIN.	20.2 CFS	13.7 CFS
A3	6.2 AC	9.9 MIN.	16.2 CFS	11 CFS
A4	3.3 AC	11.2 MIN.	8.0 CFS	5.1 CFS
A5	2.2 AC	6.4 MIN.	7.2 CFS	4.9 CFS
A6	3.0 AC	8.5 MIN.	8.5 CFS	5.7 CFS
A7	3.7 AC	8.9 MIN.	10.2 CFS	6.9 CFS
A8	3.9 AC	11.4 MIN.	9.5 CFS	6.5 CFS
A9	1.2 AC			
A10	1.1 AC	5 MIN.	2.0 CFS	1.8 CFS
OFF - SITE SUMMARY				
A	90.8 AC	27 MIN.	129.6 CFS	
B	27.2 AC	24 MIN.	47.0 CFS	
X	15.3 AC	12 MIN.	32.3 CFS	
Y	25.4 AC	12 MIN.	54.5 CFS	
C1	1.5 AC	9.8 MIN.	3.9 CFS	
C2	6.2 AC	25.6 MIN.	11.4 CFS	
C3	1.3 AC	11.4 MIN.	3.0 CFS	
C4	1.8 AC	12.4 MIN.	4.2 CFS	
C5	1.2 AC	9.2 MIN.	3.2 CFS	

NORTH BASIN

NOTE: ABOVE INFORMATION ARE BASED ON THE RATIONAL METHOD..



POST DEVELOPMENT SUMMARY

GRAPHIC SCALE

(IN FEET)
1 inch = 80 ft.

SUMMARY FOR UNIT HYDROGRAPH ROUTING WITH SOUTH BASIN (PRE-DEVELOPMENT)

		AREA B: 27.2 ACRES, Tc = 0.33 HR, UNIT HYDROGRAPH		EXISTING BASIN (AREA B), BASIN ROUTING			AREA A; 90.8 ACRES, Tc = 0.43 HR, UNIT HYDROGRAPH			PROPOSED BASIN (AREA A), BASIN ROUTING		
STORM YEAR	DURATION HOURS	AREA B PEAK FLOW CFS	TOTAL VOLUME AC-FT	ROUTING PEAK CFS	BASIN VOLUME AC-FT	BASIN DEPTH FT	AREA A PEAK FLOW CFS	TOTAL PEAK FLOW CFS	TOTAL VOLUME AC-FT	ROUTING PEAK CFS	BASIN VOLUME AC-FT	BASIN DEPTH FT
100	1	39.7	2.6	19.6	0.8	2.4	111.7	130.9	11.1	46.5	3.7	6.7
100	3	31.8	3.9	19.3	0.8	2.3	96.4	115.0	16.7	47.6	4.4	6.6
100	6	27.9	4.9	18.6	0.7	2.0	85.9	103.8	21.4	47.0	4.0	6.5
100	24	12.2	7.6	11.6	0.2	0.7	39.0	50.5	32.8	45	---	---

STORM YEAR	DURATION HOURS	AREA Y: 19.5 ACRES, Tc = 0.16 HR., UNIT HYDROGRAPH			AREA X: 15.3 ACRES, Tc= 0.16 HR., UNIT HYDROGRAPH			AREA C: 49 ACRES, PRE-DEVELOPMENT, UNIT HYDROGRAPH		
		AREA Y PEAK FLOW CFS	TOTAL PEAK FLOW CFS	TOTAL VOLUME AC-FT	AREA X PEAK FLOW CFS	TOTAL PEAK FLOW CFS	TOTAL VOLUME AC-FT	AREA C PEAK FLOW CFS	TOTAL PEAK FLOW CFS	TOTAL VOLUME AC-FT
100	1	48.6	93.7	13.9	29.7	122.1	15.4	128.9	188.7	19.5
100	3	33.8	78.8	21.1	22.3	100.0	23.4	75.5	172.6	30.3
100	6	30.7	75.7	27.6	19.4	94.5	30.5	63.1	156.2	39.4
100	24	12.6	57.6	40.2	6.0	65.3	44.7	23.6	88.8	58.3

PREPARED FOR:

PROFICIENCY 215 LLC

11777 SAN VICENTE BLVD., STE. 780
LOS ANGELES, LA 90049
Business (310) 979-8000 Business Fax (310) 979-7772

PROPOSED HYDROLOGY

ALESSANDRO BLVD. & EAST FRONTAGE ROAD

MARCH AIR FORCE BASE SITE D-3
IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

Thomsen Engineering, Inc.
Civil Engineering, Land Planning & Land Surveying
590-I W Central Ave
Brea, CA 92845
Tel. (626) 965-9350
Fax (626) 965-2379

SCALE 1"= 80
DATE Sept 2018
JOB NO. 6233B
SHEET 2 OF 2

JN 6233B ~ 09/07/2018

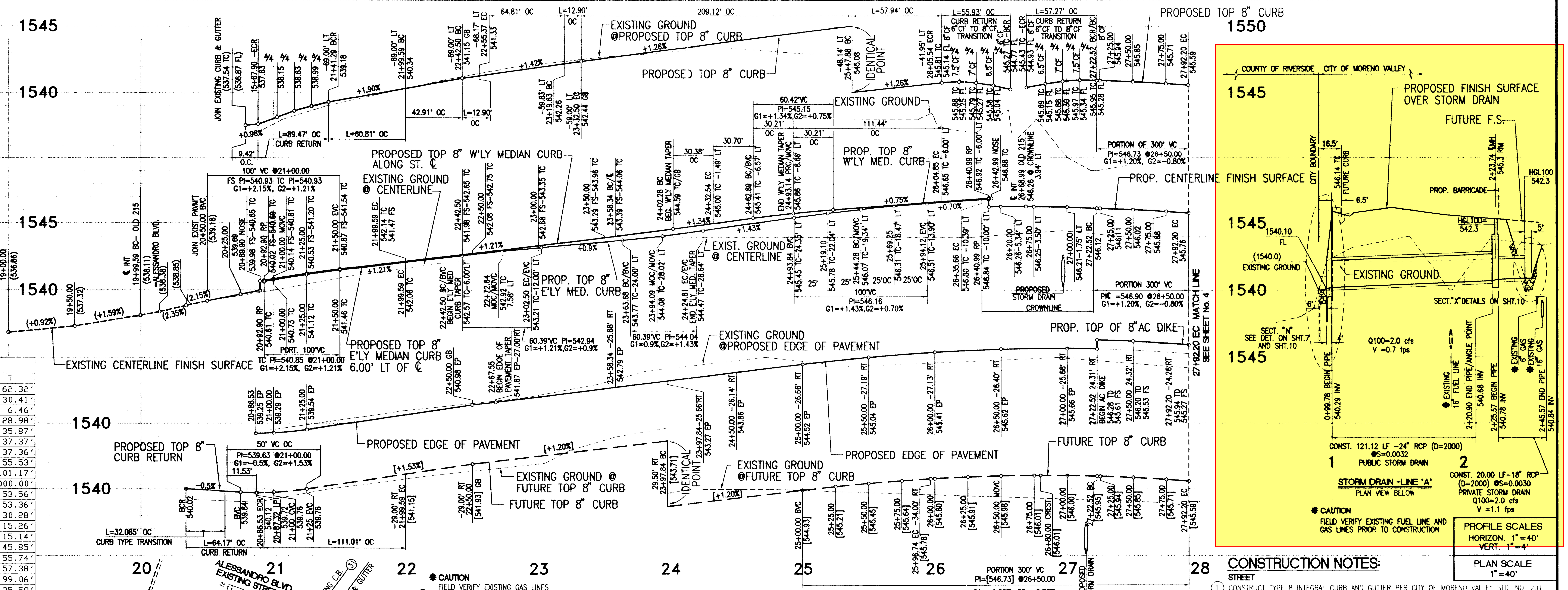
tei-151204.1425
None: Xref

COURSE DATA

LINE	BEARING	DISTANCE
L1	N11°58'24"W	42.91'
L2	N 4°34'53"W	64.81'
L3	N11°58'24"W	209.12'
L4	N11°58'24"W	198.97'
L5	N19°03'33"W	125.78'
L6	N11°58'24"W	42.91'
L7	N22°58'24"W	62.27'
L8	N11°58'24"W	202.70'
L9	N11°58'24"W	118.02'
L10	N24°42'15"W	30.70'
L11	N14°53'30"W	5.49'
L12	N19°03'33"W	36.14'
L13	N43°58'00"E	122.78'
L14	N43°58'00"E	53.53'
L15	N11°58'24"W	158.75'

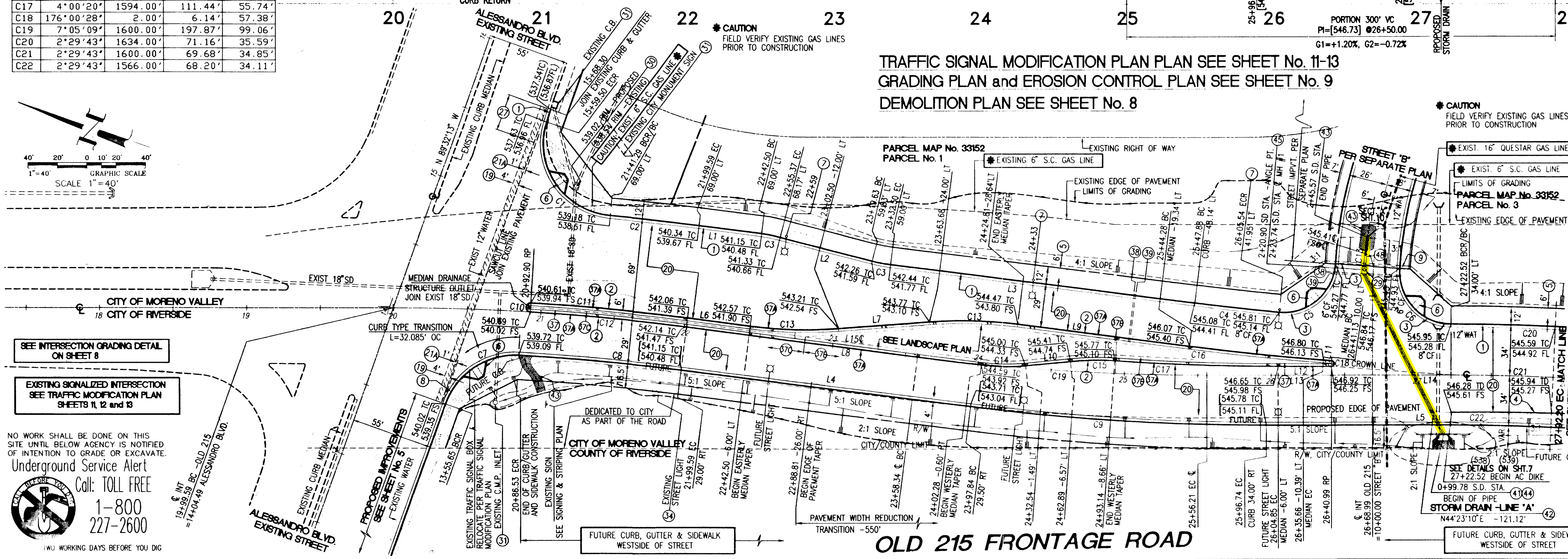
CURVE TABLE

#	Δ	R	L	T
C1	102°31'17"	50.00'	89.47'	62.32'
C2	2°05'15"	1669.00'	60.81'	30.41'
C3	7°23'31"	100.00'	12.90'	6.46'
C4	1°52'29"	1771.00'	57.94'	28.98'
C5	91°24'03"	35.00'	55.83'	35.87'
C6	93°45'21"	35.00'	57.27'	37.37'
C7	73°31'52"	50.00'	64.17'	37.36'
C8	4°02'56"	1571.00'	111.01'	55.53'
C9	7°05'09"	1634.00'	202.08'	101.17'
C10	180°00'00"	3.00'	9.42'	1000.00'
C11	3°49'14"	1606.00'	107.09'	53.56'
C12	3°49'14"	1600.00'	106.69'	53.36'
C13	10°48'07"	320.32'	60.39'	30.28'
C14	13°18'93"	130.77'	30.38'	15.26'
C15	8°58'06"	193.00'	30.21'	15.14'
C16	2°55'06"	1800.00'	91.69'	45.85'
C17	4°00'20"	1594.00'	111.44'	55.74'
C18	176°00'28"	2.00'	6.14'	57.38'
C19	7°05'09"	1600.00'	197.87'	99.06'
C20	2°29'43"	1634.00'	71.16'	35.59'
C21	2°29'43"	1600.00'	69.68'	34.85'
C22	2°29'43"	1566.00'	68.20'	34.11'



PLAN SCALE 1"=40'

TRAFFIC SIGNAL MODIFICATION PLAN PLAN SEE SHEET No. 11-13
GRADING PLAN and EROSION CONTROL PLAN SEE SHEET No. 9
DEMOLITION PLAN SEE SHEET No. 8



NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.
Underground Service Alert
Call: TOLL FREE
1-800 227-2600
TWO WORKING DAYS BEFORE YOU DIG

CONSTRUCTION NOTES:

STREET

1. CONSTRUCT TYPE B INTEGRAL CURB AND GUTTER PER CITY OF MORENO VALLEY STD. NO. 201
2. CONSTRUCT TYPE 8A CURB PER CITY OF MORENO VALLEY STD. NO. 203
3. CONSTRUCT 6" TO 8" TRANSITION CURB AND GUTTER
4. CONSTRUCT 8" AC DIKE, CASE B PER CITY OF MORENO VALLEY STD. NO. 207
5. CONSTRUCT 4" THICK PROPERTY LINE SIDEWALK PER CITY OF MORENO VALLEY STD. NO. 211
6. CONSTRUCT ACCESS RAMP TYPE I PER CITY OF MORENO VALLEY STD. NO. 214A
7. CONSTRUCT STREET LIGHT (22,000 LUMEN) PER CITY OF MORENO VALLEY STD. NO. 501
8. CONSTRUCT MODIFIED 8 CURB AND GUTTER PER DETAIL ON SHEET 10
9. CONSTRUCT TEMPORARY METAL BEAM BARRICADE PER CITY OF MORENO VALLEY STD. NO. 413A
19. COLD PLANE EXISITING A.C. PAVEMENT AND OVERLAY AND A.C. SEAL 1 1/2" MINIMUM THICKNESS
20. CONSTRUCT 5 1/2" A.C. OVER 9" A.B. (FINAL SECTION TO BE DETERMINED BY SOILS ENGINEER)
21. CONSTRUCT FULL DEPTH A.C. PAVEMENT
28. CONSTRUCT RETAINING WALL PER SEPERATE PERMIT
30. ADJUST EXISTING STORM DRAIN MANHOLE TO GRADE
31. PROTECT IN PLACE
34. REMOVE EXISTING STREET LIGHT
37. CONSTRUCT RAISED MEDIAN HARDSCAPE PER CITY OF MORENO STD. NO. 112A & 112B
37A. CONSTRUCT RAISED LANDSCAPE MEDIAN MOW STRIP PER CITY OF MORENO STD. NO. 111
37B. CONSTRUCT RAISED LANDSCAPE DRAINAGE STRUCTURE PER CITY OF MORENO STD. NO. 111
37C. CONSTRUCT RAISED LANDSCAPE DRAINAGE STRUCTURE DISPOSAL STORM DRAIN -4" PVC SDR35
38. INSTALL 4" SCH40 SLEEVE PER CITY OF MORENO STD. NO. 521
39. INSTALL 2" SCH40 SLEEVE PER CITY OF MORENO STD. NO. 521

STORM DRAIN

41. CONSTRUCT HEADWALL PER DETAIL ON SHEET 10
42. CONSTRUCT 24" RCP STORM DRAIN (D LOAD PER PROFILE)
43. CONSTRUCT RIP-RAP INLET/SPLASH PAD (3"-4" DIA. ROCKS)
44. CONSTRUCT RIP-RAP ENERGY DISSIPATOR PER DETAILS ON SHEET 10
45. CONSTRUCT MANHOLE NO.1 PER RCFCD STD. DWG. NO. MH251
48. CONSTRUCT 18" RCP STORM DRAIN (D LOAD PER PROFILE)

BENCH MARK

B.M. NO. M-61-69
LOCATION:
AT THE NORTHWEST CORNER OF FREDERICK ST. AND ALESSANDRO BLVD. 175 FEET WEST OF FREDERICK ST. 48 FEET NORTH ALESSANDRO BLVD. 4 FEET SOUTHWEST OF GAS SATION LIGHT STANCHION AT THE SOUTH END AND INSIDE OF A 4 INCH HIGH CONCRETE PLANTER SET A BRASS DISK MARKED M-61-69 IN THE OP OF A CONCRETE POST "NO MARKER POST SET"

BASIS OF BEARING

THE BEARING OF NORTH 89°34'27" WEST OF THE CENTERLINE OF CACTUS AVENUE AS PER MAP RECORDED IN BOOK 73, PAGES 85 TO 99 INCLUSIVE, OF RECORDS OF SURVEY, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA HAS BEEN ROTATED 00°00'35" COUNTER CLOCKWISE TO A BEARING OF NORTH 89°35'02" WEST AND USED AS THE BASIS OF BEARINGS FOR THIS MAP.

REVIEW BY CITY STAFF

OFFICE	INITIAL	DATE
ENGINEERING DIVISION MANAGER	MB	7/10/09
ENTERPRISE SERVICES		
PLANNING		
TRANSPORTATION		
PARKS AND RECREATION		
LAND DEVELOPMENT		7/6/09

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS
DEPUTY PW DIR./ASST. CITY ENGINEER, R.C.E. #C52463 EXP. 12/31/2010 — 7/14/09
CHRIS VOGT, PUBLIC WORKS DIRECTOR/CITY ENGINEER, R.C.E. #C44250 EXP. 06/30/2011 — 7/15/09

ENGINEER OF RECORD'S SEAL
REGISTERED PROFESSIONAL ENGINEER, ELOURDIO ESPERANZA, No. 55246, Exp. 06-30-2010, CIVIL, STATE OF CALIFORNIA

MDS CONSULTING — PLANNERS ENGINEERS SURVEYORS
UNDER THE SUPERVISION OF
ELOURDIO ESPERANZA, RCE 55246 (EXP. 06/30/2010) — 6/9/09

CITY OF MORENO VALLEY
STREET IMPROVEMENT PLANS
OLD 215 FRONTAGE ROAD
PARCEL MAP NO. 33152
STA. 20+57 TO 28+00.00

ACCT. NO.
SHEET 3 NO. 17
CITY I.D. NO. 4223

Appendix F

NOAA Rainfall Data

NOAA Atlas 14, Volume 6, Version 2
Location name: Moreno Valley, California, USA*
Latitude: 33.9153°, Longitude: -117.2816°
Elevation: 1541.95 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.089 (0.074-0.107)	0.118 (0.098-0.143)	0.157 (0.131-0.191)	0.191 (0.157-0.234)	0.238 (0.190-0.302)	0.276 (0.215-0.358)	0.316 (0.240-0.421)	0.359 (0.265-0.492)	0.421 (0.297-0.601)	0.471 (0.321-0.697)
10-min	0.127 (0.106-0.154)	0.169 (0.141-0.204)	0.225 (0.187-0.274)	0.273 (0.225-0.335)	0.341 (0.272-0.433)	0.396 (0.308-0.513)	0.453 (0.344-0.603)	0.515 (0.380-0.705)	0.603 (0.426-0.862)	0.675 (0.460-1.00)
15-min	0.154 (0.129-0.186)	0.204 (0.170-0.247)	0.273 (0.227-0.331)	0.330 (0.272-0.405)	0.413 (0.329-0.523)	0.479 (0.373-0.621)	0.548 (0.416-0.729)	0.623 (0.460-0.853)	0.729 (0.515-1.04)	0.816 (0.556-1.21)
30-min	0.237 (0.198-0.286)	0.314 (0.262-0.380)	0.419 (0.348-0.509)	0.508 (0.419-0.622)	0.634 (0.505-0.805)	0.736 (0.573-0.954)	0.843 (0.640-1.12)	0.958 (0.707-1.31)	1.12 (0.792-1.60)	1.25 (0.855-1.86)
60-min	0.337 (0.282-0.408)	0.447 (0.373-0.542)	0.597 (0.497-0.726)	0.724 (0.597-0.888)	0.905 (0.720-1.15)	1.05 (0.817-1.36)	1.20 (0.913-1.60)	1.37 (1.01-1.87)	1.60 (1.13-2.29)	1.79 (1.22-2.65)
2-hr	0.490 (0.409-0.593)	0.636 (0.530-0.770)	0.830 (0.690-1.01)	0.992 (0.817-1.22)	1.22 (0.968-1.54)	1.39 (1.08-1.80)	1.57 (1.20-2.09)	1.77 (1.30-2.42)	2.03 (1.43-2.90)	2.24 (1.53-3.32)
3-hr	0.598 (0.500-0.724)	0.771 (0.643-0.933)	0.999 (0.831-1.21)	1.19 (0.979-1.45)	1.45 (1.15-1.83)	1.65 (1.28-2.14)	1.85 (1.41-2.47)	2.07 (1.53-2.83)	2.37 (1.67-3.38)	2.60 (1.77-3.85)
6-hr	0.824 (0.688-0.997)	1.06 (0.882-1.28)	1.36 (1.13-1.66)	1.61 (1.33-1.98)	1.95 (1.56-2.48)	2.22 (1.73-2.87)	2.48 (1.89-3.30)	2.76 (2.03-3.78)	3.13 (2.21-4.48)	3.42 (2.33-5.07)
12-hr	1.07 (0.894-1.30)	1.39 (1.16-1.68)	1.80 (1.49-2.18)	2.13 (1.76-2.61)	2.59 (2.06-3.28)	2.94 (2.29-3.81)	3.29 (2.50-4.38)	3.65 (2.70-5.00)	4.15 (2.93-5.93)	4.53 (3.09-6.71)
24-hr	1.40 (1.24-1.62)	1.84 (1.63-2.13)	2.42 (2.13-2.80)	2.89 (2.53-3.37)	3.53 (2.99-4.25)	4.02 (3.34-4.95)	4.52 (3.66-5.69)	5.04 (3.97-6.52)	5.73 (4.34-7.73)	6.28 (4.60-8.75)
2-day	1.67 (1.48-1.93)	2.23 (1.97-2.58)	2.97 (2.62-3.44)	3.58 (3.13-4.18)	4.41 (3.73-5.31)	5.05 (4.19-6.21)	5.70 (4.62-7.18)	6.37 (5.03-8.25)	7.29 (5.52-9.83)	8.01 (5.86-11.2)
3-day	1.79 (1.58-2.06)	2.42 (2.14-2.79)	3.25 (2.87-3.77)	3.94 (3.45-4.60)	4.88 (4.14-5.89)	5.61 (4.66-6.91)	6.36 (5.15-8.01)	7.14 (5.63-9.24)	8.20 (6.21-11.1)	9.03 (6.61-12.6)
4-day	1.93 (1.71-2.23)	2.64 (2.33-3.04)	3.57 (3.15-4.14)	4.35 (3.80-5.07)	5.41 (4.58-6.52)	6.24 (5.17-7.67)	7.08 (5.74-8.92)	7.97 (6.28-10.3)	9.18 (6.95-12.4)	10.1 (7.42-14.1)
7-day	2.18 (1.93-2.51)	3.02 (2.67-3.49)	4.14 (3.65-4.80)	5.07 (4.43-5.92)	6.36 (5.38-7.66)	7.36 (6.11-9.05)	8.39 (6.80-10.6)	9.47 (7.47-12.3)	11.0 (8.29-14.8)	12.1 (8.88-16.9)
10-day	2.32 (2.05-2.68)	3.24 (2.87-3.75)	4.48 (3.95-5.19)	5.51 (4.82-6.43)	6.94 (5.88-8.36)	8.06 (6.69-9.91)	9.22 (7.47-11.6)	10.4 (8.22-13.5)	12.1 (9.17-16.3)	13.4 (9.83-18.7)
20-day	2.76 (2.44-3.18)	3.90 (3.45-4.50)	5.45 (4.81-6.31)	6.76 (5.91-7.89)	8.59 (7.27-10.4)	10.0 (8.34-12.4)	11.6 (9.37-14.6)	13.2 (10.4-17.1)	15.4 (11.7-20.8)	17.2 (12.6-24.0)
30-day	3.26 (2.88-3.76)	4.60 (4.07-5.31)	6.45 (5.68-7.46)	8.01 (7.00-9.35)	10.2 (8.66-12.3)	12.0 (9.96-14.8)	13.9 (11.2-17.5)	15.9 (12.5-20.5)	18.7 (14.1-25.2)	20.9 (15.3-29.2)
45-day	3.86 (3.42-4.45)	5.40 (4.78-6.24)	7.54 (6.65-8.73)	9.37 (8.19-10.9)	12.0 (10.2-14.5)	14.1 (11.7-17.4)	16.4 (13.3-20.6)	18.8 (14.8-24.3)	22.3 (16.8-30.0)	25.1 (18.3-34.9)
60-day	4.48 (3.96-5.16)	6.18 (5.47-7.14)	8.57 (7.55-9.92)	10.6 (9.29-12.4)	13.6 (11.5-16.4)	16.0 (13.3-19.7)	18.6 (15.1-23.4)	21.4 (16.9-27.7)	25.4 (19.3-34.3)	28.8 (21.0-40.1)

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

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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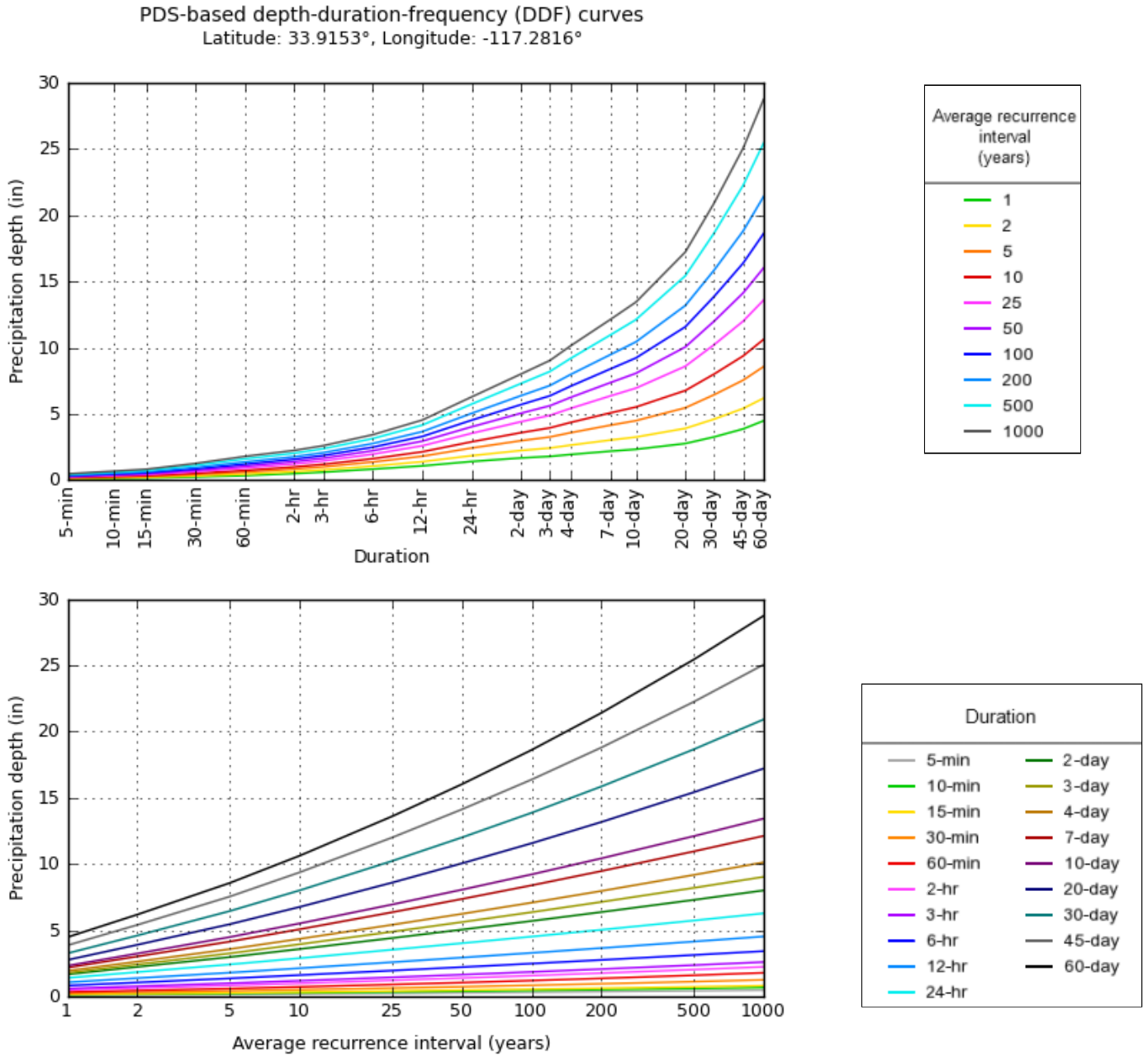
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Nov 4 15:53:34 2021

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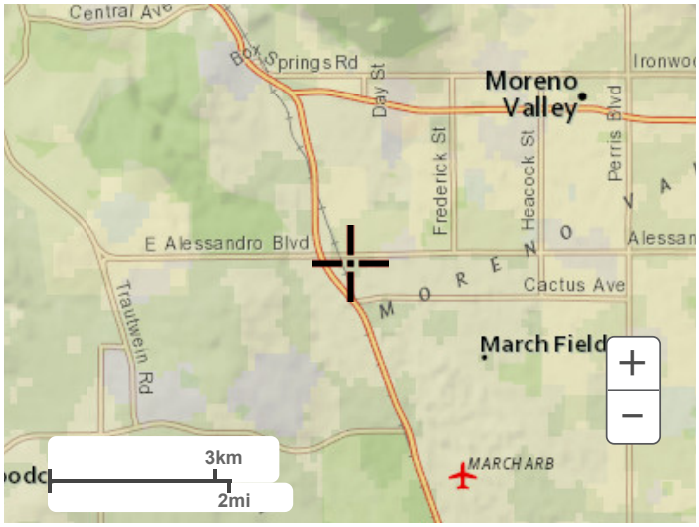
Maps & aerials

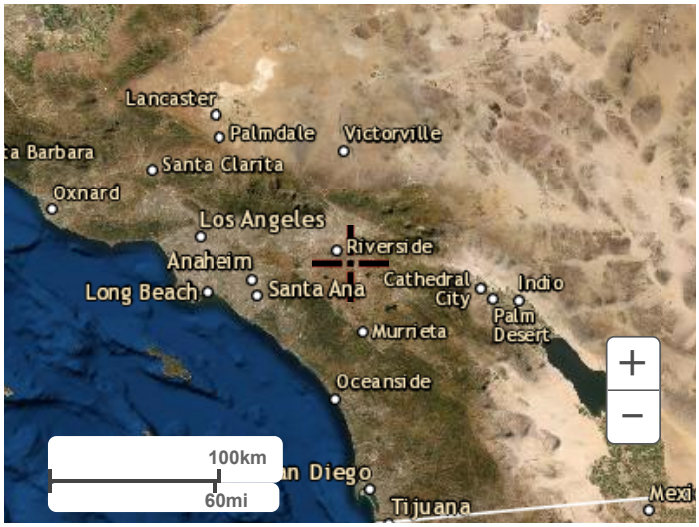
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



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

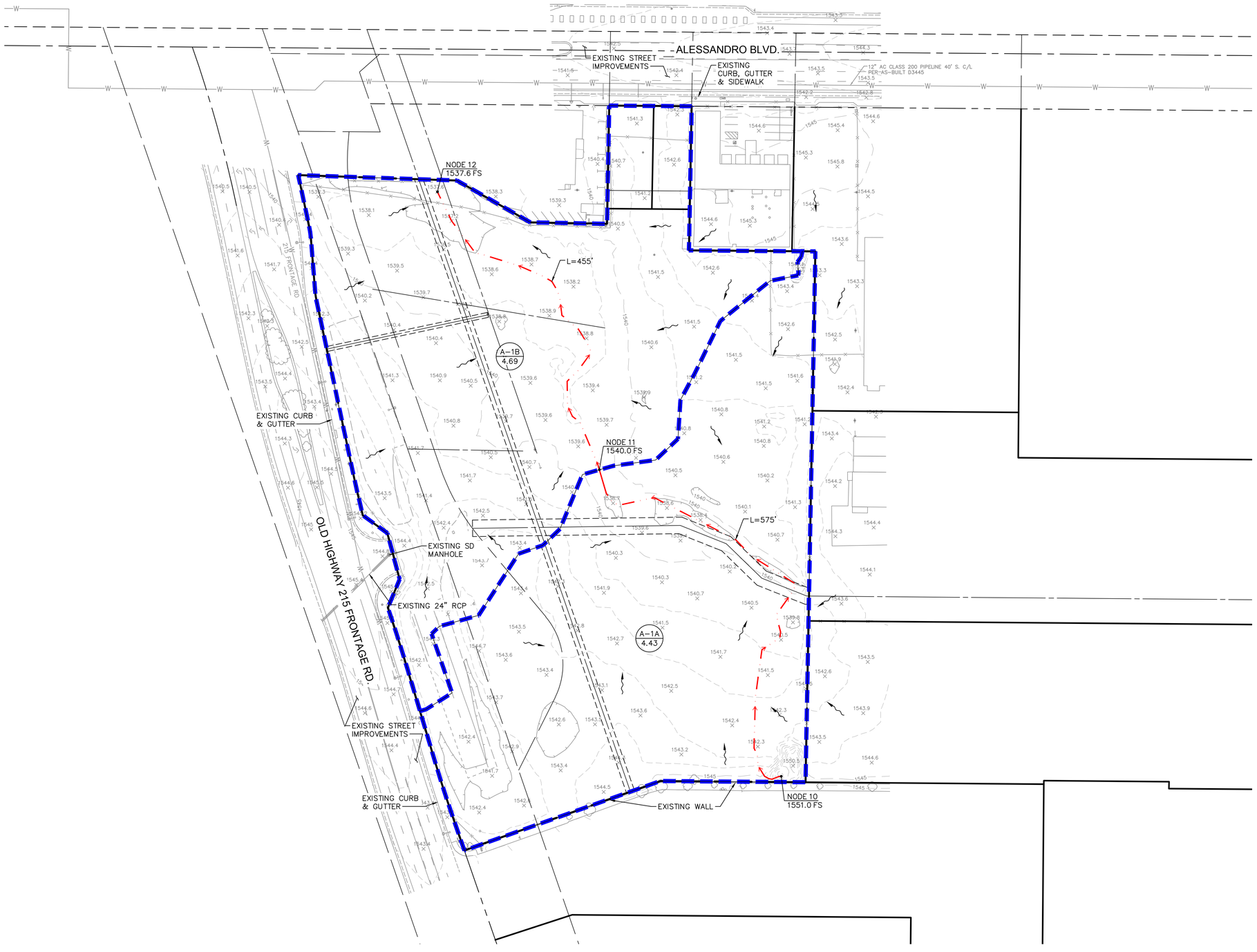
Disclaimer

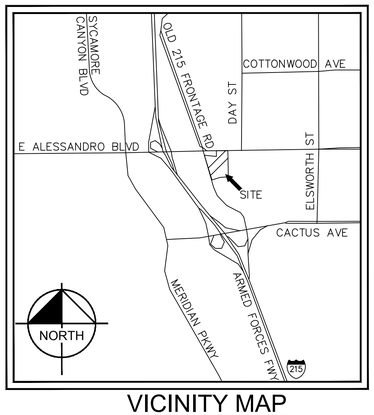
Appendix G

Drainage Maps

LEGEND

(1695)	EXISTING CONTOUR
	PROPERTY LINE
	DMA BOUNDARY
	FLOW PATH
	FLOW ARROW
NODE 10 50.00 FS	NODE ID AND ELEVATION
X XX	DA NAME DA AREA (IN ACRES)
	RIGHT OF WAY





VICINITY MAP

NTS

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120
1" = 60'
WHEN PRINTED AT FULL SIZE
(24" BY 36")

Kimley»Horn

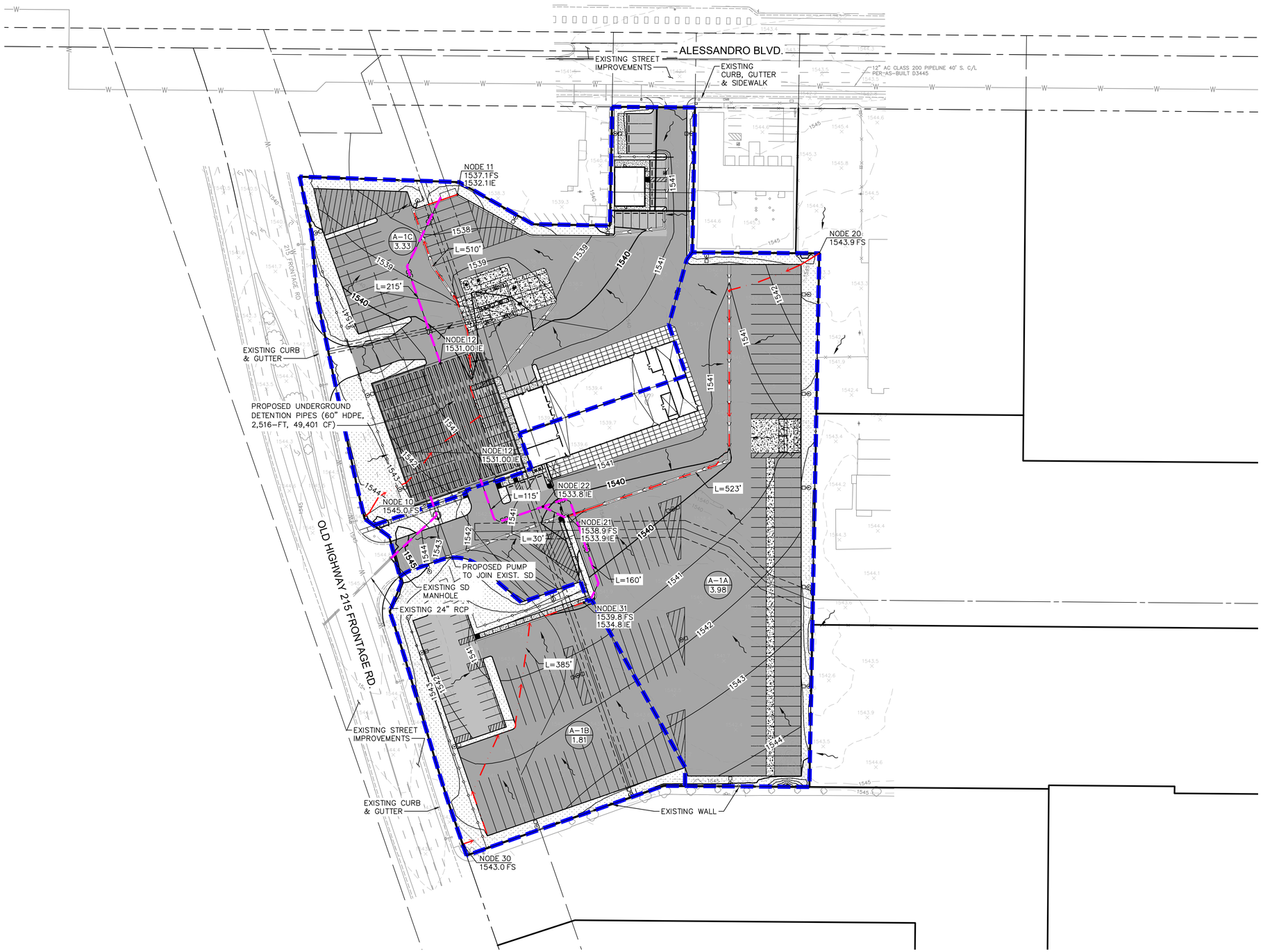
EXISTING DRAINAGE EXHIBIT

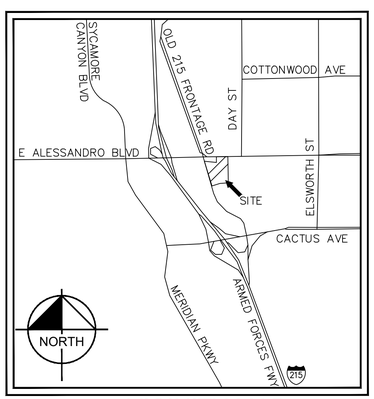
PENSKE MORENO VALLEY

11/9/2021

LEGEND

1695	PROPOSED CONTOUR
(1695)	EXISTING CONTOUR
	PROPERTY LINE
	DMA BOUNDARY
	PROPOSED STORM DRAIN
	FLOW PATH
	FLOW ARROW
NODE 10 50.00 FS	NODE ID AND ELEVATION
X XX	DA NAME DA AREA (IN ACRES)
	RIGHT OF WAY





VICINITY MAP

NTS

NORTH

GRAPHIC SCALE IN FEET

0 30 60 120

1" = 60'

WHEN PRINTED AT FULL SIZE (24" BY 36")

Kimley»Horn

PROPOSED DRAINAGE EXHIBIT

PENSKE MORENO VALLEY

11/10/2021

Appendix H

Rational Method Analysis

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 11/04/21 File:P10E.out

PENSKE MORENO VALLEY
EXIST 10-YR
XO 11/4/21

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

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

Program License Serial Number 6443

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

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.820(In/Hr)
Slope of intensity duration curve = 0.5000

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 575.000(Ft.)
Top (of initial area) elevation = 51.000(Ft.)
Bottom (of initial area) elevation = 40.000(Ft.)
Difference in elevation = 11.000(Ft.)
Slope = 0.01913 s(percent)= 1.91
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.852 min.
Rainfall intensity = 1.648(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 5.806(CFS)
Total initial stream area = 4.430(Ac.)
Pervious area fraction = 1.000

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of natural channel elevation =     40.000(Ft.)
End of natural channel elevation =     37.600(Ft.)
Length of natural channel  =   455.000(Ft.)
Estimated mean flow rate at midpoint of channel =      8.880(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   1.76(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0053
Corrected/adjusted channel slope =  0.0053
Travel time =    4.30 min.     TC =   19.16  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.451(In/Hr) for a    10.0 year storm
Subarea runoff =      5.328(CFS) for      4.690(Ac.)
Total runoff =     11.135(CFS)  Total area =       9.120(Ac.)
End of computations, total study area =            9.12 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  86.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 11/03/21 File:P100E.out

PENSKE MORENO VALLEY
EXIST 100-YR
XO 11/3/21

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

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

Program License Serial Number 6443

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5000

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 575.000(Ft.)
Top (of initial area) elevation = 51.000(Ft.)
Bottom (of initial area) elevation = 40.000(Ft.)
Difference in elevation = 11.000(Ft.)
Slope = 0.01913 s(percent)= 1.91
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.852 min.
Rainfall intensity = 2.412(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.871
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3) = 94.40
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 9.311(CFS)
Total initial stream area = 4.430(Ac.)
Pervious area fraction = 1.000

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of natural channel elevation =     40.000(Ft.)
End of natural channel elevation =     37.600(Ft.)
Length of natural channel  =   455.000(Ft.)
Estimated mean flow rate at midpoint of channel =     14.240(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   1.99(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0053
Corrected/adjusted channel slope =  0.0053
Travel time =    3.81 min.     TC =   18.67  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  94.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.151(In/Hr) for a   100.0 year storm
Subarea runoff =      8.759(CFS) for      4.690(Ac.)
Total runoff =     18.070(CFS)  Total area =       9.120(Ac.)
End of computations, total study area =            9.12 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  86.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 11/10/21 File:P10P.out

PENSKE MORENO VALLEY
PROP 10-YR
XO 11/10/21

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

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

Program License Serial Number 6443

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

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.820(In/Hr)
Slope of intensity duration curve = 0.5000

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 510.000(Ft.)
Top (of initial area) elevation = 45.000(Ft.)
Bottom (of initial area) elevation = 37.100(Ft.)
Difference in elevation = 7.900(Ft.)
Slope = 0.01549 s(percent)= 1.55
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.000 min.
Rainfall intensity = 2.117(In/Hr) for a 10.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 6.066(CFS)
Total initial stream area = 3.330(Ac.)
Pervious area fraction = 0.200

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =    32.100(Ft.)
Downstream point/station elevation =    31.000(Ft.)
Pipe length  =   215.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     6.066(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.066(CFS)
Normal flow depth in pipe =   11.58(In.)
Flow top width inside pipe =   17.25(In.)
Critical Depth =   11.42(In.)
Pipe flow velocity =      5.05(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =     9.71 min.
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.330(Ac.)
Runoff from this stream =      6.066(CFS)
Time of concentration =    9.71 min.
Rainfall intensity =     2.038(In/Hr)
Program is now starting with Main Stream No. 2
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   385.000(Ft.)
Top (of initial area) elevation =    43.000(Ft.)
Bottom (of initial area) elevation =    39.800(Ft.)
Difference in elevation =     3.200(Ft.)
Slope =    0.00831  s(percent)=       0.83
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.475 min.
Rainfall intensity =      2.063(In/Hr) for a    10.0 year storm
MOBILE HOME PARK subarea type
Runoff Coefficient = 0.849
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.250; Impervious fraction =  0.750
Initial subarea runoff =      3.172(CFS)
Total initial stream area =       1.810(Ac.)
Pervious area fraction = 0.250
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =    34.800(Ft.)
Downstream point/station elevation =    33.800(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     3.172(CFS)
Nearest computed pipe diameter  =     15.00(In.)
```

```
Calculated individual pipe flow  =     3.172(CFS)
Normal flow depth in pipe =    8.14(In.)
Flow top width inside pipe =   14.94(In.)
Critical Depth =    8.61(In.)
Pipe flow velocity =      4.66(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    10.05 min.
```

↟

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.810(Ac.)
Runoff from this stream =      3.172(CFS)
Time of concentration =   10.05 min.
Rainfall intensity =     2.004(In/Hr)
```

↟

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   523.000(Ft.)
Top (of initial area) elevation =    43.900(Ft.)
Bottom (of initial area) elevation =    38.900(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00956  s(percent)=       0.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.299 min.
Rainfall intensity =      2.083(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.294(CFS)
Total initial stream area =        3.980(Ac.)
Pervious area fraction = 0.100
```

↟

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    33.900(Ft.)
Downstream point/station elevation =    33.800(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     7.294(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     7.294(CFS)
Normal flow depth in pipe =   13.39(In.)
Flow top width inside pipe =   20.19(In.)
Critical Depth =   11.99(In.)
Pipe flow velocity =      4.50(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.41 min.
```

↟

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       22.000
```

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area = 3.980(Ac.)
Runoff from this stream = 7.294(CFS)
Time of concentration = 9.41 min.
Rainfall intensity = 2.071(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.172	10.05	2.004
2	7.294	9.41	2.071

Largest stream flow has longer or shorter time of concentration
Qp = 7.294 + sum of

Qa	Tb/Ta	
3.172 *	0.937 =	2.971

Qp = 10.266

Total of 2 streams to confluence:
Flow rates before confluence point:
3.172 7.294
Area of streams before confluence:
1.810 3.980
Results of confluence:
Total flow rate = 10.266(CFS)
Time of concentration = 9.410 min.
Effective stream area after confluence = 5.790(Ac.)

♠

++
Process from Point/Station 22.000 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 33.800(Ft.)
Downstream point/station elevation = 31.000(Ft.)
Pipe length = 115.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 10.266(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 10.266(CFS)
Normal flow depth in pipe = 11.55(In.)
Flow top width inside pipe = 12.62(In.)
Critical depth could not be calculated.
Pipe flow velocity = 10.12(Ft/s)
Travel time through pipe = 0.19 min.
Time of concentration (TC) = 9.60 min.

♠

++
Process from Point/Station 12.000 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 5.790(Ac.)
Runoff from this stream = 10.266(CFS)
Time of concentration = 9.60 min.
Rainfall intensity = 2.050(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.066	9.71	2.038

```
2       10.266      9.60                 2.050
Largest stream flow has longer or shorter time of concentration
Qp =     10.266 + sum of
          Qa          Tb/Ta
           6.066 *    0.989 =      5.997
Qp =     16.262

Total of 2 main streams to confluence:
Flow rates before confluence point:
       6.066      10.266
Area of streams before confluence:
        3.330        5.790


Results of confluence:
Total flow rate =     16.262(CFS)
Time of concentration =     9.599 min.
Effective stream area after confluence  =      9.120(Ac.)
End of computations, total study area =            9.12 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.166
Area averaged RI index number =  69.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 11/10/21 File:P100P.out

PENSKE MORENO VALLEY
PROP 100-YR
XO 11/10/21

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

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

Program License Serial Number 6443

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

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

Standard intensity-duration curves data (Plate D-4.1)
For the [Sunnymead-Moreno] area used.
10 year storm 10 minute intensity = 2.010(In/Hr)
10 year storm 60 minute intensity = 0.820(In/Hr)
100 year storm 10 minute intensity = 2.940(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5000

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 510.000(Ft.)
Top (of initial area) elevation = 45.000(Ft.)
Bottom (of initial area) elevation = 37.100(Ft.)
Difference in elevation = 7.900(Ft.)
Slope = 0.01549 s(percent)= 1.55
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.000 min.
Rainfall intensity = 3.098(In/Hr) for a 100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3) = 84.40
Pervious area fraction = 0.200; Impervious fraction = 0.800
Initial subarea runoff = 9.149(CFS)
Total initial stream area = 3.330(Ac.)
Pervious area fraction = 0.200

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =    32.100(Ft.)
Downstream point/station elevation =    31.000(Ft.)
Pipe length  =   215.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     9.149(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.149(CFS)
Normal flow depth in pipe =   13.50(In.)
Flow top width inside pipe =   20.12(In.)
Critical Depth =   13.50(In.)
Pipe flow velocity =      5.59(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =     9.64 min.
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.330(Ac.)
Runoff from this stream =      9.149(CFS)
Time of concentration =    9.64 min.
Rainfall intensity =     2.994(In/Hr)
Program is now starting with Main Stream No. 2
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   385.000(Ft.)
Top (of initial area) elevation =    43.000(Ft.)
Bottom (of initial area) elevation =    39.800(Ft.)
Difference in elevation =     3.200(Ft.)
Slope =    0.00831  s(percent)=       0.83
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.475 min.
Rainfall intensity =      3.020(In/Hr) for a   100.0 year storm
MOBILE HOME PARK subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.250; Impervious fraction =  0.750
Initial subarea runoff =      4.826(CFS)
Total initial stream area =        1.810(Ac.)
Pervious area fraction = 0.250
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =    34.800(Ft.)
Downstream point/station elevation =    33.800(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =     4.826(CFS)
Nearest computed pipe diameter  =     15.00(In.)
```

```
Calculated individual pipe flow  =     4.826(CFS)
Normal flow depth in pipe =   10.85(In.)
Flow top width inside pipe =   13.42(In.)
Critical Depth =   10.69(In.)
Pipe flow velocity =      5.08(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    10.00 min.
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.810(Ac.)
Runoff from this stream =      4.826(CFS)
Time of concentration =   10.00 min.
Rainfall intensity =     2.939(In/Hr)
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   523.000(Ft.)
Top (of initial area) elevation =    43.900(Ft.)
Bottom (of initial area) elevation =    38.900(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00956  s(percent)=       0.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.299 min.
Rainfall intensity =      3.048(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.893
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     10.837(CFS)
Total initial stream area =        3.980(Ac.)
Pervious area fraction = 0.100
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    33.900(Ft.)
Downstream point/station elevation =    33.800(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    10.837(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    10.837(CFS)
Normal flow depth in pipe =   15.73(In.)
Flow top width inside pipe =   22.81(In.)
Critical Depth =   14.16(In.)
Pipe flow velocity =      4.96(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.40 min.
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       22.000
```

```
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.980(Ac.)
Runoff from this stream =     10.837(CFS)
Time of concentration =    9.40 min.
Rainfall intensity =     3.032(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        4.826     10.00                2.939
2       10.837      9.40                3.032
Largest stream flow has longer or shorter time of concentration
Qp =     10.837 + sum of
          Qa          Tb/Ta
           4.826 *    0.940 =      4.537
Qp =     15.374

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.826      10.837
Area of streams before confluence:
        1.810        3.980
Results of confluence:
Total flow rate =     15.374(CFS)
Time of concentration =     9.400 min.
Effective stream area after confluence =      5.790(Ac.)
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =    33.800(Ft.)
Downstream point/station elevation =    31.000(Ft.)
Pipe length  =   115.00(Ft.)   Manning's N = 0.012
No. of pipes = 1  Required pipe flow  =    15.374(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    15.374(CFS)
Normal flow depth in pipe =   12.94(In.)
Flow top width inside pipe =   16.19(In.)
Critical Depth =   16.96(In.)
Pipe flow velocity =     11.31(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     9.57 min.
```

♠

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.790(Ac.)
Runoff from this stream =     15.374(CFS)
Time of concentration =    9.57 min.
Rainfall intensity =     3.005(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        9.149      9.64                2.994
```

```
2       15.374      9.57                3.005
Largest stream flow has longer or shorter time of concentration
Qp =     15.374 + sum of
          Qa          Tb/Ta
           9.149 *    0.993 =      9.082
Qp =     24.455

Total of 2 main streams to confluence:
Flow rates before confluence point:
       9.149      15.374
Area of streams before confluence:
        3.330        5.790


Results of confluence:
Total flow rate =     24.455(CFS)
Time of concentration =     9.569 min.
Effective stream area after confluence  =      9.120(Ac.)
End of computations, total study area =            9.12 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.166
Area averaged RI index number =  69.0
```

Appendix I

Synthetic Unit Hydrograph Calculations

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

Study date 11/04/21 File: P100EUH24100.out

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

Program License Serial Number 6443

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

 English Units used in output format

PENSKE MORENO VALLEY
EXIST. 100-YR
XO 11/4/21

Drainage Area = 9.12(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.12(Ac.) = 0.014 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.249 Hr.
Lag time = 14.93 Min.
25% of lag time = 3.73 Min.
40% of lag time = 5.97 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.12	1.84	16.78

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.12	4.52	41.22

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.840(In)
Area Averaged 100-Year Rainfall = 4.520(In)

Point rain (area averaged) = 4.520(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 4.520(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.120	91.00	0.000

Total Area Entered = 9.12(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)

91.0	96.4	0.047	0.000	0.047	1.000	0.047
					Sum (F) =	0.047

Area averaged mean soil loss (F) (In/Hr) = 0.047
Minimum soil loss rate ((In/Hr)) = 0.023
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	33.481	3.371	0.310
2	0.167	66.961	12.983	1.193
3	0.250	100.442	21.930	2.016
4	0.333	133.923	20.035	1.841
5	0.417	167.403	11.043	1.015
6	0.500	200.884	6.272	0.576
7	0.583	234.365	4.455	0.409
8	0.667	267.845	3.465	0.318
9	0.750	301.326	2.824	0.260
10	0.833	334.806	2.206	0.203
11	0.917	368.287	1.929	0.177
12	1.000	401.768	1.528	0.140
13	1.083	435.248	1.252	0.115
14	1.167	468.729	1.061	0.098
15	1.250	502.210	1.010	0.093
16	1.333	535.690	0.853	0.078
17	1.417	569.171	0.715	0.066
18	1.500	602.652	0.614	0.056
19	1.583	636.132	0.526	0.048
20	1.667	669.613	0.446	0.041
21	1.750	703.094	0.346	0.032
22	1.833	736.574	0.335	0.031
23	1.917	770.055	0.335	0.031
24	2.000	803.536	0.467	0.043
		Sum = 100.000	Sum=	9.191

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.036	(0.083)	0.033	0.004
2	0.17	0.07	0.036	(0.083)	0.033	0.004
3	0.25	0.07	0.036	(0.082)	0.033	0.004
4	0.33	0.10	0.054	(0.082)	0.049	0.005
5	0.42	0.10	0.054	(0.082)	0.049	0.005
6	0.50	0.10	0.054	(0.081)	0.049	0.005
7	0.58	0.10	0.054	(0.081)	0.049	0.005
8	0.67	0.10	0.054	(0.081)	0.049	0.005
9	0.75	0.10	0.054	(0.080)	0.049	0.005
10	0.83	0.13	0.072	(0.080)	0.065	0.007
11	0.92	0.13	0.072	(0.080)	0.065	0.007
12	1.00	0.13	0.072	(0.079)	0.065	0.007
13	1.08	0.10	0.054	(0.079)	0.049	0.005
14	1.17	0.10	0.054	(0.079)	0.049	0.005
15	1.25	0.10	0.054	(0.079)	0.049	0.005
16	1.33	0.10	0.054	(0.078)	0.049	0.005
17	1.42	0.10	0.054	(0.078)	0.049	0.005
18	1.50	0.10	0.054	(0.078)	0.049	0.005
19	1.58	0.10	0.054	(0.077)	0.049	0.005
20	1.67	0.10	0.054	(0.077)	0.049	0.005

21	1.75	0.10	0.054	(	0.077)	0.049		0.005
22	1.83	0.13	0.072	(	0.076)	0.065		0.007
23	1.92	0.13	0.072	(	0.076)	0.065		0.007
24	2.00	0.13	0.072	(	0.076)	0.065		0.007
25	2.08	0.13	0.072	(	0.075)	0.065		0.007
26	2.17	0.13	0.072	(	0.075)	0.065		0.007
27	2.25	0.13	0.072	(	0.075)	0.065		0.007
28	2.33	0.13	0.072	(	0.075)	0.065		0.007
29	2.42	0.13	0.072	(	0.074)	0.065		0.007
30	2.50	0.13	0.072	(	0.074)	0.065		0.007
31	2.58	0.17	0.090		0.074	(	0.081)	0.017
32	2.67	0.17	0.090		0.073	(	0.081)	0.017
33	2.75	0.17	0.090		0.073	(	0.081)	0.017
34	2.83	0.17	0.090		0.073	(	0.081)	0.018
35	2.92	0.17	0.090		0.072	(	0.081)	0.018
36	3.00	0.17	0.090		0.072	(	0.081)	0.018
37	3.08	0.17	0.090		0.072	(	0.081)	0.019
38	3.17	0.17	0.090		0.072	(	0.081)	0.019
39	3.25	0.17	0.090		0.071	(	0.081)	0.019
40	3.33	0.17	0.090		0.071	(	0.081)	0.019
41	3.42	0.17	0.090		0.071	(	0.081)	0.020
42	3.50	0.17	0.090		0.070	(	0.081)	0.020
43	3.58	0.17	0.090		0.070	(	0.081)	0.020
44	3.67	0.17	0.090		0.070	(	0.081)	0.021
45	3.75	0.17	0.090		0.069	(	0.081)	0.021
46	3.83	0.20	0.108		0.069	(	0.098)	0.039
47	3.92	0.20	0.108		0.069	(	0.098)	0.040
48	4.00	0.20	0.108		0.069	(	0.098)	0.040
49	4.08	0.20	0.108		0.068	(	0.098)	0.040
50	4.17	0.20	0.108		0.068	(	0.098)	0.040
51	4.25	0.20	0.108		0.068	(	0.098)	0.041
52	4.33	0.23	0.127		0.067	(	0.114)	0.059
53	4.42	0.23	0.127		0.067	(	0.114)	0.059
54	4.50	0.23	0.127		0.067	(	0.114)	0.060
55	4.58	0.23	0.127		0.067	(	0.114)	0.060
56	4.67	0.23	0.127		0.066	(	0.114)	0.060
57	4.75	0.23	0.127		0.066	(	0.114)	0.061
58	4.83	0.27	0.145		0.066	(	0.130)	0.079
59	4.92	0.27	0.145		0.065	(	0.130)	0.079
60	5.00	0.27	0.145		0.065	(	0.130)	0.080
61	5.08	0.20	0.108		0.065	(	0.098)	0.044
62	5.17	0.20	0.108		0.065	(	0.098)	0.044
63	5.25	0.20	0.108		0.064	(	0.098)	0.044
64	5.33	0.23	0.127		0.064	(	0.114)	0.063
65	5.42	0.23	0.127		0.064	(	0.114)	0.063
66	5.50	0.23	0.127		0.063	(	0.114)	0.063
67	5.58	0.27	0.145		0.063	(	0.130)	0.081
68	5.67	0.27	0.145		0.063	(	0.130)	0.082
69	5.75	0.27	0.145		0.063	(	0.130)	0.082
70	5.83	0.27	0.145		0.062	(	0.130)	0.082
71	5.92	0.27	0.145		0.062	(	0.130)	0.083
72	6.00	0.27	0.145		0.062	(	0.130)	0.083
73	6.08	0.30	0.163		0.062	(	0.146)	0.101
74	6.17	0.30	0.163		0.061	(	0.146)	0.101
75	6.25	0.30	0.163		0.061	(	0.146)	0.102
76	6.33	0.30	0.163		0.061	(	0.146)	0.102
77	6.42	0.30	0.163		0.060	(	0.146)	0.102
78	6.50	0.30	0.163		0.060	(	0.146)	0.103
79	6.58	0.33	0.181		0.060	(	0.163)	0.121
80	6.67	0.33	0.181		0.060	(	0.163)	0.121
81	6.75	0.33	0.181		0.059	(	0.163)	0.121
82	6.83	0.33	0.181		0.059	(	0.163)	0.122
83	6.92	0.33	0.181		0.059	(	0.163)	0.122
84	7.00	0.33	0.181		0.059	(	0.163)	0.122
85	7.08	0.33	0.181		0.058	(	0.163)	0.123
86	7.17	0.33	0.181		0.058	(	0.163)	0.123
87	7.25	0.33	0.181		0.058	(	0.163)	0.123
88	7.33	0.37	0.199		0.057	(	0.179)	0.141
89	7.42	0.37	0.199		0.057	(	0.179)	0.142

90	7.50	0.37	0.199	0.057	(	0.179)	0.142
91	7.58	0.40	0.217	0.057	(	0.195)	0.160
92	7.67	0.40	0.217	0.056	(	0.195)	0.161
93	7.75	0.40	0.217	0.056	(	0.195)	0.161
94	7.83	0.43	0.235	0.056	(	0.212)	0.179
95	7.92	0.43	0.235	0.056	(	0.212)	0.179
96	8.00	0.43	0.235	0.055	(	0.212)	0.180
97	8.08	0.50	0.271	0.055	(	0.244)	0.216
98	8.17	0.50	0.271	0.055	(	0.244)	0.216
99	8.25	0.50	0.271	0.055	(	0.244)	0.217
100	8.33	0.50	0.271	0.054	(	0.244)	0.217
101	8.42	0.50	0.271	0.054	(	0.244)	0.217
102	8.50	0.50	0.271	0.054	(	0.244)	0.217
103	8.58	0.53	0.289	0.054	(	0.260)	0.236
104	8.67	0.53	0.289	0.053	(	0.260)	0.236
105	8.75	0.53	0.289	0.053	(	0.260)	0.236
106	8.83	0.57	0.307	0.053	(	0.277)	0.255
107	8.92	0.57	0.307	0.053	(	0.277)	0.255
108	9.00	0.57	0.307	0.052	(	0.277)	0.255
109	9.08	0.63	0.344	0.052	(	0.309)	0.291
110	9.17	0.63	0.344	0.052	(	0.309)	0.292
111	9.25	0.63	0.344	0.052	(	0.309)	0.292
112	9.33	0.67	0.362	0.051	(	0.325)	0.310
113	9.42	0.67	0.362	0.051	(	0.325)	0.310
114	9.50	0.67	0.362	0.051	(	0.325)	0.311
115	9.58	0.70	0.380	0.051	(	0.342)	0.329
116	9.67	0.70	0.380	0.050	(	0.342)	0.329
117	9.75	0.70	0.380	0.050	(	0.342)	0.330
118	9.83	0.73	0.398	0.050	(	0.358)	0.348
119	9.92	0.73	0.398	0.050	(	0.358)	0.348
120	10.00	0.73	0.398	0.049	(	0.358)	0.348
121	10.08	0.50	0.271	0.049	(	0.244)	0.222
122	10.17	0.50	0.271	0.049	(	0.244)	0.222
123	10.25	0.50	0.271	0.049	(	0.244)	0.222
124	10.33	0.50	0.271	0.048	(	0.244)	0.223
125	10.42	0.50	0.271	0.048	(	0.244)	0.223
126	10.50	0.50	0.271	0.048	(	0.244)	0.223
127	10.58	0.67	0.362	0.048	(	0.325)	0.314
128	10.67	0.67	0.362	0.048	(	0.325)	0.314
129	10.75	0.67	0.362	0.047	(	0.325)	0.314
130	10.83	0.67	0.362	0.047	(	0.325)	0.315
131	10.92	0.67	0.362	0.047	(	0.325)	0.315
132	11.00	0.67	0.362	0.047	(	0.325)	0.315
133	11.08	0.63	0.344	0.046	(	0.309)	0.297
134	11.17	0.63	0.344	0.046	(	0.309)	0.297
135	11.25	0.63	0.344	0.046	(	0.309)	0.298
136	11.33	0.63	0.344	0.046	(	0.309)	0.298
137	11.42	0.63	0.344	0.045	(	0.309)	0.298
138	11.50	0.63	0.344	0.045	(	0.309)	0.298
139	11.58	0.57	0.307	0.045	(	0.277)	0.262
140	11.67	0.57	0.307	0.045	(	0.277)	0.263
141	11.75	0.57	0.307	0.045	(	0.277)	0.263
142	11.83	0.60	0.325	0.044	(	0.293)	0.281
143	11.92	0.60	0.325	0.044	(	0.293)	0.281
144	12.00	0.60	0.325	0.044	(	0.293)	0.282
145	12.08	0.83	0.452	0.044	(	0.407)	0.408
146	12.17	0.83	0.452	0.043	(	0.407)	0.409
147	12.25	0.83	0.452	0.043	(	0.407)	0.409
148	12.33	0.87	0.470	0.043	(	0.423)	0.427
149	12.42	0.87	0.470	0.043	(	0.423)	0.427
150	12.50	0.87	0.470	0.043	(	0.423)	0.427
151	12.58	0.93	0.506	0.042	(	0.456)	0.464
152	12.67	0.93	0.506	0.042	(	0.456)	0.464
153	12.75	0.93	0.506	0.042	(	0.456)	0.464
154	12.83	0.97	0.524	0.042	(	0.472)	0.483
155	12.92	0.97	0.524	0.042	(	0.472)	0.483
156	13.00	0.97	0.524	0.041	(	0.472)	0.483
157	13.08	1.13	0.615	0.041	(	0.553)	0.574
158	13.17	1.13	0.615	0.041	(	0.553)	0.574

159	13.25	1.13	0.615	0.041	(	0.553)	0.574
160	13.33	1.13	0.615	0.040	(	0.553)	0.574
161	13.42	1.13	0.615	0.040	(	0.553)	0.574
162	13.50	1.13	0.615	0.040	(	0.553)	0.575
163	13.58	0.77	0.416	0.040	(	0.374)	0.376
164	13.67	0.77	0.416	0.040	(	0.374)	0.376
165	13.75	0.77	0.416	0.039	(	0.374)	0.376
166	13.83	0.77	0.416	0.039	(	0.374)	0.377
167	13.92	0.77	0.416	0.039	(	0.374)	0.377
168	14.00	0.77	0.416	0.039	(	0.374)	0.377
169	14.08	0.90	0.488	0.039	(	0.439)	0.449
170	14.17	0.90	0.488	0.038	(	0.439)	0.450
171	14.25	0.90	0.488	0.038	(	0.439)	0.450
172	14.33	0.87	0.470	0.038	(	0.423)	0.432
173	14.42	0.87	0.470	0.038	(	0.423)	0.432
174	14.50	0.87	0.470	0.038	(	0.423)	0.432
175	14.58	0.87	0.470	0.038	(	0.423)	0.433
176	14.67	0.87	0.470	0.037	(	0.423)	0.433
177	14.75	0.87	0.470	0.037	(	0.423)	0.433
178	14.83	0.83	0.452	0.037	(	0.407)	0.415
179	14.92	0.83	0.452	0.037	(	0.407)	0.415
180	15.00	0.83	0.452	0.037	(	0.407)	0.415
181	15.08	0.80	0.434	0.036	(	0.391)	0.398
182	15.17	0.80	0.434	0.036	(	0.391)	0.398
183	15.25	0.80	0.434	0.036	(	0.391)	0.398
184	15.33	0.77	0.416	0.036	(	0.374)	0.380
185	15.42	0.77	0.416	0.036	(	0.374)	0.380
186	15.50	0.77	0.416	0.035	(	0.374)	0.380
187	15.58	0.63	0.344	0.035	(	0.309)	0.308
188	15.67	0.63	0.344	0.035	(	0.309)	0.308
189	15.75	0.63	0.344	0.035	(	0.309)	0.309
190	15.83	0.63	0.344	0.035	(	0.309)	0.309
191	15.92	0.63	0.344	0.035	(	0.309)	0.309
192	16.00	0.63	0.344	0.034	(	0.309)	0.309
193	16.08	0.13	0.072	0.034	(	0.065)	0.038
194	16.17	0.13	0.072	0.034	(	0.065)	0.038
195	16.25	0.13	0.072	0.034	(	0.065)	0.038
196	16.33	0.13	0.072	0.034	(	0.065)	0.039
197	16.42	0.13	0.072	0.033	(	0.065)	0.039
198	16.50	0.13	0.072	0.033	(	0.065)	0.039
199	16.58	0.10	0.054	0.033	(	0.049)	0.021
200	16.67	0.10	0.054	0.033	(	0.049)	0.021
201	16.75	0.10	0.054	0.033	(	0.049)	0.021
202	16.83	0.10	0.054	0.033	(	0.049)	0.022
203	16.92	0.10	0.054	0.032	(	0.049)	0.022
204	17.00	0.10	0.054	0.032	(	0.049)	0.022
205	17.08	0.17	0.090	0.032	(	0.081)	0.058
206	17.17	0.17	0.090	0.032	(	0.081)	0.058
207	17.25	0.17	0.090	0.032	(	0.081)	0.059
208	17.33	0.17	0.090	0.032	(	0.081)	0.059
209	17.42	0.17	0.090	0.032	(	0.081)	0.059
210	17.50	0.17	0.090	0.031	(	0.081)	0.059
211	17.58	0.17	0.090	0.031	(	0.081)	0.059
212	17.67	0.17	0.090	0.031	(	0.081)	0.059
213	17.75	0.17	0.090	0.031	(	0.081)	0.060
214	17.83	0.13	0.072	0.031	(	0.065)	0.042
215	17.92	0.13	0.072	0.031	(	0.065)	0.042
216	18.00	0.13	0.072	0.030	(	0.065)	0.042
217	18.08	0.13	0.072	0.030	(	0.065)	0.042
218	18.17	0.13	0.072	0.030	(	0.065)	0.042
219	18.25	0.13	0.072	0.030	(	0.065)	0.042
220	18.33	0.13	0.072	0.030	(	0.065)	0.042
221	18.42	0.13	0.072	0.030	(	0.065)	0.043
222	18.50	0.13	0.072	0.030	(	0.065)	0.043
223	18.58	0.10	0.054	0.029	(	0.049)	0.025
224	18.67	0.10	0.054	0.029	(	0.049)	0.025
225	18.75	0.10	0.054	0.029	(	0.049)	0.025
226	18.83	0.07	0.036	0.029	(	0.033)	0.007
227	18.92	0.07	0.036	0.029	(	0.033)	0.007

228	19.00	0.07	0.036	0.029	(	0.033)	0.007
229	19.08	0.10	0.054	0.029	(	0.049)	0.026
230	19.17	0.10	0.054	0.028	(	0.049)	0.026
231	19.25	0.10	0.054	0.028	(	0.049)	0.026
232	19.33	0.13	0.072	0.028	(	0.065)	0.044
233	19.42	0.13	0.072	0.028	(	0.065)	0.044
234	19.50	0.13	0.072	0.028	(	0.065)	0.044
235	19.58	0.10	0.054	0.028	(	0.049)	0.026
236	19.67	0.10	0.054	0.028	(	0.049)	0.027
237	19.75	0.10	0.054	0.028	(	0.049)	0.027
238	19.83	0.07	0.036	0.027	(	0.033)	0.009
239	19.92	0.07	0.036	0.027	(	0.033)	0.009
240	20.00	0.07	0.036	0.027	(	0.033)	0.009
241	20.08	0.10	0.054	0.027	(	0.049)	0.027
242	20.17	0.10	0.054	0.027	(	0.049)	0.027
243	20.25	0.10	0.054	0.027	(	0.049)	0.027
244	20.33	0.10	0.054	0.027	(	0.049)	0.028
245	20.42	0.10	0.054	0.027	(	0.049)	0.028
246	20.50	0.10	0.054	0.026	(	0.049)	0.028
247	20.58	0.10	0.054	0.026	(	0.049)	0.028
248	20.67	0.10	0.054	0.026	(	0.049)	0.028
249	20.75	0.10	0.054	0.026	(	0.049)	0.028
250	20.83	0.07	0.036	0.026	(	0.033)	0.010
251	20.92	0.07	0.036	0.026	(	0.033)	0.010
252	21.00	0.07	0.036	0.026	(	0.033)	0.010
253	21.08	0.10	0.054	0.026	(	0.049)	0.029
254	21.17	0.10	0.054	0.026	(	0.049)	0.029
255	21.25	0.10	0.054	0.026	(	0.049)	0.029
256	21.33	0.07	0.036	0.025	(	0.033)	0.011
257	21.42	0.07	0.036	0.025	(	0.033)	0.011
258	21.50	0.07	0.036	0.025	(	0.033)	0.011
259	21.58	0.10	0.054	0.025	(	0.049)	0.029
260	21.67	0.10	0.054	0.025	(	0.049)	0.029
261	21.75	0.10	0.054	0.025	(	0.049)	0.029
262	21.83	0.07	0.036	0.025	(	0.033)	0.011
263	21.92	0.07	0.036	0.025	(	0.033)	0.011
264	22.00	0.07	0.036	0.025	(	0.033)	0.011
265	22.08	0.10	0.054	0.025	(	0.049)	0.030
266	22.17	0.10	0.054	0.025	(	0.049)	0.030
267	22.25	0.10	0.054	0.024	(	0.049)	0.030
268	22.33	0.07	0.036	0.024	(	0.033)	0.012
269	22.42	0.07	0.036	0.024	(	0.033)	0.012
270	22.50	0.07	0.036	0.024	(	0.033)	0.012
271	22.58	0.07	0.036	0.024	(	0.033)	0.012
272	22.67	0.07	0.036	0.024	(	0.033)	0.012
273	22.75	0.07	0.036	0.024	(	0.033)	0.012
274	22.83	0.07	0.036	0.024	(	0.033)	0.012
275	22.92	0.07	0.036	0.024	(	0.033)	0.012
276	23.00	0.07	0.036	0.024	(	0.033)	0.012
277	23.08	0.07	0.036	0.024	(	0.033)	0.012
278	23.17	0.07	0.036	0.024	(	0.033)	0.012
279	23.25	0.07	0.036	0.024	(	0.033)	0.012
280	23.33	0.07	0.036	0.024	(	0.033)	0.013
281	23.42	0.07	0.036	0.024	(	0.033)	0.013
282	23.50	0.07	0.036	0.024	(	0.033)	0.013
283	23.58	0.07	0.036	0.024	(	0.033)	0.013
284	23.67	0.07	0.036	0.023	(	0.033)	0.013
285	23.75	0.07	0.036	0.023	(	0.033)	0.013
286	23.83	0.07	0.036	0.023	(	0.033)	0.013
287	23.92	0.07	0.036	0.023	(	0.033)	0.013
288	24.00	0.07	0.036	0.023	(	0.033)	0.013

(Loss Rate Not Used)

Sum = 100.0 Sum = 41.5

Flood volume = Effective rainfall 3.46(In)
times area 9.1(Ac.)/[(In)/(Ft.)] = 2.6(Ac.Ft)
Total soil loss = 1.06(In)
Total soil loss = 0.807(Ac.Ft)
Total rainfall = 4.52(In)
Flood volume = 114477.8 Cubic Feet

Total soil loss = 35156.8 Cubic Feet

Peak flow rate of this hydrograph = 4.986(CFS)

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24 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q				
0+10	0.0000	0.01	Q				
0+15	0.0001	0.01	Q				
0+20	0.0003	0.02	Q				
0+25	0.0004	0.03	Q				
0+30	0.0007	0.03	Q				
0+35	0.0009	0.04	Q				
0+40	0.0012	0.04	Q				
0+45	0.0015	0.04	Q				
0+50	0.0018	0.04	Q				
0+55	0.0021	0.05	Q				
1+ 0	0.0024	0.05	Q				
1+ 5	0.0028	0.05	Q				
1+10	0.0032	0.06	Q				
1+15	0.0036	0.05	Q				
1+20	0.0039	0.05	Q				
1+25	0.0043	0.05	Q				
1+30	0.0046	0.05	Q				
1+35	0.0050	0.05	Q				
1+40	0.0053	0.05	Q				
1+45	0.0056	0.05	Q				
1+50	0.0060	0.05	Q				
1+55	0.0064	0.05	Q				
2+ 0	0.0067	0.06	Q				
2+ 5	0.0072	0.06	Q				
2+10	0.0076	0.06	Q				
2+15	0.0080	0.06	Q				
2+20	0.0085	0.06	Q				
2+25	0.0089	0.06	Q				
2+30	0.0093	0.06	Q				
2+35	0.0098	0.07	Q				
2+40	0.0104	0.08	Q				
2+45	0.0110	0.10	Q				
2+50	0.0119	0.12	Q				
2+55	0.0128	0.13	Q				
3+ 0	0.0137	0.14	Q				
3+ 5	0.0147	0.14	Q				
3+10	0.0157	0.15	Q				
3+15	0.0168	0.15	Q				
3+20	0.0179	0.16	Q				
3+25	0.0190	0.16	Q				
3+30	0.0201	0.17	Q				
3+35	0.0213	0.17	Q				
3+40	0.0225	0.17	Q				
3+45	0.0237	0.18	Q				
3+50	0.0250	0.19	Q				
3+55	0.0264	0.21	Q				
4+ 0	0.0282	0.25	VQ				
4+ 5	0.0301	0.29	VQ				
4+10	0.0323	0.31	VQ				
4+15	0.0345	0.32	VQ				
4+20	0.0368	0.34	VQ				
4+25	0.0393	0.37	VQ				
4+30	0.0422	0.41	VQ				
4+35	0.0453	0.45	VQ				
4+40	0.0486	0.48	VQ				

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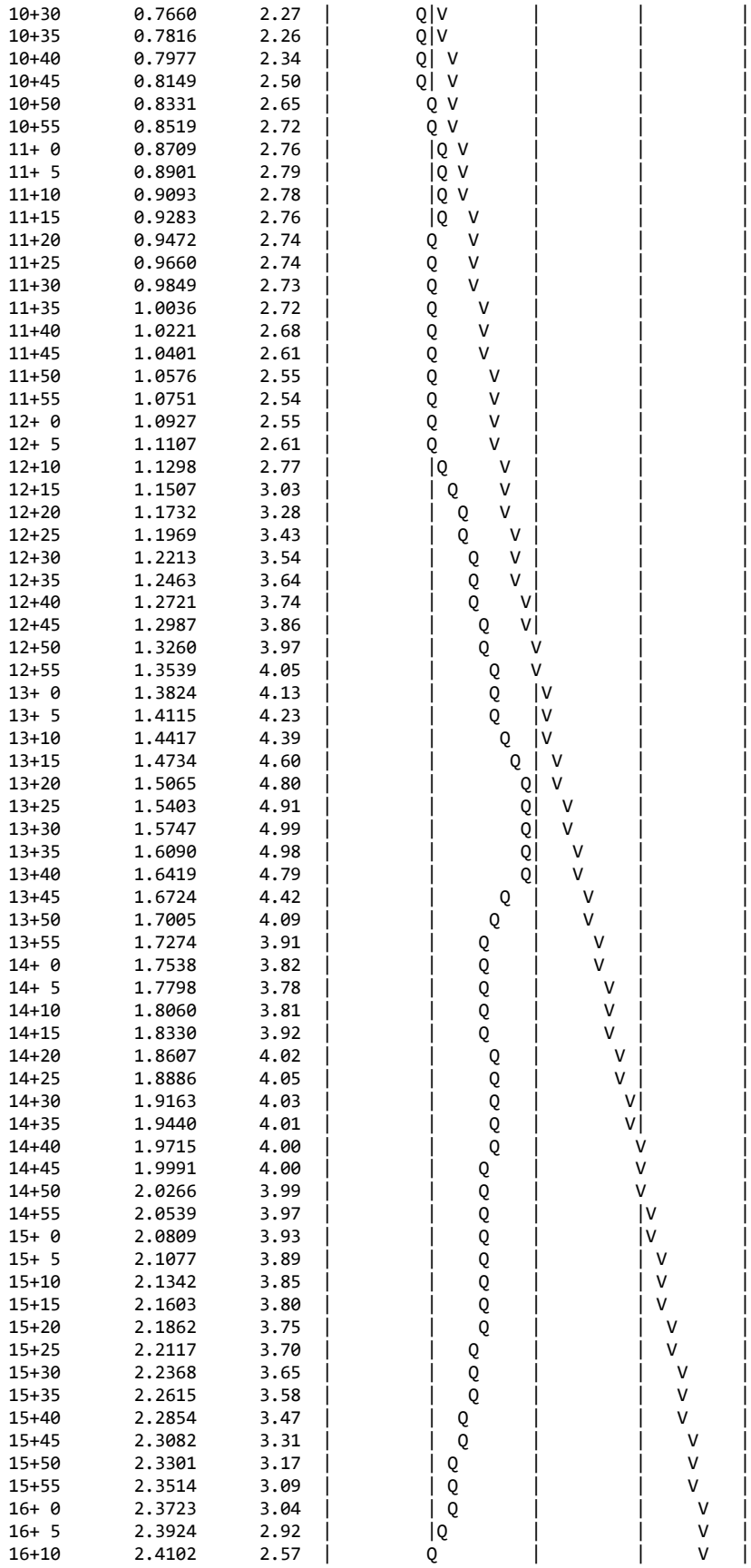
 4+45       0.0519      0.49  VQ        |         |         |         |
 4+50       0.0554      0.51  V Q       |         |         |         |
 4+55       0.0592      0.54  V Q       |         |         |         |
 5+ 0       0.0632      0.59  V Q       |         |         |         |
 5+ 5       0.0675      0.62  |VQ       |         |         |         |
 5+10       0.0716      0.60  |VQ       |         |         |         |
 5+15       0.0753      0.54  |VQ       |         |         |         |
 5+20       0.0787      0.49  |Q        |         |         |         |
 5+25       0.0821      0.49  |Q        |         |         |         |
 5+30       0.0856      0.51  |VQ       |         |         |         |
 5+35       0.0894      0.55  |VQ       |         |         |         |
 5+40       0.0934      0.58  |VQ       |         |         |         |
 5+45       0.0977      0.63  |VQ       |         |         |         |
 5+50       0.1023      0.67  |VQ       |         |         |         |
 5+55       0.1071      0.69  |VQ       |         |         |         |
 6+ 0       0.1119      0.70  |VQ       |         |         |         |
 6+ 5       0.1169      0.72  |VQ       |         |         |         |
 6+10       0.1221      0.75  |V Q      |         |         |         |
 6+15       0.1276      0.80  |V Q      |         |         |         |
 6+20       0.1333      0.84  | VQ      |         |         |         |
 6+25       0.1393      0.86  | VQ      |         |         |         |
 6+30       0.1453      0.88  | VQ      |         |         |         |
 6+35       0.1515      0.89  | VQ      |         |         |         |
 6+40       0.1578      0.93  | VQ      |         |         |         |
 6+45       0.1645      0.97  | VQ      |         |         |         |
 6+50       0.1715      1.01  | V Q     |         |         |         |
 6+55       0.1787      1.04  | V Q     |         |         |         |
 7+ 0       0.1859      1.05  | V Q     |         |         |         |
 7+ 5       0.1933      1.07  | V Q     |         |         |         |
 7+10       0.2007      1.08  |  VQ     |         |         |         |
 7+15       0.2082      1.09  |  VQ     |         |         |         |
 7+20       0.2158      1.10  |  VQ     |         |         |         |
 7+25       0.2236      1.13  |  VQ     |         |         |         |
 7+30       0.2317      1.17  |  VQ     |         |         |         |
 7+35       0.2401      1.22  |  VQ     |         |         |         |
 7+40       0.2488      1.26  |  V Q    |         |         |         |
 7+45       0.2578      1.32  |  V Q    |         |         |         |
 7+50       0.2672      1.37  |   VQ    |         |         |         |
 7+55       0.2770      1.42  |   VQ    |         |         |         |
 8+ 0       0.2871      1.47  |   VQ    |         |         |         |
 8+ 5       0.2976      1.53  |   V Q   |         |         |         |
 8+10       0.3087      1.60  |   V Q   |         |         |         |
 8+15       0.3204      1.70  |   V Q   |         |         |         |
 8+20       0.3326      1.78  |    V Q  |         |         |         |
 8+25       0.3452      1.83  |    V Q  |         |         |         |
 8+30       0.3581      1.86  |    V Q  |         |         |         |
 8+35       0.3711      1.89  |    V Q  |         |         |         |
 8+40       0.3844      1.94  |    V Q  |         |         |         |
 8+45       0.3981      1.99  |     VQ  |         |         |         |
 8+50       0.4122      2.04  |     V Q |         |         |         |
 8+55       0.4266      2.09  |     V Q |         |         |         |
 9+ 0       0.4414      2.15  |     V Q |         |         |         |
 9+ 5       0.4567      2.21  |     V Q |         |         |         |
 9+10       0.4724      2.29  |      V Q|         |         |         |
 9+15       0.4889      2.38  |      V Q|         |         |         |
 9+20       0.5059      2.47  |      V Q|         |         |         |
 9+25       0.5234      2.55  |      V  Q         |         |         |
 9+30       0.5415      2.62  |       V Q         |         |         |
 9+35       0.5599      2.68  |       V Q         |         |         |
 9+40       0.5788      2.74  |       V Q         |         |         |
 9+45       0.5982      2.81  |        V|Q        |         |         |
 9+50       0.6179      2.87  |        V|Q        |         |         |
 9+55       0.6381      2.93  |        V|Q        |         |         |
10+ 0       0.6586      2.99  |         VQ        |         |         |
10+ 5       0.6793      3.00  |         V Q       |         |         |
10+10       0.6992      2.89  |         VQ        |         |         |
10+15       0.7175      2.66  |         Q         |         |         |
10+20       0.7343      2.44  |        Q|V        |         |         |
10+25       0.7504      2.33  |        Q|V        |         |         |
```



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16+15       2.4239      2.00  |       Q |         |         |     V   |
16+20       2.4342      1.48  |    Q    |         |         |      V  |
16+25       2.4424      1.19  |   Q     |         |         |      V  |
16+30       2.4494      1.03  |   Q     |         |         |      V  |
16+35       2.4556      0.90  |  Q      |         |         |      V  |
16+40       2.4610      0.78  |  Q      |         |         |      V  |
16+45       2.4656      0.67  | Q       |         |         |      V  |
16+50       2.4696      0.58  | Q       |         |         |      V  |
16+55       2.4731      0.50  | Q       |         |         |      V  |
17+ 0       2.4762      0.45  |Q        |         |         |      V  |
17+ 5       2.4791      0.42  |Q        |         |         |      V  |
17+10       2.4821      0.43  |Q        |         |         |      V  |
17+15       2.4853      0.47  |Q        |         |         |      V  |
17+20       2.4888      0.51  | Q       |         |         |      V  |
17+25       2.4925      0.53  | Q       |         |         |      V  |
17+30       2.4961      0.53  | Q       |         |         |      V  |
17+35       2.4998      0.53  | Q       |         |         |       V |
17+40       2.5034      0.53  | Q       |         |         |       V |
17+45       2.5071      0.53  | Q       |         |         |       V |
17+50       2.5107      0.52  | Q       |         |         |       V |
17+55       2.5142      0.50  | Q       |         |         |       V |
18+ 0       2.5173      0.46  |Q        |         |         |       V |
18+ 5       2.5203      0.43  |Q        |         |         |       V |
18+10       2.5232      0.42  |Q        |         |         |       V |
18+15       2.5260      0.41  |Q        |         |         |       V |
18+20       2.5288      0.41  |Q        |         |         |       V |
18+25       2.5316      0.40  |Q        |         |         |       V |
18+30       2.5343      0.40  |Q        |         |         |       V |
18+35       2.5370      0.40  |Q        |         |         |       V |
18+40       2.5396      0.37  |Q        |         |         |       V |
18+45       2.5419      0.34  |Q        |         |         |       V |
18+50       2.5440      0.30  |Q        |         |         |       V |
18+55       2.5458      0.26  |Q        |         |         |       V |
19+ 0       2.5472      0.21  Q         |         |         |       V |
19+ 5       2.5485      0.18  Q         |         |         |       V |
19+10       2.5497      0.18  Q         |         |         |       V |
19+15       2.5510      0.20  Q         |         |         |       V |
19+20       2.5526      0.23  Q         |         |         |       V |
19+25       2.5544      0.26  |Q        |         |         |       V |
19+30       2.5564      0.30  |Q        |         |         |       V |
19+35       2.5587      0.33  |Q        |         |         |       V |
19+40       2.5609      0.33  |Q        |         |         |       V |
19+45       2.5630      0.30  |Q        |         |         |        V|
19+50       2.5648      0.27  |Q        |         |         |        V|
19+55       2.5665      0.24  Q         |         |         |        V|
20+ 0       2.5678      0.20  Q         |         |         |        V|
20+ 5       2.5690      0.17  Q         |         |         |        V|
20+10       2.5701      0.17  Q         |         |         |        V|
20+15       2.5715      0.19  Q         |         |         |        V|
20+20       2.5730      0.22  Q         |         |         |        V|
20+25       2.5745      0.23  Q         |         |         |        V|
20+30       2.5762      0.24  Q         |         |         |        V|
20+35       2.5778      0.24  Q         |         |         |        V|
20+40       2.5795      0.24  Q         |         |         |        V|
20+45       2.5812      0.25  Q         |         |         |        V|
20+50       2.5829      0.24  Q         |         |         |        V|
20+55       2.5844      0.22  Q         |         |         |        V|
21+ 0       2.5857      0.19  Q         |         |         |        V|
21+ 5       2.5868      0.16  Q         |         |         |        V|
21+10       2.5880      0.17  Q         |         |         |        V|
21+15       2.5894      0.20  Q         |         |         |        V|
21+20       2.5908      0.22  Q         |         |         |        V|
21+25       2.5923      0.21  Q         |         |         |        V|
21+30       2.5935      0.18  Q         |         |         |        V|
21+35       2.5946      0.16  Q         |         |         |        V|
21+40       2.5957      0.16  Q         |         |         |        V|
21+45       2.5970      0.19  Q         |         |         |        V|
21+50       2.5985      0.22  Q         |         |         |        V|
21+55       2.6000      0.21  Q         |         |         |        V|
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22+ 0	2.6012	0.18	Q	|	|	|	V|
22+ 5	2.6023	0.16	Q	|	|	|	V|
22+10	2.6034	0.17	Q	|	|	|	V|
22+15	2.6048	0.20	Q	|	|	|	V|
22+20	2.6063	0.22	Q	|	|	|	V|
22+25	2.6077	0.21	Q	|	|	|	V|
22+30	2.6090	0.18	Q	|	|	|	V|
22+35	2.6101	0.16	Q	|	|	|	V|
22+40	2.6110	0.14	Q	|	|	|	V|
22+45	2.6120	0.13	Q	|	|	|	V|
22+50	2.6129	0.13	Q	|	|	|	V|
22+55	2.6137	0.13	Q	|	|	|	V|
23+ 0	2.6146	0.13	Q	|	|	|	V|
23+ 5	2.6154	0.12	Q	|	|	|	V|
23+10	2.6163	0.12	Q	|	|	|	V|
23+15	2.6171	0.12	Q	|	|	|	V|
23+20	2.6179	0.12	Q	|	|	|	V|
23+25	2.6188	0.12	Q	|	|	|	V|
23+30	2.6196	0.12	Q	|	|	|	V|
23+35	2.6204	0.12	Q	|	|	|	V|
23+40	2.6212	0.12	Q	|	|	|	V|
23+45	2.6220	0.12	Q	|	|	|	V|
23+50	2.6228	0.12	Q	|	|	|	V|
23+55	2.6236	0.12	Q	|	|	|	V|
24+ 0	2.6244	0.12	Q	|	|	|	V|
24+ 5	2.6252	0.11	Q	|	|	|	V|
24+10	2.6259	0.10	Q	|	|	|	V|
24+15	2.6264	0.07	Q	|	|	|	V|
24+20	2.6267	0.05	Q	|	|	|	V|
24+25	2.6270	0.04	Q	|	|	|	V|
24+30	2.6272	0.03	Q	|	|	|	V|
24+35	2.6273	0.02	Q	|	|	|	V|
24+40	2.6275	0.02	Q	|	|	|	V|
24+45	2.6276	0.02	Q	|	|	|	V|
24+50	2.6277	0.01	Q	|	|	|	V|
24+55	2.6277	0.01	Q	|	|	|	V|
25+ 0	2.6278	0.01	Q	|	|	|	V|
25+ 5	2.6278	0.01	Q	|	|	|	V|
25+10	2.6279	0.01	Q	|	|	|	V|
25+15	2.6279	0.01	Q	|	|	|	V|
25+20	2.6280	0.00	Q	|	|	|	V|
25+25	2.6280	0.00	Q	|	|	|	V|
25+30	2.6280	0.00	Q	|	|	|	V|
25+35	2.6280	0.00	Q	|	|	|	V|
25+40	2.6280	0.00	Q	|	|	|	V|
25+45	2.6280	0.00	Q	|	|	|	V|
25+50	2.6280	0.00	Q	|	|	|	V|
25+55	2.6280	0.00	Q	|	|	|	V|

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

Study date 11/10/21 File: P100PUH24100.out

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

Program License Serial Number 6443

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

English Units used in output format

PENSKE MORENO VALLEY
PROP. 100-YR
XO 11/10/21

Drainage Area = 9.12(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.12(Ac.) = 0.014 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.128 Hr.
Lag time = 7.66 Min.
25% of lag time = 1.91 Min.
40% of lag time = 3.06 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.12	1.84	16.78

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.12	4.52	41.22

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.840(In)
Area Averaged 100-Year Rainfall = 4.520(In)

Point rain (area averaged) = 4.520(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 4.520(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.120	69.00	0.830

Total Area Entered = 9.12(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)

69.0	84.4	0.194	0.830	0.049	1.000	0.049
					Sum (F) =	0.049

Area averaged mean soil loss (F) (In/Hr) = 0.049
Minimum soil loss rate ((In/Hr)) = 0.025
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.236

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	65.308	9.459	0.869
2	0.167	130.617	37.461	3.443
3	0.250	195.925	24.764	2.276
4	0.333	261.233	9.529	0.876
5	0.417	326.541	5.759	0.529
6	0.500	391.850	3.865	0.355
7	0.583	457.158	2.640	0.243
8	0.667	522.466	1.986	0.183
9	0.750	587.774	1.506	0.138
10	0.833	653.083	1.112	0.102
11	0.917	718.391	0.776	0.071
12	1.000	783.699	0.653	0.060
13	1.083	849.007	0.490	0.045
		Sum = 100.000	Sum=	9.191

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.036	(0.087)	0.009	0.028
2	0.17	0.07	0.036	(0.087)	0.009	0.028
3	0.25	0.07	0.036	(0.086)	0.009	0.028
4	0.33	0.10	0.054	(0.086)	0.013	0.041
5	0.42	0.10	0.054	(0.086)	0.013	0.041
6	0.50	0.10	0.054	(0.085)	0.013	0.041
7	0.58	0.10	0.054	(0.085)	0.013	0.041
8	0.67	0.10	0.054	(0.085)	0.013	0.041
9	0.75	0.10	0.054	(0.084)	0.013	0.041
10	0.83	0.13	0.072	(0.084)	0.017	0.055
11	0.92	0.13	0.072	(0.084)	0.017	0.055
12	1.00	0.13	0.072	(0.083)	0.017	0.055
13	1.08	0.10	0.054	(0.083)	0.013	0.041
14	1.17	0.10	0.054	(0.083)	0.013	0.041
15	1.25	0.10	0.054	(0.082)	0.013	0.041
16	1.33	0.10	0.054	(0.082)	0.013	0.041
17	1.42	0.10	0.054	(0.082)	0.013	0.041
18	1.50	0.10	0.054	(0.081)	0.013	0.041
19	1.58	0.10	0.054	(0.081)	0.013	0.041
20	1.67	0.10	0.054	(0.081)	0.013	0.041
21	1.75	0.10	0.054	(0.080)	0.013	0.041
22	1.83	0.13	0.072	(0.080)	0.017	0.055
23	1.92	0.13	0.072	(0.080)	0.017	0.055
24	2.00	0.13	0.072	(0.079)	0.017	0.055
25	2.08	0.13	0.072	(0.079)	0.017	0.055
26	2.17	0.13	0.072	(0.079)	0.017	0.055
27	2.25	0.13	0.072	(0.078)	0.017	0.055
28	2.33	0.13	0.072	(0.078)	0.017	0.055
29	2.42	0.13	0.072	(0.078)	0.017	0.055
30	2.50	0.13	0.072	(0.077)	0.017	0.055
31	2.58	0.17	0.090	(0.077)	0.021	0.069

32	2.67	0.17	0.090	(	0.077)	0.021		0.069
33	2.75	0.17	0.090	(	0.077)	0.021		0.069
34	2.83	0.17	0.090	(	0.076)	0.021		0.069
35	2.92	0.17	0.090	(	0.076)	0.021		0.069
36	3.00	0.17	0.090	(	0.076)	0.021		0.069
37	3.08	0.17	0.090	(	0.075)	0.021		0.069
38	3.17	0.17	0.090	(	0.075)	0.021		0.069
39	3.25	0.17	0.090	(	0.075)	0.021		0.069
40	3.33	0.17	0.090	(	0.074)	0.021		0.069
41	3.42	0.17	0.090	(	0.074)	0.021		0.069
42	3.50	0.17	0.090	(	0.074)	0.021		0.069
43	3.58	0.17	0.090	(	0.073)	0.021		0.069
44	3.67	0.17	0.090	(	0.073)	0.021		0.069
45	3.75	0.17	0.090	(	0.073)	0.021		0.069
46	3.83	0.20	0.108	(	0.072)	0.026		0.083
47	3.92	0.20	0.108	(	0.072)	0.026		0.083
48	4.00	0.20	0.108	(	0.072)	0.026		0.083
49	4.08	0.20	0.108	(	0.072)	0.026		0.083
50	4.17	0.20	0.108	(	0.071)	0.026		0.083
51	4.25	0.20	0.108	(	0.071)	0.026		0.083
52	4.33	0.23	0.127	(	0.071)	0.030		0.097
53	4.42	0.23	0.127	(	0.070)	0.030		0.097
54	4.50	0.23	0.127	(	0.070)	0.030		0.097
55	4.58	0.23	0.127	(	0.070)	0.030		0.097
56	4.67	0.23	0.127	(	0.069)	0.030		0.097
57	4.75	0.23	0.127	(	0.069)	0.030		0.097
58	4.83	0.27	0.145	(	0.069)	0.034		0.111
59	4.92	0.27	0.145	(	0.069)	0.034		0.111
60	5.00	0.27	0.145	(	0.068)	0.034		0.111
61	5.08	0.20	0.108	(	0.068)	0.026		0.083
62	5.17	0.20	0.108	(	0.068)	0.026		0.083
63	5.25	0.20	0.108	(	0.067)	0.026		0.083
64	5.33	0.23	0.127	(	0.067)	0.030		0.097
65	5.42	0.23	0.127	(	0.067)	0.030		0.097
66	5.50	0.23	0.127	(	0.066)	0.030		0.097
67	5.58	0.27	0.145	(	0.066)	0.034		0.111
68	5.67	0.27	0.145	(	0.066)	0.034		0.111
69	5.75	0.27	0.145	(	0.066)	0.034		0.111
70	5.83	0.27	0.145	(	0.065)	0.034		0.111
71	5.92	0.27	0.145	(	0.065)	0.034		0.111
72	6.00	0.27	0.145	(	0.065)	0.034		0.111
73	6.08	0.30	0.163	(	0.064)	0.038		0.124
74	6.17	0.30	0.163	(	0.064)	0.038		0.124
75	6.25	0.30	0.163	(	0.064)	0.038		0.124
76	6.33	0.30	0.163	(	0.064)	0.038		0.124
77	6.42	0.30	0.163	(	0.063)	0.038		0.124
78	6.50	0.30	0.163	(	0.063)	0.038		0.124
79	6.58	0.33	0.181	(	0.063)	0.043		0.138
80	6.67	0.33	0.181	(	0.062)	0.043		0.138
81	6.75	0.33	0.181	(	0.062)	0.043		0.138
82	6.83	0.33	0.181	(	0.062)	0.043		0.138
83	6.92	0.33	0.181	(	0.062)	0.043		0.138
84	7.00	0.33	0.181	(	0.061)	0.043		0.138
85	7.08	0.33	0.181	(	0.061)	0.043		0.138
86	7.17	0.33	0.181	(	0.061)	0.043		0.138
87	7.25	0.33	0.181	(	0.060)	0.043		0.138
88	7.33	0.37	0.199	(	0.060)	0.047		0.152
89	7.42	0.37	0.199	(	0.060)	0.047		0.152
90	7.50	0.37	0.199	(	0.060)	0.047		0.152
91	7.58	0.40	0.217	(	0.059)	0.051		0.166
92	7.67	0.40	0.217	(	0.059)	0.051		0.166
93	7.75	0.40	0.217	(	0.059)	0.051		0.166
94	7.83	0.43	0.235	(	0.059)	0.055		0.180
95	7.92	0.43	0.235	(	0.058)	0.055		0.180
96	8.00	0.43	0.235	(	0.058)	0.055		0.180
97	8.08	0.50	0.271		0.058	(	0.064)	0.213
98	8.17	0.50	0.271		0.058	(	0.064)	0.214
99	8.25	0.50	0.271		0.057	(	0.064)	0.214
100	8.33	0.50	0.271		0.057	(	0.064)	0.214

101	8.42	0.50	0.271	0.057	(	0.064)	0.214
102	8.50	0.50	0.271	0.056	(	0.064)	0.215
103	8.58	0.53	0.289	0.056	(	0.068)	0.233
104	8.67	0.53	0.289	0.056	(	0.068)	0.233
105	8.75	0.53	0.289	0.056	(	0.068)	0.234
106	8.83	0.57	0.307	0.055	(	0.073)	0.252
107	8.92	0.57	0.307	0.055	(	0.073)	0.252
108	9.00	0.57	0.307	0.055	(	0.073)	0.252
109	9.08	0.63	0.344	0.055	(	0.081)	0.289
110	9.17	0.63	0.344	0.054	(	0.081)	0.289
111	9.25	0.63	0.344	0.054	(	0.081)	0.289
112	9.33	0.67	0.362	0.054	(	0.085)	0.308
113	9.42	0.67	0.362	0.054	(	0.085)	0.308
114	9.50	0.67	0.362	0.053	(	0.085)	0.308
115	9.58	0.70	0.380	0.053	(	0.090)	0.327
116	9.67	0.70	0.380	0.053	(	0.090)	0.327
117	9.75	0.70	0.380	0.053	(	0.090)	0.327
118	9.83	0.73	0.398	0.052	(	0.094)	0.345
119	9.92	0.73	0.398	0.052	(	0.094)	0.346
120	10.00	0.73	0.398	0.052	(	0.094)	0.346
121	10.08	0.50	0.271	0.052	(	0.064)	0.220
122	10.17	0.50	0.271	0.051	(	0.064)	0.220
123	10.25	0.50	0.271	0.051	(	0.064)	0.220
124	10.33	0.50	0.271	0.051	(	0.064)	0.220
125	10.42	0.50	0.271	0.051	(	0.064)	0.221
126	10.50	0.50	0.271	0.050	(	0.064)	0.221
127	10.58	0.67	0.362	0.050	(	0.085)	0.312
128	10.67	0.67	0.362	0.050	(	0.085)	0.312
129	10.75	0.67	0.362	0.050	(	0.085)	0.312
130	10.83	0.67	0.362	0.049	(	0.085)	0.312
131	10.92	0.67	0.362	0.049	(	0.085)	0.313
132	11.00	0.67	0.362	0.049	(	0.085)	0.313
133	11.08	0.63	0.344	0.049	(	0.081)	0.295
134	11.17	0.63	0.344	0.048	(	0.081)	0.295
135	11.25	0.63	0.344	0.048	(	0.081)	0.295
136	11.33	0.63	0.344	0.048	(	0.081)	0.296
137	11.42	0.63	0.344	0.048	(	0.081)	0.296
138	11.50	0.63	0.344	0.047	(	0.081)	0.296
139	11.58	0.57	0.307	0.047	(	0.073)	0.260
140	11.67	0.57	0.307	0.047	(	0.073)	0.260
141	11.75	0.57	0.307	0.047	(	0.073)	0.261
142	11.83	0.60	0.325	0.046	(	0.077)	0.279
143	11.92	0.60	0.325	0.046	(	0.077)	0.279
144	12.00	0.60	0.325	0.046	(	0.077)	0.279
145	12.08	0.83	0.452	0.046	(	0.107)	0.406
146	12.17	0.83	0.452	0.046	(	0.107)	0.406
147	12.25	0.83	0.452	0.045	(	0.107)	0.407
148	12.33	0.87	0.470	0.045	(	0.111)	0.425
149	12.42	0.87	0.470	0.045	(	0.111)	0.425
150	12.50	0.87	0.470	0.045	(	0.111)	0.425
151	12.58	0.93	0.506	0.044	(	0.119)	0.462
152	12.67	0.93	0.506	0.044	(	0.119)	0.462
153	12.75	0.93	0.506	0.044	(	0.119)	0.462
154	12.83	0.97	0.524	0.044	(	0.124)	0.481
155	12.92	0.97	0.524	0.044	(	0.124)	0.481
156	13.00	0.97	0.524	0.043	(	0.124)	0.481
157	13.08	1.13	0.615	0.043	(	0.145)	0.572
158	13.17	1.13	0.615	0.043	(	0.145)	0.572
159	13.25	1.13	0.615	0.043	(	0.145)	0.572
160	13.33	1.13	0.615	0.042	(	0.145)	0.572
161	13.42	1.13	0.615	0.042	(	0.145)	0.572
162	13.50	1.13	0.615	0.042	(	0.145)	0.573
163	13.58	0.77	0.416	0.042	(	0.098)	0.374
164	13.67	0.77	0.416	0.042	(	0.098)	0.374
165	13.75	0.77	0.416	0.041	(	0.098)	0.374
166	13.83	0.77	0.416	0.041	(	0.098)	0.375
167	13.92	0.77	0.416	0.041	(	0.098)	0.375
168	14.00	0.77	0.416	0.041	(	0.098)	0.375
169	14.08	0.90	0.488	0.041	(	0.115)	0.448

170	14.17	0.90	0.488	0.040	(0.115)	0.448
171	14.25	0.90	0.488	0.040	(0.115)	0.448
172	14.33	0.87	0.470	0.040	(0.111)	0.430
173	14.42	0.87	0.470	0.040	(0.111)	0.430
174	14.50	0.87	0.470	0.040	(0.111)	0.431
175	14.58	0.87	0.470	0.039	(0.111)	0.431
176	14.67	0.87	0.470	0.039	(0.111)	0.431
177	14.75	0.87	0.470	0.039	(0.111)	0.431
178	14.83	0.83	0.452	0.039	(0.107)	0.413
179	14.92	0.83	0.452	0.039	(0.107)	0.413
180	15.00	0.83	0.452	0.038	(0.107)	0.414
181	15.08	0.80	0.434	0.038	(0.102)	0.396
182	15.17	0.80	0.434	0.038	(0.102)	0.396
183	15.25	0.80	0.434	0.038	(0.102)	0.396
184	15.33	0.77	0.416	0.038	(0.098)	0.378
185	15.42	0.77	0.416	0.037	(0.098)	0.379
186	15.50	0.77	0.416	0.037	(0.098)	0.379
187	15.58	0.63	0.344	0.037	(0.081)	0.307
188	15.67	0.63	0.344	0.037	(0.081)	0.307
189	15.75	0.63	0.344	0.037	(0.081)	0.307
190	15.83	0.63	0.344	0.036	(0.081)	0.307
191	15.92	0.63	0.344	0.036	(0.081)	0.307
192	16.00	0.63	0.344	0.036	(0.081)	0.308
193	16.08	0.13	0.072	(0.036)	0.017	0.055
194	16.17	0.13	0.072	(0.036)	0.017	0.055
195	16.25	0.13	0.072	(0.035)	0.017	0.055
196	16.33	0.13	0.072	(0.035)	0.017	0.055
197	16.42	0.13	0.072	(0.035)	0.017	0.055
198	16.50	0.13	0.072	(0.035)	0.017	0.055
199	16.58	0.10	0.054	(0.035)	0.013	0.041
200	16.67	0.10	0.054	(0.035)	0.013	0.041
201	16.75	0.10	0.054	(0.034)	0.013	0.041
202	16.83	0.10	0.054	(0.034)	0.013	0.041
203	16.92	0.10	0.054	(0.034)	0.013	0.041
204	17.00	0.10	0.054	(0.034)	0.013	0.041
205	17.08	0.17	0.090	(0.034)	0.021	0.069
206	17.17	0.17	0.090	(0.034)	0.021	0.069
207	17.25	0.17	0.090	(0.033)	0.021	0.069
208	17.33	0.17	0.090	(0.033)	0.021	0.069
209	17.42	0.17	0.090	(0.033)	0.021	0.069
210	17.50	0.17	0.090	(0.033)	0.021	0.069
211	17.58	0.17	0.090	(0.033)	0.021	0.069
212	17.67	0.17	0.090	(0.033)	0.021	0.069
213	17.75	0.17	0.090	(0.032)	0.021	0.069
214	17.83	0.13	0.072	(0.032)	0.017	0.055
215	17.92	0.13	0.072	(0.032)	0.017	0.055
216	18.00	0.13	0.072	(0.032)	0.017	0.055
217	18.08	0.13	0.072	(0.032)	0.017	0.055
218	18.17	0.13	0.072	(0.032)	0.017	0.055
219	18.25	0.13	0.072	(0.031)	0.017	0.055
220	18.33	0.13	0.072	(0.031)	0.017	0.055
221	18.42	0.13	0.072	(0.031)	0.017	0.055
222	18.50	0.13	0.072	(0.031)	0.017	0.055
223	18.58	0.10	0.054	(0.031)	0.013	0.041
224	18.67	0.10	0.054	(0.031)	0.013	0.041
225	18.75	0.10	0.054	(0.031)	0.013	0.041
226	18.83	0.07	0.036	(0.030)	0.009	0.028
227	18.92	0.07	0.036	(0.030)	0.009	0.028
228	19.00	0.07	0.036	(0.030)	0.009	0.028
229	19.08	0.10	0.054	(0.030)	0.013	0.041
230	19.17	0.10	0.054	(0.030)	0.013	0.041
231	19.25	0.10	0.054	(0.030)	0.013	0.041
232	19.33	0.13	0.072	(0.030)	0.017	0.055
233	19.42	0.13	0.072	(0.029)	0.017	0.055
234	19.50	0.13	0.072	(0.029)	0.017	0.055
235	19.58	0.10	0.054	(0.029)	0.013	0.041
236	19.67	0.10	0.054	(0.029)	0.013	0.041
237	19.75	0.10	0.054	(0.029)	0.013	0.041
238	19.83	0.07	0.036	(0.029)	0.009	0.028

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239  19.92     0.07      0.036       (  0.029)       0.009        0.028
240  20.00     0.07      0.036       (  0.028)       0.009        0.028
241  20.08     0.10      0.054       (  0.028)       0.013        0.041
242  20.17     0.10      0.054       (  0.028)       0.013        0.041
243  20.25     0.10      0.054       (  0.028)       0.013        0.041
244  20.33     0.10      0.054       (  0.028)       0.013        0.041
245  20.42     0.10      0.054       (  0.028)       0.013        0.041
246  20.50     0.10      0.054       (  0.028)       0.013        0.041
247  20.58     0.10      0.054       (  0.028)       0.013        0.041
248  20.67     0.10      0.054       (  0.028)       0.013        0.041
249  20.75     0.10      0.054       (  0.027)       0.013        0.041
250  20.83     0.07      0.036       (  0.027)       0.009        0.028
251  20.92     0.07      0.036       (  0.027)       0.009        0.028
252  21.00     0.07      0.036       (  0.027)       0.009        0.028
253  21.08     0.10      0.054       (  0.027)       0.013        0.041
254  21.17     0.10      0.054       (  0.027)       0.013        0.041
255  21.25     0.10      0.054       (  0.027)       0.013        0.041
256  21.33     0.07      0.036       (  0.027)       0.009        0.028
257  21.42     0.07      0.036       (  0.027)       0.009        0.028
258  21.50     0.07      0.036       (  0.026)       0.009        0.028
259  21.58     0.10      0.054       (  0.026)       0.013        0.041
260  21.67     0.10      0.054       (  0.026)       0.013        0.041
261  21.75     0.10      0.054       (  0.026)       0.013        0.041
262  21.83     0.07      0.036       (  0.026)       0.009        0.028
263  21.92     0.07      0.036       (  0.026)       0.009        0.028
264  22.00     0.07      0.036       (  0.026)       0.009        0.028
265  22.08     0.10      0.054       (  0.026)       0.013        0.041
266  22.17     0.10      0.054       (  0.026)       0.013        0.041
267  22.25     0.10      0.054       (  0.026)       0.013        0.041
268  22.33     0.07      0.036       (  0.026)       0.009        0.028
269  22.42     0.07      0.036       (  0.025)       0.009        0.028
270  22.50     0.07      0.036       (  0.025)       0.009        0.028
271  22.58     0.07      0.036       (  0.025)       0.009        0.028
272  22.67     0.07      0.036       (  0.025)       0.009        0.028
273  22.75     0.07      0.036       (  0.025)       0.009        0.028
274  22.83     0.07      0.036       (  0.025)       0.009        0.028
275  22.92     0.07      0.036       (  0.025)       0.009        0.028
276  23.00     0.07      0.036       (  0.025)       0.009        0.028
277  23.08     0.07      0.036       (  0.025)       0.009        0.028
278  23.17     0.07      0.036       (  0.025)       0.009        0.028
279  23.25     0.07      0.036       (  0.025)       0.009        0.028
280  23.33     0.07      0.036       (  0.025)       0.009        0.028
281  23.42     0.07      0.036       (  0.025)       0.009        0.028
282  23.50     0.07      0.036       (  0.025)       0.009        0.028
283  23.58     0.07      0.036       (  0.025)       0.009        0.028
284  23.67     0.07      0.036       (  0.025)       0.009        0.028
285  23.75     0.07      0.036       (  0.025)       0.009        0.028
286  23.83     0.07      0.036       (  0.025)       0.009        0.028
287  23.92     0.07      0.036       (  0.025)       0.009        0.028
288  24.00     0.07      0.036       (  0.025)       0.009        0.028
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    45.9
       Flood volume = Effective rainfall      3.83(In)
        times area       9.1(Ac.)/[(In)/(Ft.)] =       2.9(Ac.Ft)
       Total soil loss =      0.69(In)
       Total soil loss =     0.525(Ac.Ft)
       Total rainfall =      4.52(In)
       Flood volume =      126760.7 Cubic Feet
       Total soil loss =       22873.9 Cubic Feet
       ---------------------------------------------------------------------
        Peak flow rate of this hydrograph =      5.179(CFS)
       ---------------------------------------------------------------------
       +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
       ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

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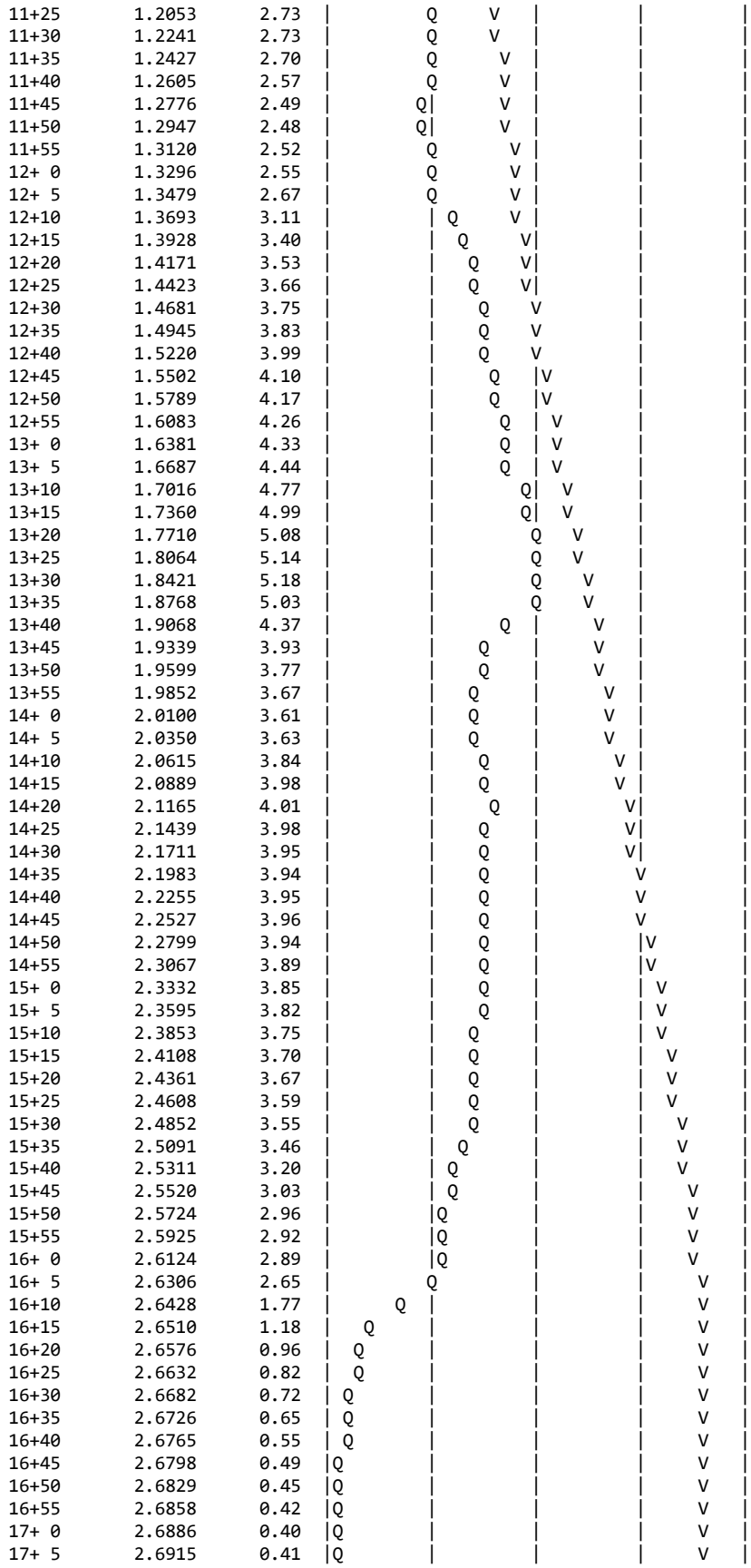
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0002	0.02	Q				
0+10	0.0010	0.12	Q				
0+15	0.0022	0.18	Q				
0+20	0.0037	0.22	Q				
0+25	0.0057	0.28	VQ				
0+30	0.0079	0.32	VQ				
0+35	0.0102	0.34	VQ				
0+40	0.0127	0.35	VQ				
0+45	0.0152	0.36	VQ				
0+50	0.0178	0.38	VQ				
0+55	0.0208	0.43	VQ				
1+ 0	0.0240	0.47	VQ				
1+ 5	0.0272	0.47	VQ				
1+10	0.0302	0.43	VQ				
1+15	0.0330	0.40	VQ				
1+20	0.0357	0.40	VQ				
1+25	0.0384	0.39	VQ				
1+30	0.0411	0.39	VQ				
1+35	0.0437	0.39	VQ				
1+40	0.0464	0.39	VQ				
1+45	0.0490	0.38	VQ				
1+50	0.0518	0.40	VQ				
1+55	0.0548	0.44	VQ				
2+ 0	0.0581	0.47	VQ				
2+ 5	0.0614	0.48	VQ				
2+10	0.0648	0.49	VQ				
2+15	0.0682	0.50	VQ				
2+20	0.0716	0.50	VQ				
2+25	0.0751	0.50	|VQ				
2+30	0.0786	0.50	|VQ				
2+35	0.0821	0.52	|VQ				
2+40	0.0860	0.57	|VQ				
2+45	0.0902	0.60	|VQ				
2+50	0.0944	0.61	|VQ				
2+55	0.0986	0.62	|VQ				
3+ 0	0.1029	0.62	|VQ				
3+ 5	0.1072	0.63	|VQ				
3+10	0.1116	0.63	|VQ				
3+15	0.1159	0.63	|VQ				
3+20	0.1203	0.63	|VQ				
3+25	0.1246	0.63	|VQ				
3+30	0.1290	0.63	|VQ				
3+35	0.1334	0.64	|VQ				
3+40	0.1378	0.64	|VQ				
3+45	0.1421	0.64	|VQ				
3+50	0.1466	0.65	| Q				
3+55	0.1514	0.69	| Q				
4+ 0	0.1564	0.73	| Q				
4+ 5	0.1615	0.74	| Q				
4+10	0.1666	0.75	| Q				
4+15	0.1718	0.75	| VQ				
4+20	0.1770	0.77	| VQ				
4+25	0.1827	0.82	| VQ				
4+30	0.1885	0.85	| VQ				
4+35	0.1945	0.86	| VQ				
4+40	0.2004	0.87	| VQ				
4+45	0.2065	0.88	| VQ				
4+50	0.2126	0.89	| VQ				
4+55	0.2191	0.94	| Q				
5+ 0	0.2259	0.98	| Q				
5+ 5	0.2325	0.97	| Q				
5+10	0.2386	0.88	| Q				
5+15	0.2442	0.82	| Q				
5+20	0.2498	0.81	| Q				
5+25	0.2557	0.85	| Q				
5+30	0.2617	0.87	| Q				
5+35	0.2678	0.89	| Q				

5+40	0.2743	0.94	Q			
5+45	0.2810	0.98	Q			
5+50	0.2878	0.99	Q			
5+55	0.2947	1.00	QV			
6+ 0	0.3016	1.00	Q			
6+ 5	0.3086	1.02	Q			
6+10	0.3160	1.07	Q			
6+15	0.3236	1.10	Q			
6+20	0.3313	1.12	Q			
6+25	0.3390	1.13	Q			
6+30	0.3468	1.13	Q			
6+35	0.3547	1.15	Q			
6+40	0.3629	1.20	Q			
6+45	0.3714	1.23	QV			
6+50	0.3800	1.24	QV			
6+55	0.3886	1.25	Q			
7+ 0	0.3973	1.26	Q			
7+ 5	0.4060	1.26	Q			
7+10	0.4147	1.26	Q			
7+15	0.4234	1.27	Q			
7+20	0.4322	1.28	Q			
7+25	0.4414	1.33	QV			
7+30	0.4507	1.36	QV			
7+35	0.4603	1.39	QV			
7+40	0.4702	1.44	QV			
7+45	0.4804	1.48	QV			
7+50	0.4907	1.50	Q			
7+55	0.5015	1.56	Q			
8+ 0	0.5125	1.60	QV			
8+ 5	0.5238	1.65	QV			
8+10	0.5360	1.77	Q			
8+15	0.5489	1.86	Q			
8+20	0.5619	1.90	Q			
8+25	0.5751	1.92	Q			
8+30	0.5885	1.94	QV			
8+35	0.6020	1.97	QV			
8+40	0.6160	2.04	Q			
8+45	0.6304	2.09	Q			
8+50	0.6450	2.12	Q			
8+55	0.6602	2.20	QV			
9+ 0	0.6757	2.25	Q			
9+ 5	0.6916	2.31	Q			
9+10	0.7085	2.45	Q			
9+15	0.7260	2.54	VQ			
9+20	0.7439	2.60	Q			
9+25	0.7624	2.69	Q			
9+30	0.7813	2.75	Q			
9+35	0.8005	2.79	Q			
9+40	0.8203	2.87	Q			
9+45	0.8405	2.93	Q			
9+50	0.8609	2.97	Q			
9+55	0.8820	3.05	Q			
10+ 0	0.9034	3.11	Q			
10+ 5	0.9242	3.02	Q			
10+10	0.9421	2.60	Q V			
10+15	0.9581	2.33	Q V			
10+20	0.9735	2.23	Q V			
10+25	0.9884	2.17	Q V			
10+30	1.0030	2.13	Q V			
10+35	1.0180	2.18	Q V			
10+40	1.0351	2.47	Q V			
10+45	1.0534	2.66	Q V			
10+50	1.0722	2.73	Q V			
10+55	1.0913	2.77	Q V			
11+ 0	1.1106	2.80	Q V			
11+ 5	1.1299	2.80	Q V			
11+10	1.1489	2.76	Q V			
11+15	1.1678	2.73	Q V			
11+20	1.1865	2.73	Q V			



17+10	2.6949	0.51	Q				V
17+15	2.6989	0.57	Q				V
17+20	2.7029	0.59	Q				V
17+25	2.7071	0.60	Q				V
17+30	2.7113	0.61	Q				V
17+35	2.7155	0.62	Q				V
17+40	2.7198	0.62	Q				V
17+45	2.7242	0.63	Q				V
17+50	2.7284	0.62	Q				V
17+55	2.7324	0.57	Q				V
18+ 0	2.7361	0.54	Q				V
18+ 5	2.7398	0.53	Q				V
18+10	2.7434	0.52	Q				V
18+15	2.7470	0.52	Q				V
18+20	2.7505	0.52	Q				V
18+25	2.7541	0.51	Q				V
18+30	2.7576	0.51	Q				V
18+35	2.7610	0.50	Q				V
18+40	2.7641	0.45	Q				V
18+45	2.7670	0.42	Q				V
18+50	2.7697	0.39	Q				V
18+55	2.7720	0.34	Q				V
19+ 0	2.7741	0.30	Q				V
19+ 5	2.7762	0.30	Q				V
19+10	2.7785	0.34	Q				V
19+15	2.7810	0.36	Q				V
19+20	2.7836	0.38	Q				V
19+25	2.7865	0.43	Q				V
19+30	2.7897	0.46	Q				V
19+35	2.7930	0.47	Q				V
19+40	2.7959	0.43	Q				V
19+45	2.7987	0.40	Q				V
19+50	2.8013	0.38	Q				V
19+55	2.8036	0.33	Q				V
20+ 0	2.8056	0.30	Q				V
20+ 5	2.8077	0.30	Q				V
20+10	2.8100	0.33	Q				V
20+15	2.8124	0.36	Q				V
20+20	2.8150	0.37	Q				V
20+25	2.8175	0.37	Q				V
20+30	2.8201	0.37	Q				V
20+35	2.8227	0.38	Q				V
20+40	2.8253	0.38	Q				V
20+45	2.8279	0.38	Q				V
20+50	2.8304	0.37	Q				V
20+55	2.8326	0.32	Q				V
21+ 0	2.8346	0.29	Q				V
21+ 5	2.8366	0.29	Q				V
21+10	2.8389	0.33	Q				V
21+15	2.8413	0.36	Q				V
21+20	2.8438	0.35	Q				V
21+25	2.8459	0.31	Q				V
21+30	2.8479	0.28	Q				V
21+35	2.8498	0.28	Q				V
21+40	2.8521	0.33	Q				V
21+45	2.8545	0.35	Q				V
21+50	2.8569	0.35	Q				V
21+55	2.8590	0.31	Q				V
22+ 0	2.8610	0.28	Q				V
22+ 5	2.8629	0.28	Q				V
22+10	2.8652	0.33	Q				V
22+15	2.8676	0.35	Q				V
22+20	2.8700	0.35	Q				V
22+25	2.8722	0.31	Q				V
22+30	2.8741	0.28	Q				V
22+35	2.8760	0.27	Q				V
22+40	2.8778	0.27	Q				V
22+45	2.8796	0.26	Q				V
22+50	2.8814	0.26	Q				V

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   22+55       2.8832      0.26  |Q        |         |         |        V|
   23+ 0       2.8850      0.26  |Q        |         |         |        V|
   23+ 5       2.8867      0.26  |Q        |         |         |        V|
   23+10       2.8885      0.26  |Q        |         |         |        V|
   23+15       2.8902      0.25  |Q        |         |         |        V|
   23+20       2.8920      0.25  |Q        |         |         |        V|
   23+25       2.8937      0.25  |Q        |         |         |        V|
   23+30       2.8955      0.25  |Q        |         |         |        V|
   23+35       2.8972      0.25  |Q        |         |         |        V|
   23+40       2.8990      0.25  |Q        |         |         |        V|
   23+45       2.9007      0.25  |Q        |         |         |        V|
   23+50       2.9025      0.25  |Q        |         |         |        V|
   23+55       2.9042      0.25  |Q        |         |         |        V|
   24+ 0       2.9060      0.25  |Q        |         |         |        V|
   24+ 5       2.9076      0.23  Q         |         |         |        V|
   24+10       2.9085      0.13  Q         |         |         |        V|
   24+15       2.9090      0.07  Q         |         |         |        V|
   24+20       2.9093      0.05  Q         |         |         |        V|
   24+25       2.9096      0.03  Q         |         |         |        V|
   24+30       2.9097      0.02  Q         |         |         |        V|
   24+35       2.9098      0.02  Q         |         |         |        V|
   24+40       2.9099      0.01  Q         |         |         |        V|
   24+45       2.9100      0.01  Q         |         |         |        V|
   24+50       2.9100      0.00  Q         |         |         |        V|
   24+55       2.9100      0.00  Q         |         |         |        V|
   25+ 0       2.9100      0.00  Q         |         |         |        V|
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Appendix J

Soils Reports

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California

Penske Moreno Valley

August 11, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 13, May 27, 2020

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

Date(s) aerial images were photographed: May 25, 2019—Jun 25, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MmB	Monserate sandy loam, 0 to 5 percent slopes	8.0	86.9%
MmC2	Monserate sandy loam, 5 to 8 percent slopes, eroded	1.2	13.1%
Totals for Area of Interest		**9.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

MmB—Monserate sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hcx4
Elevation: 700 to 2,500 feet
Mean annual precipitation: 10 to 18 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Monserate and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Monserate

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 28 inches: sandy clay loam
H3 - 28 to 45 inches: indurated
H4 - 45 to 57 inches: cemented
H5 - 57 to 70 inches: loamy coarse sand, coarse sandy loam
H5 - 57 to 70 inches:

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 20 to 39 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA
Hydric soil rating: No

Minor Components

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Hanford
Percent of map unit: 5 percent
Hydric soil rating: No

Tujunga
Percent of map unit: 5 percent
Hydric soil rating: No

MmC2—Monserate sandy loam, 5 to 8 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcx5
Elevation: 700 to 2,500 feet
Mean annual precipitation: 10 to 18 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Monserate and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Monserate

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 10 inches: sandy loam
H2 - 10 to 28 inches: sandy clay loam
H3 - 28 to 45 inches: indurated
H4 - 45 to 57 inches: cemented
H5 - 57 to 70 inches: loamy coarse sand, coarse sandy loam
H5 - 57 to 70 inches:

Properties and qualities
Slope: 5 to 8 percent
Depth to restrictive feature: 20 to 39 inches to duripan
Drainage class: Well drained
Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Ramona

Percent of map unit: 3 percent
Hydric soil rating: No

Hanford

Percent of map unit: 3 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 3 percent
Hydric soil rating: No

Tujunga

Percent of map unit: 3 percent
Hydric soil rating: No

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GEOTECHNICAL ENGINEERING INVESTIGATION
PENSKE TRUCK LEASING FACILITY
HIGHWAY 215 FRONTAGE ROAD
MORENO VALLEY, CALIFORNIA

KA PROJECT NO. 112-21093
OCTOBER 22, 2021

Prepared for:

MR. MIKE BARNS, DIRECTOR OF CONSTRUCTION
PENSKE TRUCK LEASING
1541 W. BELL DEL MAR DRIVE
TEMPE, ARIZONA 85283

Prepared by:

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GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

October 22, 2021 KA Project No. 112-21093

Mr. Mike Barnes, Director of Construction
Penske Truck Leasing
1541 W. Bell Del Mar Drive
Tempe, Arizona 85283 (480) 276-5888
Mike.barnes@penske.com

RE: Geotechnical Engineering Investigation
Proposed Penske Truck Leasing Facility
SEC of Alessandro Blvd. and Highway 215 Frontage Rd.
Moreno Valley, California

Dear Mr. Barnes:

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Jorge A. Pelayo, PE
Project Engineer
RCE No. 91269

CLT:JAP

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GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED PENSKE TRUCK LEASING FACILITY
ALESSANDRO BLVD. AND HIGHWAY 215 FRONTAGE RD.
MORENO VALLEY, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed Penske Truck Leasing Facility to be located on Alessandro Boulevard and east of Highway 215 Frontage Road, in the City of Moreno Valley, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, soil cement reactivity, pavement design, and water infiltration rates.

A site plan showing the approximate boring locations is presented following the text of this report, the attached Site Map, Figure 1. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A contains a description of the laboratory testing phase of this study; along with the laboratory test results. Appendices B and C contain guides to earthwork and pavement specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the subject site, to make geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our proposal dated August 19, 2021 (KA Proposal No. G21100CAC) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of drilling a total of nine (9) borings to depths of approximately 10 to 50 feet below existing site grades for evaluation of the subsurface conditions at the project site.
- Performance of laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Performance of two (2) water infiltration tests at the subject site in order to obtain approximate water infiltration rates for the near surface soil conditions.

- Collection of a bulk sample for laboratory testing of R-value used in our pavement design recommendations.

- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.

- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We have reviewed the Site Plan, prepared by K/G Architects for the proposed development. Building 1 is proposed as a new structure called, "Service Bays," that is a two-story semi-truck drive through building constructed of steel spans on concrete foundations and consisting of 19,158 square feet. Building 2 is proposed as a new single-story structure constructed of conventional wood frame with slab-on-grade floors and consisting of 1,192 square feet. The proposed development will include on-site parking and localized landscaped areas.

The anticipated finished grade elevation for the proposed structure is assumed to be relatively close to the existing site grades. As a result, only minor cuts and fills are anticipated at the site to account for site drainage. In the event these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

The subject site is roughly rectangular in shape and encompasses approximately 10 acres. The subject site is located on Alessandro Blvd. and east of the Highway 215 Frontage Rd. in the city of Moreno Valley, California, see the attached Vicinity Map, Figure 2. The site is bound to the south by Robertson's Ready Mix, to the west by the existing Highway 215 Frontage Rd., to the north by Alessandro Blvd., and to the east by Alessandro Self Storage (on Day St.).

The site is currently undeveloped and free of any above grade structures. Ground surface at the site consists of exposed soil and localized weed and brush growth. The site topography is relatively flat and level with no major changes in topography at an approximate elevation of 1545 feet above mean sea level. The site currently drains to the west side of the property.

GEOLOGIC SETTING

The subject site is located within the Peninsular Ranges Geomorphic Province (CGS Note 36). The Peninsular Ranges is a series of ranges is separated by northwest trending valleys, subparallel to faults branching from the San Andreas Fault. The trend of topography is similar to the Coast Ranges, but the geology is more like the Sierra Nevada, with granitic rock intruding the older metamorphic rocks. The

Peninsular Ranges extend into lower California and are bound on the east by the Colorado Desert. The Los Angeles Basin and the island group (Santa Catalina, Santa Barbara, and the distinctly terraced San Clemente and San Nicolas islands), together with the surrounding continental shelf (cut by deep submarine fault troughs), are included in this province.

Locally, the site is located in an inactive portion of the San Jacinto River floodplain, and central area of Moreno Valley. The Moreno Valley is bound to the south and west by the Santa Ana Mountains, to the north by the Box Springs Mountains, to the east by the San Jacinto Mountains.

The near-surface deposits in the vicinity of the subject site are indicated to be comprised of recent alluvium (Map Symbol Q) consisting of unconsolidated sands, silt, and clays derived from erosion of local mountain ranges. See the attached Geologic Map (Figure 3) and Boring Logs (Appendix A) for a description of the earth materials encountered during our investigation.

Numerous moderate to large earthquakes have affected the area of the subject site within historic time. Based on the proximity of several dominant active faults and seismogenic structures, as well as the historic seismic record, the area of the subject site is considered subject to relatively high seismicity. The nearest significant active faults are the San Jacinto (8 miles northeast), San Andreas (17 miles northeast), and Elsinore fault zone(s) (16 miles southwest), of the site. The area in consideration shows no mapped faults on-site according to maps prepared by the California Geologic Survey and published by the International Conference of Building Officials (ICBO). No evidence of surface faulting was observed on the property during our reconnaissance.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling a total of eleven (9) borings (B-1 to B-9) to depths of approximately 10 to 50 feet below existing site grade, using a truck-mounted drill rig; in addition, two borings (IT-1 and IT-2) were advanced to a depth of ten feet for the purpose of infiltration testing. A bulk subgrade sample was obtained from the site for laboratory R-Value testing. The approximate boring and bulk sample locations are shown on the attached, Site Map, Figure 1. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsurface soils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, R-Value, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the surface soils consisted of approximately 6 to 12 inches of very loose silty sand or silty sand/sand. These soils are disturbed, have low strength characteristics and are highly compressible when saturated.

Beneath the loose surface soils, approximately 2 to 3 feet of loose to very dense silty sand or silty sand/sand was encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 13 blows per foot to over 50 blows per 6 inches. Dry densities ranged from 110 to 129 pcf. A representative soil sample consolidated approximately 3¾ percent under a 2 ksf load when saturated. A representative soil sample had an angle of internal friction of 25 degrees.

Below 3 to 4 feet, predominately loose to very dense silty sand, silty sand/sand, silty sand/sandy silt or sand were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 14 blows per foot to over 50 blows per 6 inches. Dry densities ranged from 94 to 124 pcf. A representative soil sample consolidated approximately 4½ percent under a 2 ksf load when saturated. A representative soil sample had an internal angle of friction of 29 degrees. These soils had similar strength characteristics as the upper soils and extended to the termination depth of our borings.

For additional information about the soils encountered, please refer to the logs of borings in Appendix A.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Groundwater was encountered at a depth of approximately 14 feet below existing site grade in Boring Nos. B6, B7 and B8.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

SEISMICITY AND LIQUEFACTION POTENTIAL

Seismicity is a general term relating to the abrupt release of accumulated strain energy in the rock materials of the earth's crust in a given geographical area. The recurrence of accumulation and subsequent release of strain have resulted in faults and fault systems. Fault patterns and density reflect relative degrees of regional stress through time, but do not necessarily indicate recent seismic activity; therefore, the degree of seismic risk must be determined or estimated by the seismic record in any given region.

Soil liquefaction is a state of soil particle suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as clean sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events.

To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Soil type

2) Groundwater depth

3) Relative density

4) Initial confining pressure

5) Intensity and duration of ground shaking

The site is located in an area designated by the County of Riverside Liquefaction Susceptibility Map as having Moderate Liquefaction Potential. Groundwater was encountered at the subject site at a depth of approximately 14 feet below current site grades.

The potential for soil liquefaction during a seismic event was evaluated using the LIQUEFYPRO computer program (version 5.8h) developed by CivilTech Software. For the analysis, a maximum earthquake magnitude of 7.0 was used. A peak horizontal ground surface acceleration of 0.620g was considered conservative and appropriate for the liquefaction analysis. An estimated high groundwater depth of fourteen (14) feet was used for our analysis. The computer analysis indicates that soil conditions encountered at the subject site are not subject to liquefaction under seismic shaking.

The computer analysis indicates that an estimated total and differential seismic induced settlement is not anticipated to exceed ½ inch and ¼ inch, respectively. Accordingly, the liquefaction potential at the site is not considered significant and measures to mitigate the liquefaction induced settlement are not warranted.

FAULT RUPTURE HAZARD ZONES

The Alquist-Priolo Geologic Hazards Zones Act went into effect in March, 1973. Since that time, the Act has been amended 11 times (Hart, 2007). The purpose of the Act, as provided in California Geologic Survey (CGS) Special Publication 42 (SP 42), is to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." The Act was renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994, and at that time, the originally designated "Special Studies Zones" was renamed the "Earthquake Fault Zones." An Earthquake Fault Zones Map has not been prepared for the vicinity of the subject site to date.

SEISMIC HAZARDS ZONES

In 1990, the California State Legislature passed the Seismic Hazard Mapping Act to protect public safety from the effects of strong shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The Act requires that the State Geologist delineate various seismic hazards zones on Seismic Hazards Zones Maps. Specifically, the maps identify areas where soil liquefaction and earthquake-induced landslides are most likely to occur. A site-specific geotechnical evaluation is required prior to permitting most urban developments within the mapped zones. The Act also requires sellers of real property within the zones to disclose this fact to potential buyers. A Seismic Hazard Zones Map has not been prepared for the vicinity of the subject site to date. Furthermore, the County of Riverside Liquefaction Susceptibility Map has identified the site as having Moderate Liquefaction Potential. It is our opinion that the site is not located in a Liquefaction Hazard Zone based on the absence of shallow groundwater in the upper 50 feet below existing site grades and the relatively dense soils encountered.

OTHER HAZARDS

Rockfall, Landslide, Slope Instability, and Debris Flow: The subject site is relatively flat and level. It is our understanding that there are no significant slopes proposed as part of the proposed development. Provided the recommendations presented in this report are implemented into the design and construction of the anticipated development, rockfalls, landslides, slope instability, and debris flows are not anticipated to pose a hazard to the subject site.

Seiches: Seiches are large waves generated within enclosed bodies of water. The site is not located in close proximity to any lakes or reservoirs. As such, seiches are not anticipated to pose a hazard to the subject site.

Tsunamis: Tsunamis are tidal waves generated by fault displacement or major ground movement. The site is several miles from the ocean. As such, tsunamis are not anticipated to pose a hazard to the subject site.

Hydroconsolidation: The near surface soils encountered at the subject site were found to be medium dense to dense. The underlying native soils were found to be dense to very dense. Provided the recommendations in this report are incorporated into the design and construction of the proposed development, hydroconsolidation is not anticipated to be a significant concern for the subject site.

Expansive Soil

The near-surface silty sand soils encountered at the site have been identified through laboratory testing as having a low expansion potential. Expansive soils have the potential to undergo volume change, or shrinkage and swelling, with changes in soil moisture. As expansive soils dry, the soil shrinks; when moisture is reintroduced into the soil, the soil swells.

SOIL CORROSIVITY

Corrosion tests were performed to evaluate the soil corrosivity to the buried structures. The tests consisted of sulfate content, chloride content, and resistivity and the results of the tests are included as follows:

Parameter	Results	Test Method
Resistivity	1,900 ohms-cm	CA 643
Sulfate	296 ppm	CA 417
Chloride	71 ppm	CA 422
pH	8.0	EPA 9045C

INFILTRATION TESTING

Estimated infiltration rates were determined using the results of open borehole percolation testing performed at the subject site. The percolation testing indicated that the near surface dense silty sand soil was found to have infiltration rates of approximately 0.11 and 0.16 inch per hour in IT-1 and IT-2, respectively. The locations of these infiltration tests are presented on the attached Site Map, Figure 1.

The soil infiltration rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the infiltration system to compensate for these factors as determined appropriate by the designer. In addition, routine maintenance consisting of clearing the system of clogged soils and debris should be expected.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the loose surficial soils, appear to be conducive to the development of the project.

To reduce post-construction soil movement and provide uniform support for the buildings and other foundations, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of at least four (4) feet below existing grades or three (3) feet below the bottom of the proposed foundation bearing grades. In addition, any fill soil present in the building area should be removed and re-placed as compacted Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The exposed subgrade at the base of the overexcavation should then be scarified, moisture-conditioned as necessary,

and compacted. The overexcavation and recompaction should also extend laterally five feet (5') beyond edges of the proposed footings or building limits. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

To reduce post-construction soil movement and provide uniform support for the proposed parking and drive areas, overexcavation and recompaction of the near surface soil in the proposed parking area should be performed to a minimum depth of at least twelve (12) inches below existing grades or proposed subgrade, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least three (3) feet beyond edges of the proposed paving limits or to the property boundary. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and compacted to achieve at least 95 percent maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required density or if soil conditions are not stable.

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 18-inches on centers, be used for this purpose. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

Groundwater Influence on Structures/Construction

During our recent field investigation groundwater was encountered at approximately 14 feet below existing site grade. Therefore, dewatering and/or waterproofing may be required should structures or excavations extend below this depth. If groundwater is encountered, our firm should be consulted prior to dewatering the site. Installation of a standpipe piezometer is suggested prior to construction should groundwater levels be a concern.

In addition to the groundwater level, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation

General site clearing should include removal of vegetation; existing utilities; structures including foundations; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Overexcavation and Recompaction – Building and Foundation Areas

To reduce post-construction soil movement and provide uniform support for the buildings and other foundations, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of at least four (4) feet below existing grades or three (3) feet below the bottom of the proposed foundation bearing grades, whichever is greater. In addition, any fill soil present in the building area should be removed and re-placed as compacted Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The exposed subgrade at the base of the overexcavation should then be scarified, moisture-conditioned as necessary, and compacted. The overexcavation and recompaction should also extend laterally five feet (5') beyond edges of the proposed footings or building limits. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Overexcavation and Recompaction – Proposed Parking Area

To reduce post-construction soil movement and provide uniform support for the proposed parking and drive areas, overexcavation and recompaction of the near surface soil in the proposed parking area should be performed to a minimum depth of at least twelve (12) inches below existing grades or proposed subgrade, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least three (3) feet beyond edges of the proposed paving limits or to the property boundary. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Any buried structures encountered during construction should be properly removed and the resulting excavations backfilled with Engineered Fill, compacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures encountered, should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

The upper soils, during wet winter months become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The on-site upper native soils are predominately silty sand and silty sand/sand. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics and debris.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics:

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and compacted to achieve at least 95 percent maximum dry density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1804.4 of the 2019 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative

means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 2 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practice following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

The Contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Foundations - Conventional

The proposed structures may be supported on a shallow foundation system bearing on a minimum of three (3) feet of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,000 psf
Dead-Plus-Live Load	2,600 psf
Total Load, including wind or seismic loads	3,500 psf

The footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 15 inches, regardless of load.

The total soil movement is not expected to exceed 1 inch. Differential movement measured across a horizontal distance of 30 feet should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated.

The footing excavations should not be allowed to dry out any time prior to pouring concrete. It is recommended that footings be reinforced by at least one No. 4 reinforcing bar in both top and bottom.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.30 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads.

Floor Slabs and Exterior Flatwork

In areas where moisture-sensitive floor coverings will be utilized, concrete slab-on-grade floors should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with accepted engineering practices. The water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 3 inches of compacted, clean gravel of ¾-inch maximum size. To aid in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of the vapor retarder. The granular fill should consist of damp clean sand with at least 10 to 30 percent of the sand passing the 100 sieve. The sand should be free of clay, silt, or organic material. Rock dust which is manufactured sand from rock crushing operations is typically suitable for the granular fill. This granular fill material should be compacted.

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 18-inch centers, be used for this purpose. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew

in the structure. To reduce moisture vapor intrusion, it is recommended that a vapor retarder be installed. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to reduce the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 44 pounds per square foot per foot of depth. Walls incapable of this deflection or are fully constrained walls against deflection may be designed for an equivalent fluid at-rest pressure of 64 pounds per square foot per foot of depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand-operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete, or other suitable backfill to reduce surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with CalTrans Standard Specifications (2018). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall, in the center line of the drainage blanket and should have a minimum diameter of four inches. Collector pipes may be either slotted or perforated. Slots should be no wider than ⅛ inch in diameter, while perforations should be no more than ¼ inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet

maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

R-Value Test Results and Pavement Design

One bulk soil sample was obtained from the project site for R-Value testing at the location shown on the attached site plan. The sample was tested in accordance with the State of California Materials Manual Test Designation 301. Results of the test are as follows:

Sample	Depth	Description	R-Value at Equilibrium
B7/R1	0-36"	Silty Sand (SM)	55

The test results are moderate and indicate good subgrade support characteristics under dynamic traffic loads. The following table shows the recommended pavement sections for various traffic indices.

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
4.0	2.0"	4.0"	6.0"
4.5	2.5"	4.0"	6.0"
5.0	2.5"	4.0"	6.0"
5.5	3.0"	4.0"	6.0"
6.0	3.0"	4.0"	6.0"
6.5	3.5"	4.0"	6.0"
7.0	4.0"	4.0"	6.0"
7.5	4.0"	4.0"	6.0"

**** 95% compaction based on ASTM Test Method D1557 or CAL 216***
***** 95% compaction based on ASTM Test Method D1557 or CAL 216***

If traffic indices are not available, an estimated (typical value) index of 4.5 may be used for light automobile traffic and an index of 7.0 may be used for light truck traffic. Following grading operations, it is recommended additional R-Value testing be performed to verify the design R-Value.

The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

PORTLAND CEMENT PAVEMENT
LIGHT DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
4.5	5.0"	4.0"	12.0"

HEAVY DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
7.0	6.0"	4.0"	12.0"

**** 95% compaction based on ASTM Test Method D1557 or CAL 216***
***** 95% compaction based on ASTM Test Method D1557 or CAL 216***
******Minimum compressive strength of 3000 psi***

Seismic Parameters – 2019 California Building Code

The Site Class per Section 1613 of the 2019 California Building Code (2019 CBC) and ASCE 7-16, Chapter 20 is based upon the site soil conditions. It is our opinion that a Site Class D is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2019 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.2.2
Site Coefficient F_a	1.000	Table 1613.2.3 (1)
S_s	1.500	Section 1613.2.1
S_{MS}	1.500	Section 1613.2.3
S_{DS}	1.000	Section 1613.2.4
Site Coefficient F_v	1.700	Table 1613.2.3 (2)
S_1	0.600	Section 1613.2.1
S_{M1}	1.020	Section 1613.2.3
S_{D1}	0.670	Section 1613.2.4
T_S	0.670	Section 1613.2

* Based on Equivalent Lateral Force (ELF) Design Procedure being used.

Infiltration Testing

The shallow soil conditions present at the subject site were evaluated by drilling shallow borings in the vicinity of the infiltration test. The borings drilled at the site indicated the subsurface soil conditions consisted of medium dense to dense silty sand.

Infiltration rates were determined using the results of open borehole infiltration testing performed at the subject site. Infiltration testing performed on the near surface silty sand soil indicate infiltration rates of approximately 0.11 to 0.16 inches per hour. Based on the low infiltration rates, the subsurface conditions encountered at the site may not be conducive to infiltration. Detailed results of the percolation test and infiltration rate results are attached in tabular format.

The soil percolation rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the percolation system to compensate for these factors as determined appropriate by the designer. In addition, periodic maintenance consisting of clearing the bottom of the system of clogged soils should be expected.

It is recommended that the location of the infiltration systems not be closer than ten feet (10') as measured laterally from the edge of the adjacent property line, ten feet (10') from the outside edge of any foundation and five (5') from the edge of any right-of way to the outside edges of the infiltration system.

If the infiltration location is within ten feet (10') of the proposed foundation, it is recommended that this infiltration system should be impervious from the finished ground surface to a depth that will achieve a diagonal distance of a minimum of ten feet (10') below the bottom of the closest footing in the project.

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

One soil sample was obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentration detected from the soil sample indicated moderate sulfate exposure value as established by HUD/FHA and CBC. Therefore, it is recommended that concrete in contact with soil utilize Type II Cement and have a minimum compressive strength of 4,000 psi and a water to cement ratio of 0.50.

Electrical resistivity testing of the soil indicates that the onsite soils may have a severe potential for metal loss from electrochemical corrosion process. A qualified corrosion engineer should be consulted regarding the corrosion effects of the onsite soils on underground metal utilities.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent upon the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in-situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction are characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

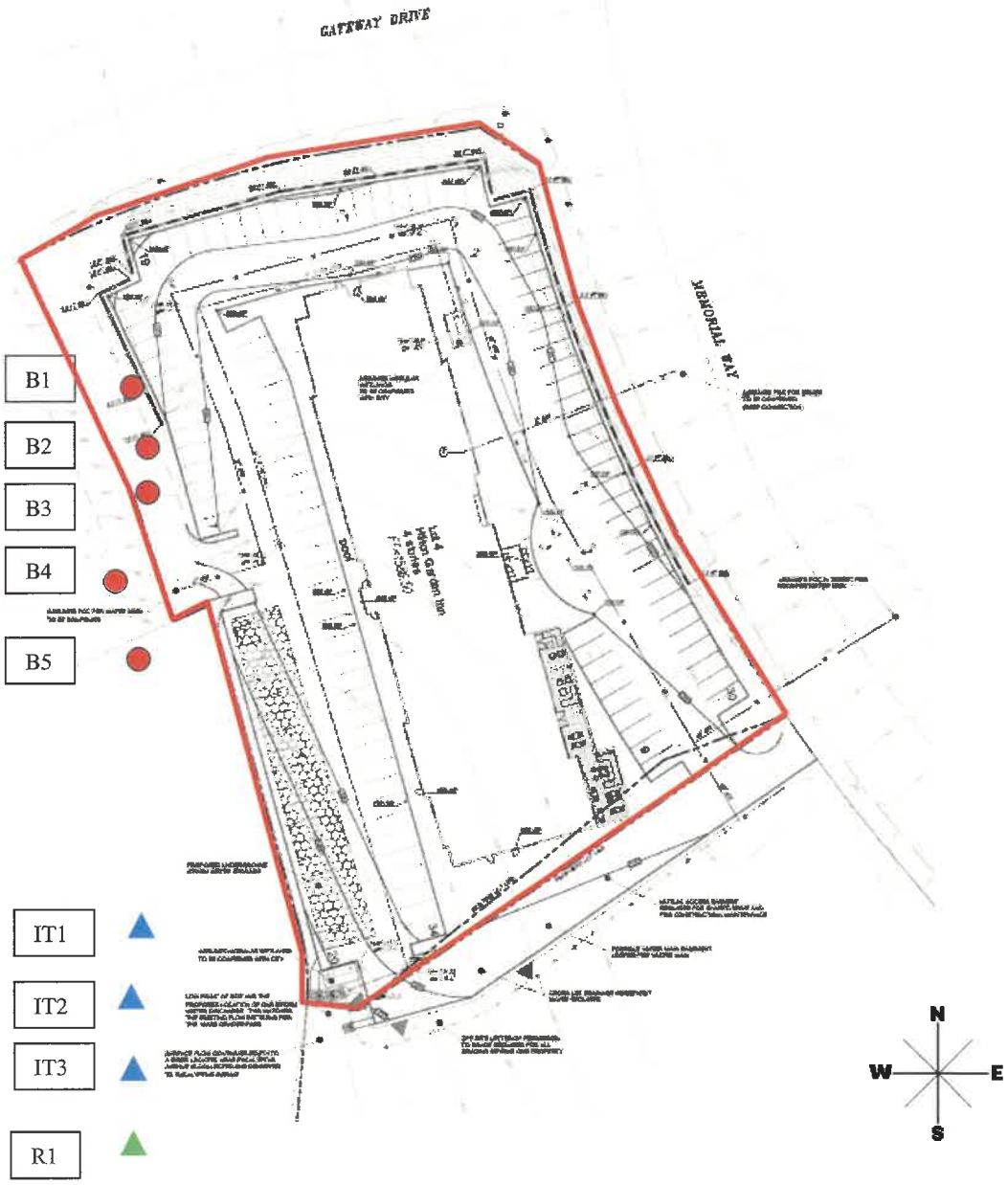
The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Christopher L. Tomlin, MBA, CEG
Senior Engineering Geologist
PG No. 6296, CEG No. 2066

Jorge A. Pelayo, MS, PE
Project Engineer
RCE No. 91269



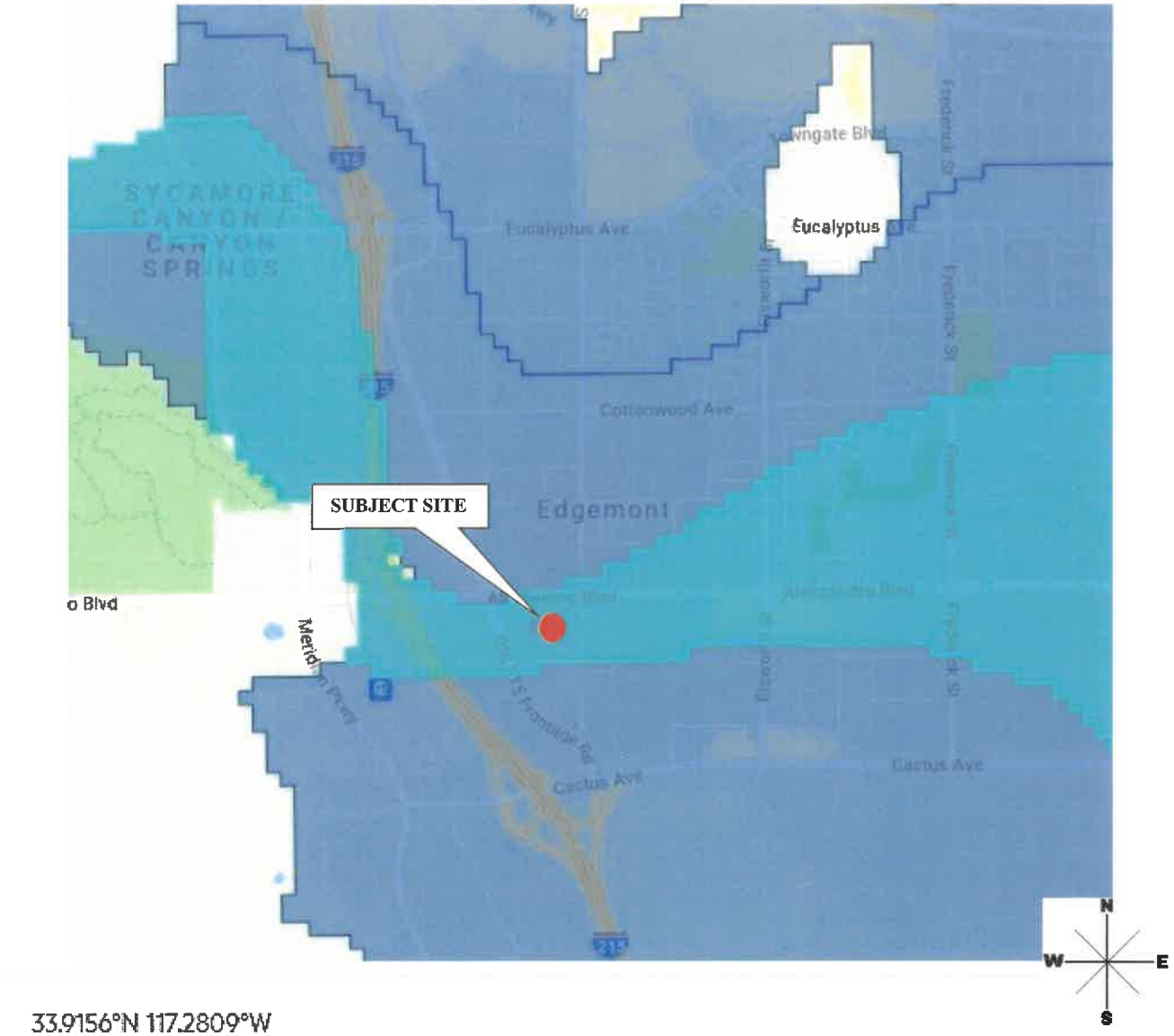
▲ APPROXIMATE INFILTRAION TEST LOCATION

● APPROXIMATE BORING LOCATION

▲ APPROXIMATE R-VALUE LOCATION

SITE MAP	**Scale:** NTS	**Date:** Oct, 2020	Krazan GEOTECHNICAL ENGINEERING
PROPOSED PENSKE MORENO VALLEY, CALIFORNIA	**Drawn by:** CLT	**Approved by:** JAP	
	Project No. 112-21093	**Figure No.** 1	

VICINITY MAP	Scale: NTS	Date: Oct, 2021	Krazan GEOTECHNICAL ENGINEERING
PROPOSED PENSKE MORENO VALLEY, CALIFORNIA	Drawn by: CLT	Approved by: JAP	
	Project No. 112-21093	Figure No. 2	



33.9156°N 117.2809°W

Riverside County, CA Lique

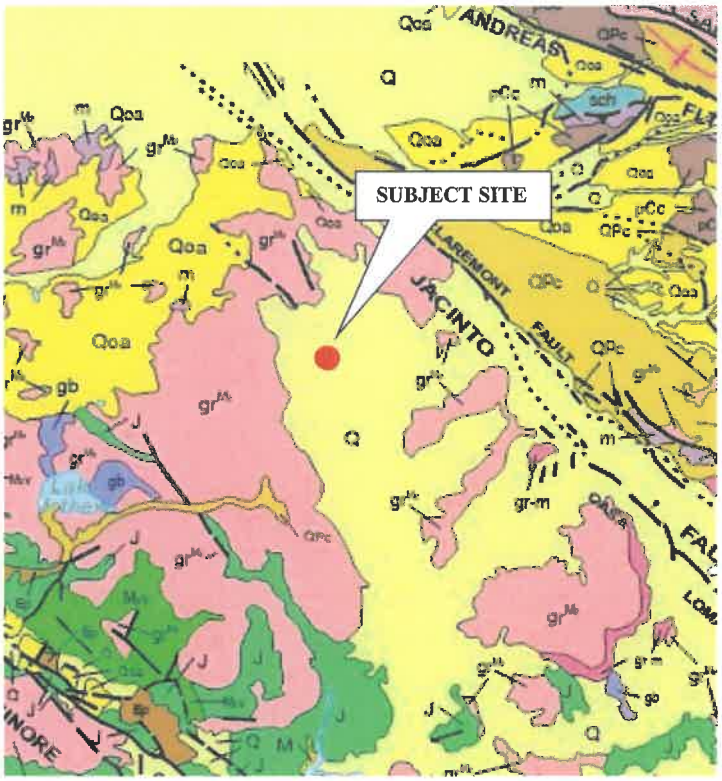
0.0m

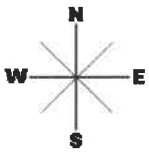
SUSCEPTIBILITY Moderate

DEFINITION 4 50<GW<100 feet, Contains Etype: SED{TPHWCIf, TPHUCac, PHUCIf, PHUCaud, PHUCaf, PHMCaud, PHIf,

Source: Riverside County GIS Map: Liquefaction

COUNTY OF RIVERSIDE GIS MAP: LIQUEFACTION	**Scale:** NTS	**Date:** Oct, 2021	Krazan GEOTECHNICAL ENGINEERING
PROPOSED PENSKE MORENO VALLEY, CALIFORNIA	**Drawn by:** CLT	**Approved by:** JAP	
	Project No. 112-21093	**Figure No.** 3	





DESCRIPTION OF MAP UNITS

QUATERNARY DEPOSITS

Qs	Extensive marine and nonmarine sand deposits, generally near the coast or desert playas
Q	Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated
Qls	Selected large landslides
Qg	Glacial till and moraines. Found at high elevations mostly in the Sierra Nevada and Klamath Mountains
Qoa	Older alluvium, lake, playa, and terrace deposits
QPc	Pleistocene and/or Pliocene sandstone, shale, and gravels deposits, mostly loosely consolidated

Source: Department of Conservation: Geologic Map of California, 2010

GEOLOGIC MAP	**Scale:** NTS	**Date:** Oct, 2021	Krazan GEOTECHNICAL ENGINEERING
PROPOSED PENSKE MORENO VALLEY, CALIFORNIA	**Drawn by:** CLT	**Approved by:** JAP	
	Project No. 112-21093	**Figure No.** 4	

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Nine (9) 8½-inch diameter exploratory borings were advanced. The boring locations are shown on the attached Site Plan, Figure 1.

The soils encountered were logged in the field during the exploration and, with supplementary laboratory test data, are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests and standard penetration tests were performed at selected depths. This test represents the resistance to driving a 2½-inch and 1½-inch diameter split barrel sampler, respectively. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with one-half of the block shaded. All samples were returned to our Corona laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. Expansion index and R-Value tests were completed for select bag samples obtained from the auger cuttings. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% 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 (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more 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 of 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 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

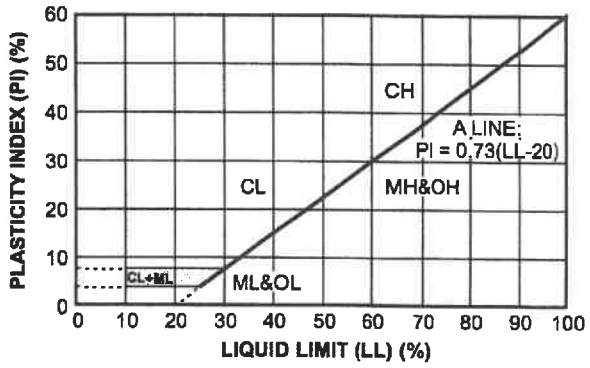
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	12 to 13 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Log of Boring B1

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-1

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, moist, drills easily Loose below 12 inches Medium dense below 2 feet				
6				7.2		14
10				10.1		28
10		End of Borehole				
20		Water not encountered Boring backfilled with soil cuttings				

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Rig: CME 75

Driller: Whitcomb Drilling, Inc.

Krazan and Associates

Drill Date: 9-2-21

Hole Size: 8½ Inches

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B2

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-2

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
0		Ground Surface						
		SILTY SAND (SM) Very loose, fine- to medium-grained; brown, moist, drills easily						
2		Loose below 12 inches Medium dense below 2 feet	113.6	6.0		29		
4		Dense and drills firmly below 5 feet	97.2	4.7		42		
6								
8								
10			106.7	6.1		48		
12								
14								
		Medium dense and drills easily below 15 feet		11.4		19		
16								
18								
		Water not encountered Boring backfilled with soil cuttings		16.6		26		
20								

Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B3

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-3

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, moist, drills easily Medium dense below 12 inches Very dense and drills firmly below 2 feet				
2			112.6	6.8		50+
4						
6			93.8	9.3		50+
8						
10			98.4	8.1		50+
12						
14		***SILTY SAND/SAND (SM/SP)*** Dense, fine- to coarse-grained; brown, moist, drills firmly		16.5		43
16						
18		Water not encountered Boring backfilled with soil cuttings		15.4		34
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 20 Feet

Log of Boring B4

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-4

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	Penetration Test blows/ft (20 40 60)	Water Content (%) (10 20 30 40)
0		Ground Surface						
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, moist, drills easily Loose below 12 inches Dense and drills firmly below 2 feet						
6				6.4		52		■
8		***SILTY SAND/SAND (SM/SP)*** Very dense, fine- to medium-grained; brown, damp, drills firmly		3.9		50+		■
10		End of Borehole						
20		Water not encountered Boring backfilled with soil cuttings						

Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B5

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-5

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered **Initial:** N/A **At Completion:** N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND/SAND (SM/SP)*** Very loose, fine- to coarse-grained; brown, moist, drills easily Loose below 12 inches Very dense and drills firmly below 2 feet				
6				8.2		50+
8		***SAND (SP)*** Very dense, fine- to coarse-grained; brown, damp, drills firmly		1.8		50+
10		End of Borehole				
20		Water not encountered Boring backfilled with soil cuttings				

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Log of Boring B6

Project: Penske Truck Leasing

Project No: 112-21093

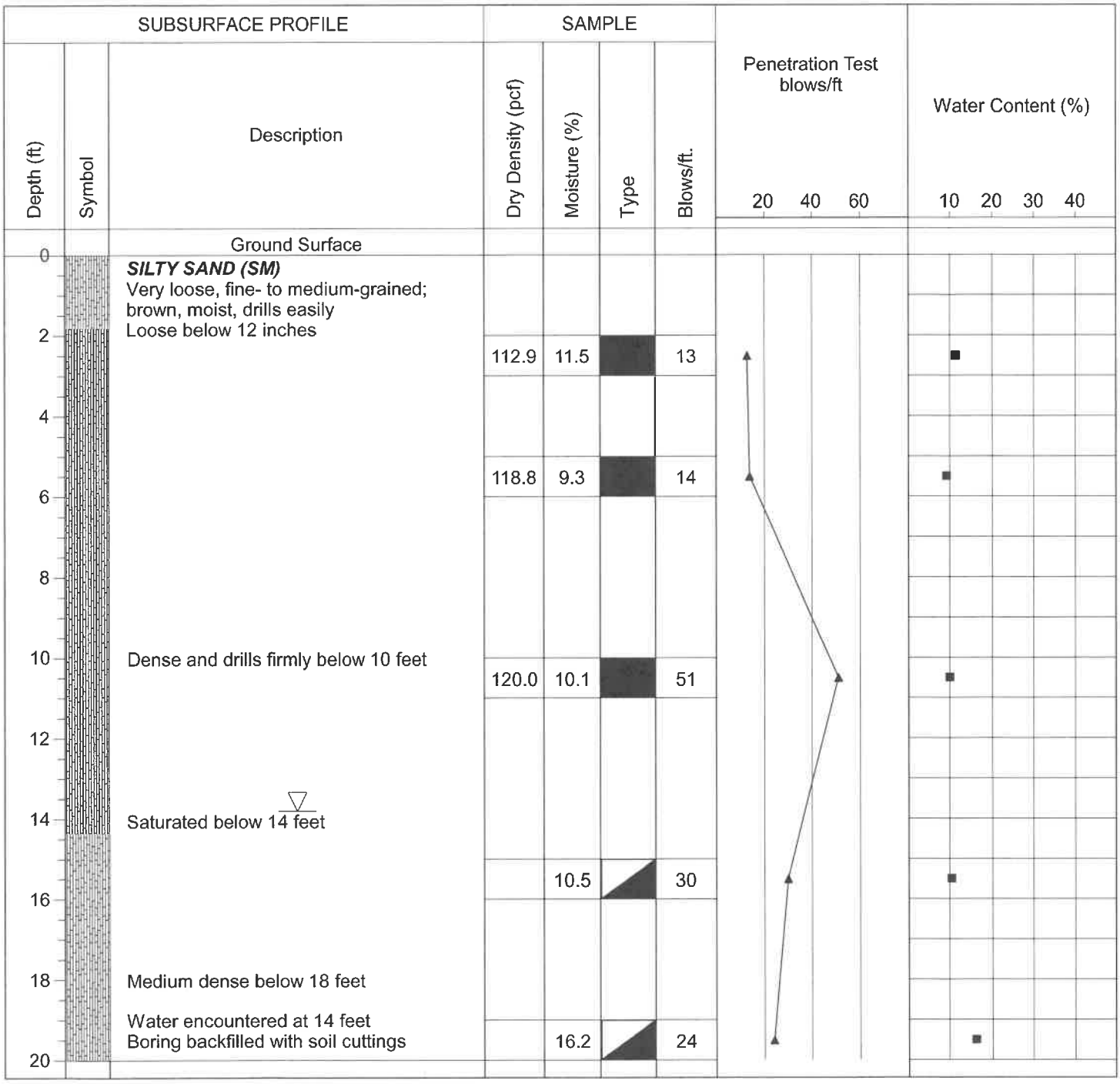
Client: Penske Truck Leasing

Figure No.: A-6

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> 14 Feet **Initial:** 14 Feet **At Completion:** 14 Feet



Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B7

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-7

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> 14 Feet **Initial:** 14 Feet **At Completion:** 14 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, moist, drills easily				
2		Loose below 12 inches Dense and drills firmly below 2 feet	129.4	9.5	■	43
4						
6		Very dense below 5½ feet	115.9	3.1	■	50+
8						
10			123.9	11.0	■	50+
12						
14		▽ Medium dense and saturated below 14 feet				
16				13.7	◢	20
18						
20		Dense below 20 feet			◢	

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Rig: CME 75

Driller: Whitcomb Drilling, Inc.

Krazan and Associates

Drill Date: 9-2-21

Hole Size: 8½ Inches

Elevation: 50 Feet

Log of Boring B7

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-7

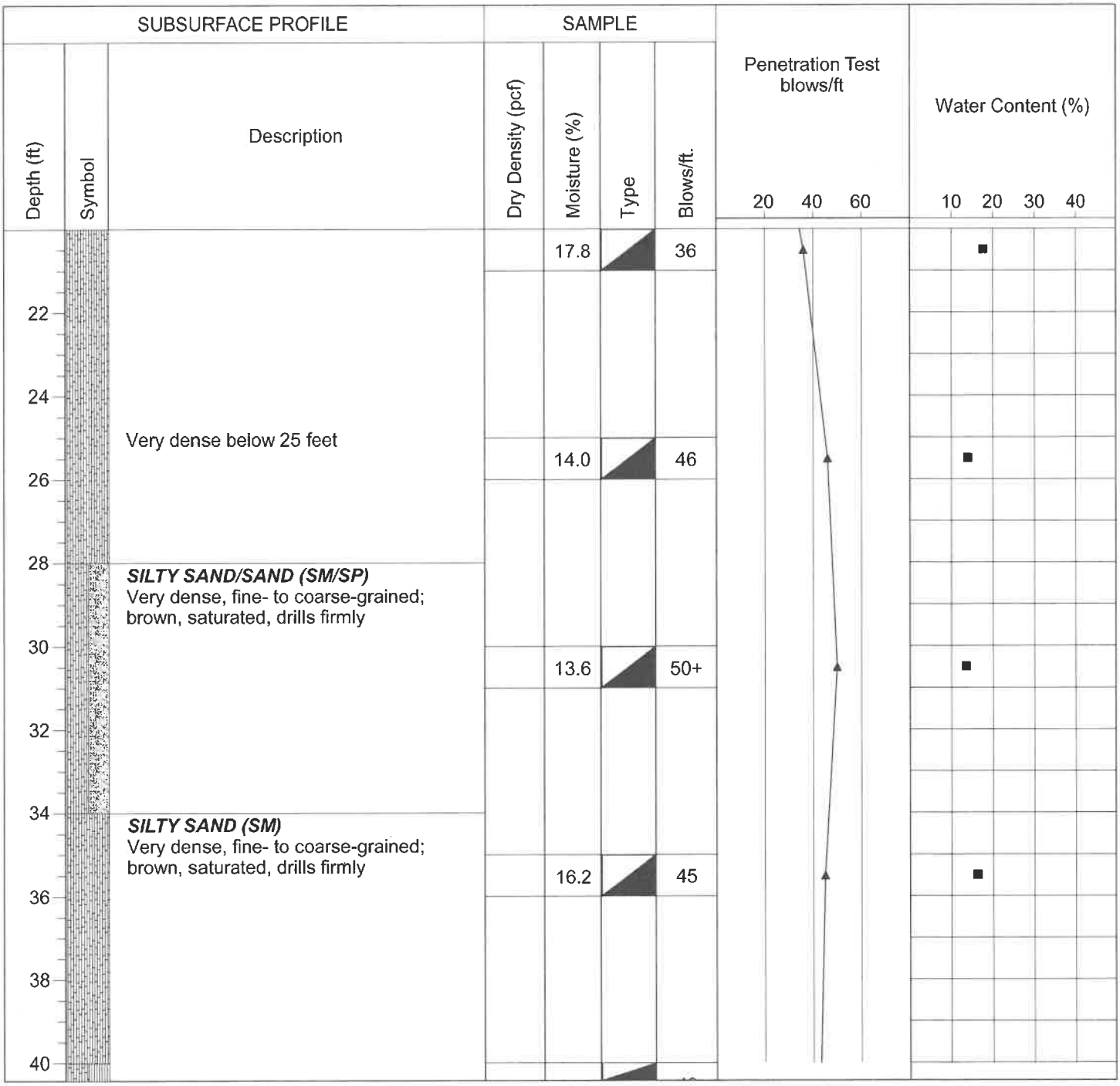
Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> 14 Feet

Initial: 14 Feet

At Completion: 14 Feet



Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 50 Feet

Log of Boring B7

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-7

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> 14 Feet **Initial:** 14 Feet **At Completion:** 14 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
42		***SILTY SAND/SANDY SILT (SM/ML)*** Dense, fine- to medium-grained; brown, saturated, drills firmly		18.7		43
44		***SILTY SAND (SM)*** Very dense, fine- to coarse-grained; brown, saturated, drills firmly		14.1		72
48		***SILTY SAND/SAND (SM/SP)*** Very dense, fine- to coarse-grained; brown, saturated, drills firmly		13.6		50+
50		End of Borehole				
52						
54		Water encountered at 14 feet Boring backfilled with soil cuttings				
56						
58						
60						

Penetration Test blows/ft: 20, 40, 60

Water Content (%): 10, 20, 30, 40

Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 50 Feet

Log of Boring B8

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-8

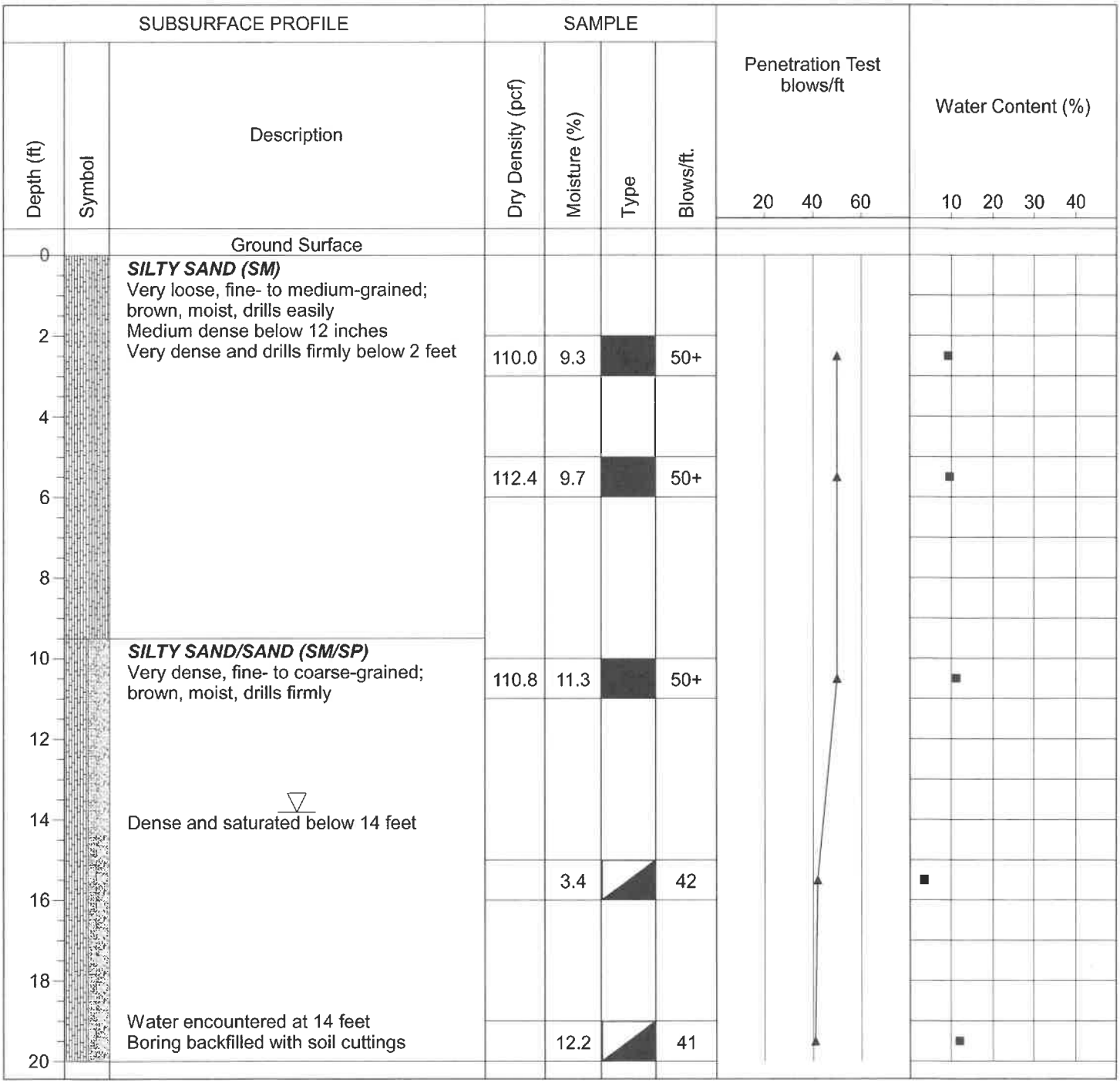
Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> 14 Feet

Initial: 14 Feet

At Completion: 14 Feet



Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B9

Project: Penske Truck Leasing

Project No: 112-21093

Client: Penske Truck Leasing

Figure No.: A-9

Location: Highway 215 Frontage Road, Moreno Valley, California

Logged By: Angel Menchaca

Depth to Water> Not Encountered

Initial: N/A

At Completion: N/A

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, moist, drills easily				
2		Medium dense below 12 inches				
2		Very dense and drills firmly below 2 feet				
6				6.0		50+
8		Dense below 9 feet		7.3		39
10		End of Borehole				
20		Water not encountered Boring backfilled with soil cuttings				

Penetration Test blows/ft: 20, 40, 60

Water Content (%): 10, 20, 30, 40

Drill Method: Hollow Stem

Drill Date: 9-2-21

Drill Rig: CME 75

Krazan and Associates

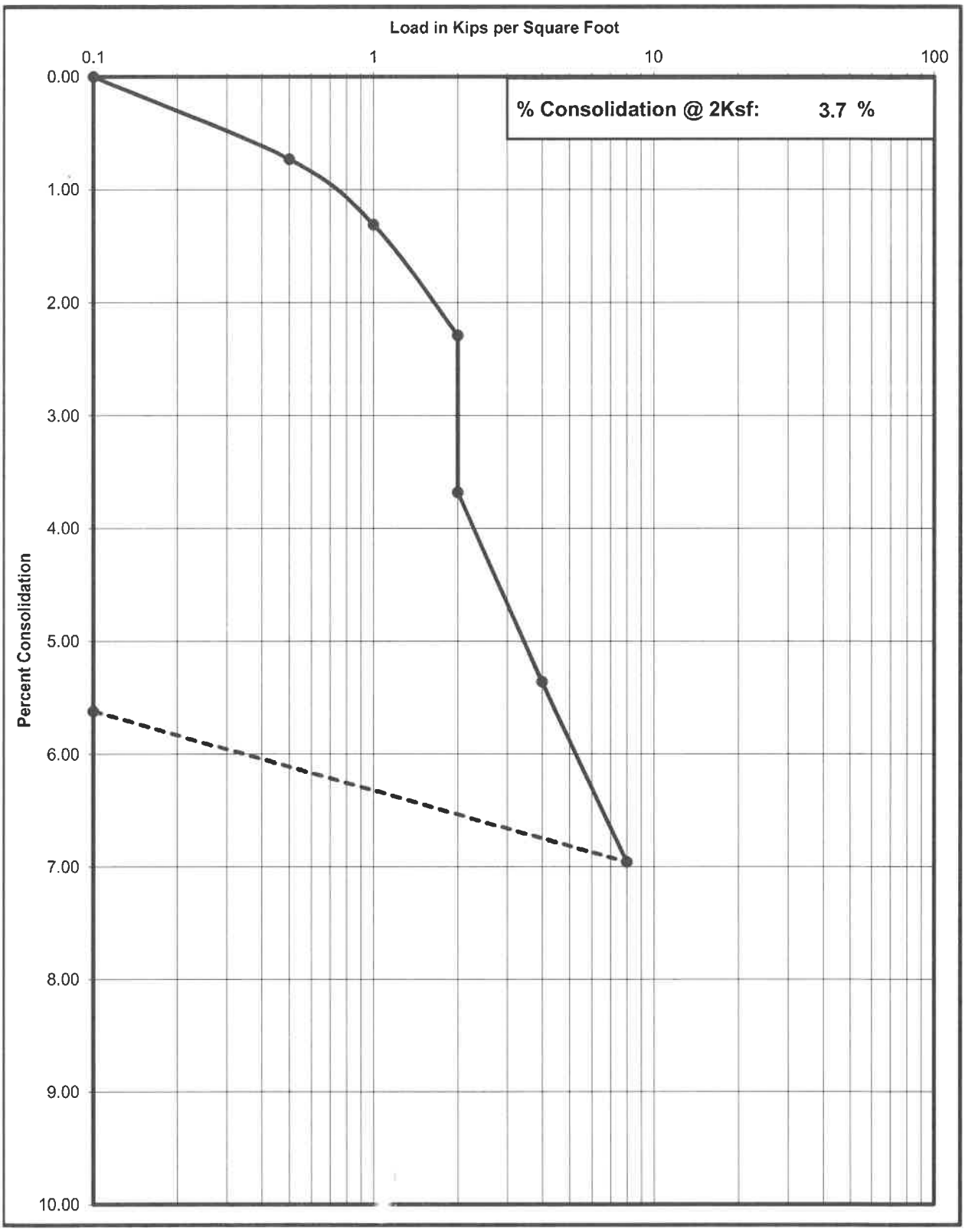
Hole Size: 8½ Inches

Driller: Whitcomb Drilling, Inc.

Elevation: 10 Feet

Consolidation Test

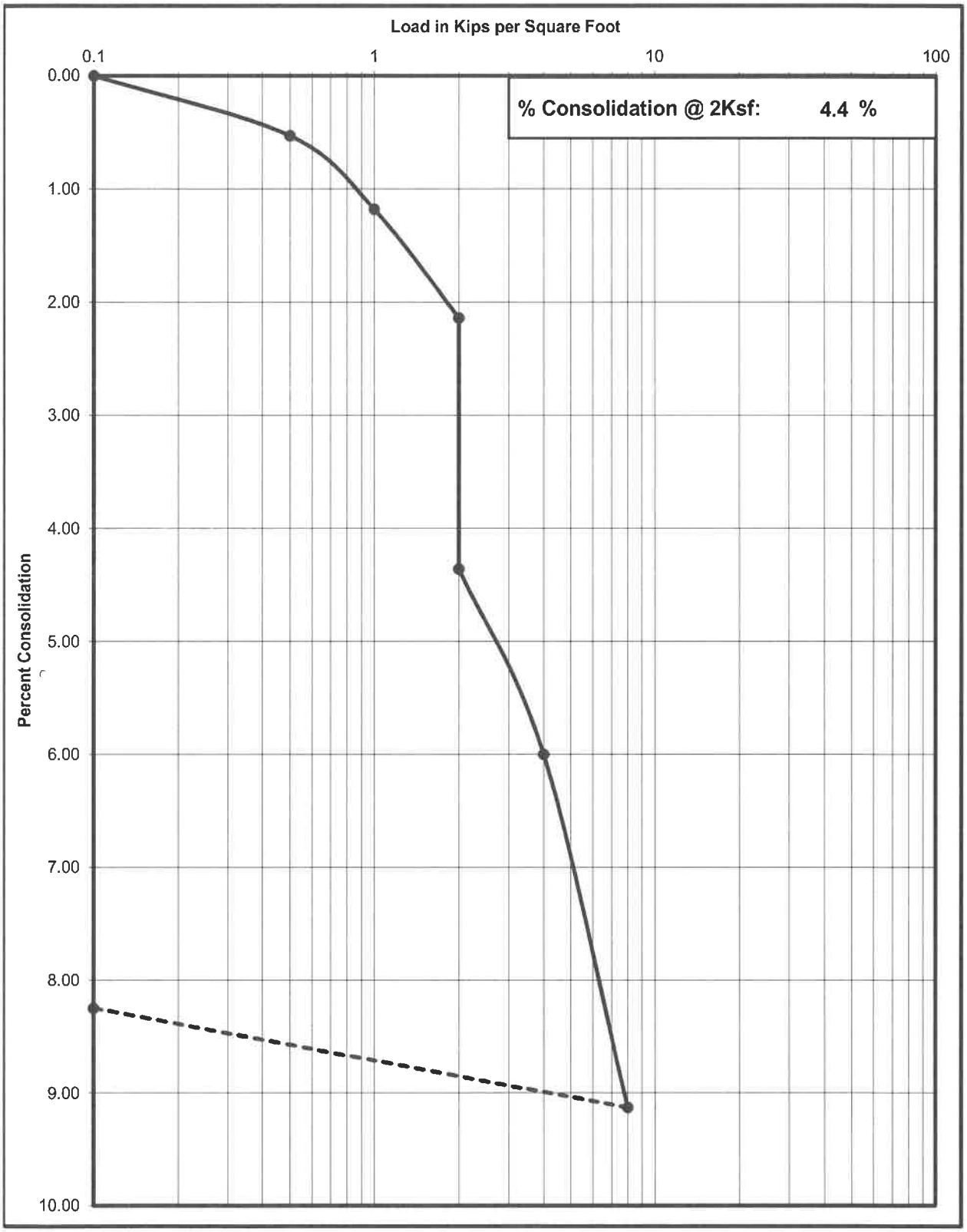
Project No	Boring No. & Depth	Date	Soil Classification
11221093	B-2 @ 2'	10/12/2021	SM



Krazan Testing Laboratory

Consolidation Test

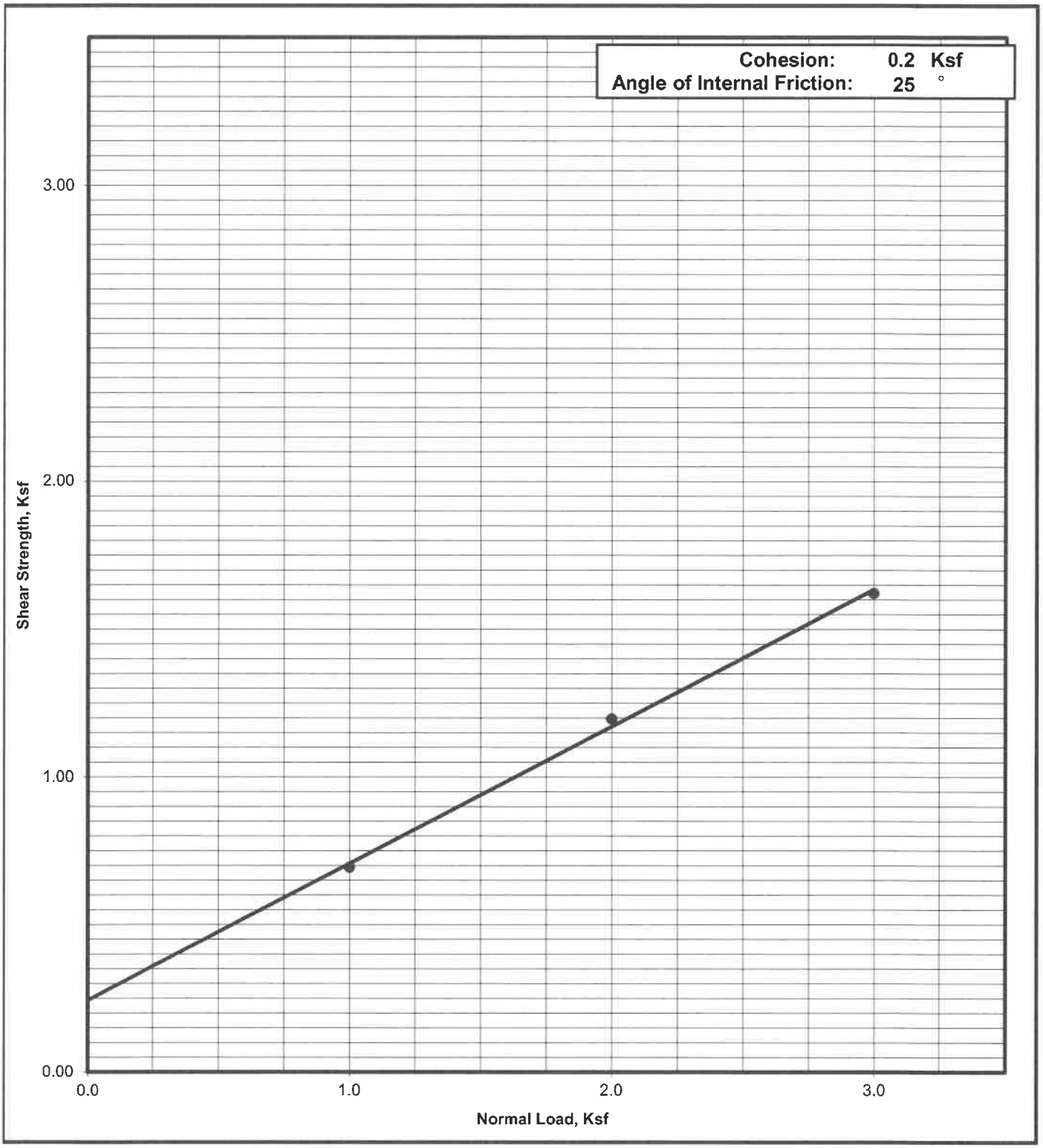
Project No	Boring No. & Depth	Date	Soil Classification
11221093	B-7 @ 5'	10/12/2021	SM



Krazan Testing Laboratory

ASTM D - 3080 / AASHTO T - 236

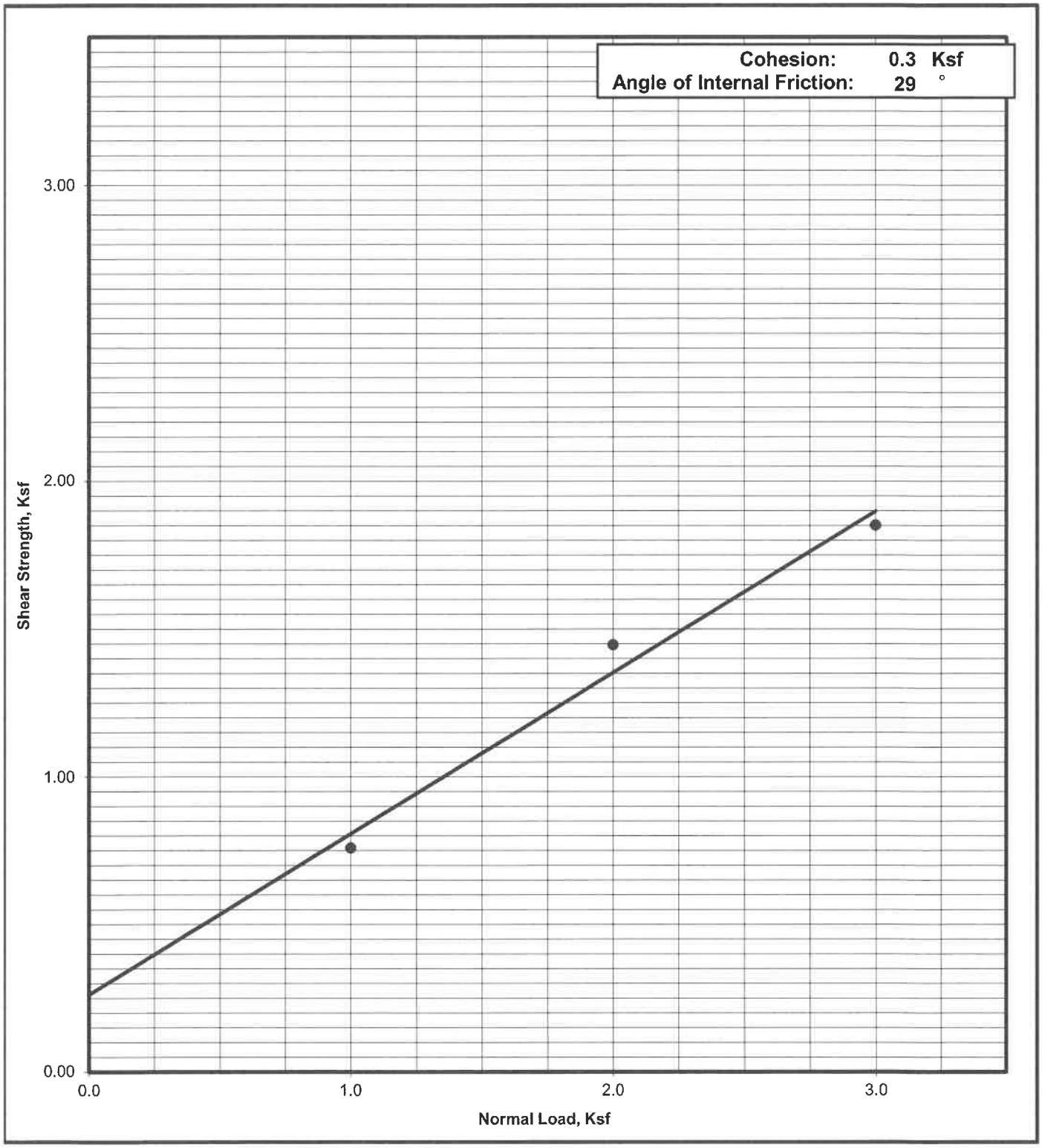
Project Number	Boring No. & Depth	Soil Type	Date
11221093	B-2 @ 2'	SM	10/12/2021



Krazan Testing Laboratory

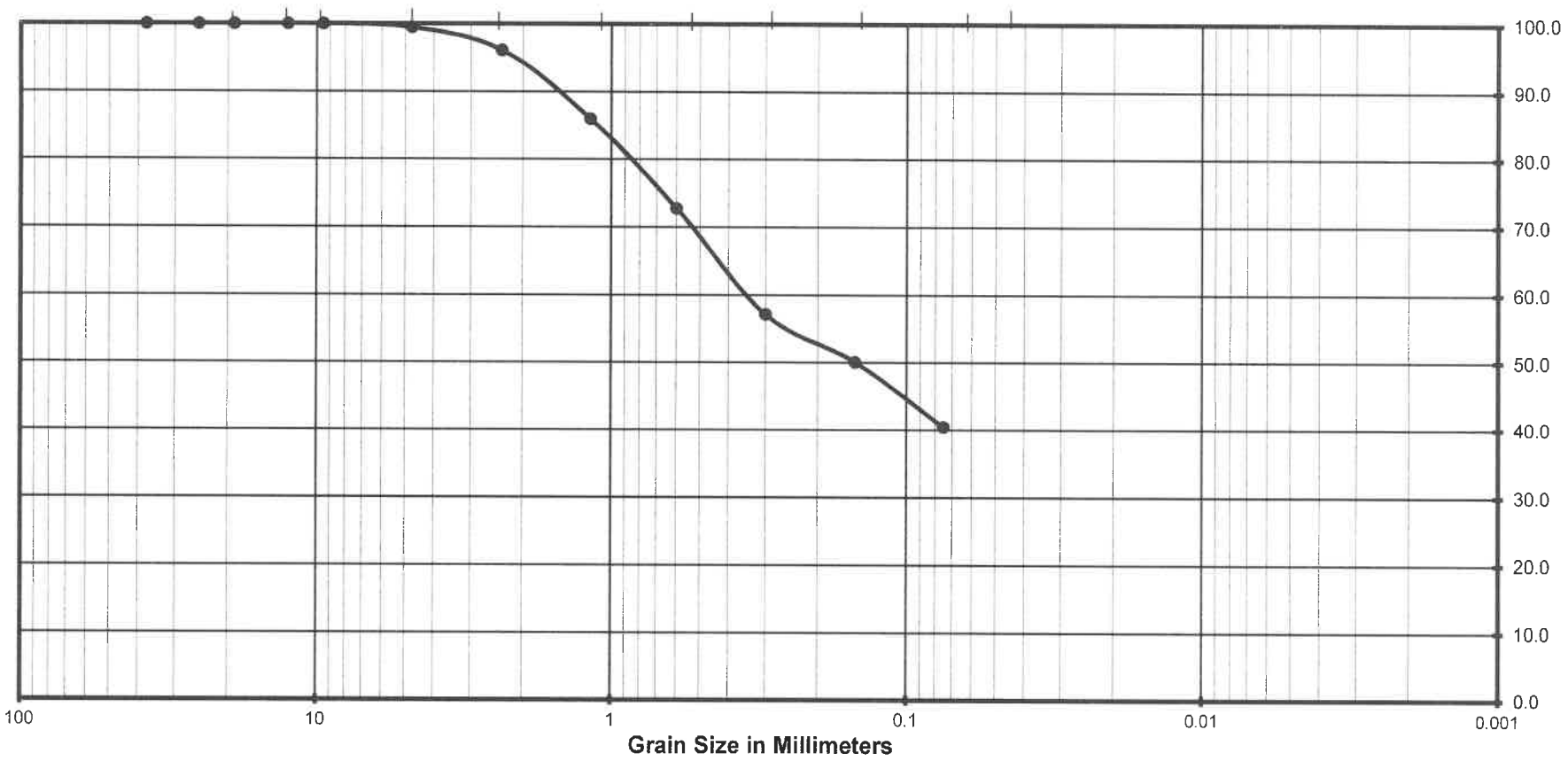
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
11221093	B-7 @ 5'	SM	10/12/2021



Krazan Testing Laboratory

Grain Size Analysis



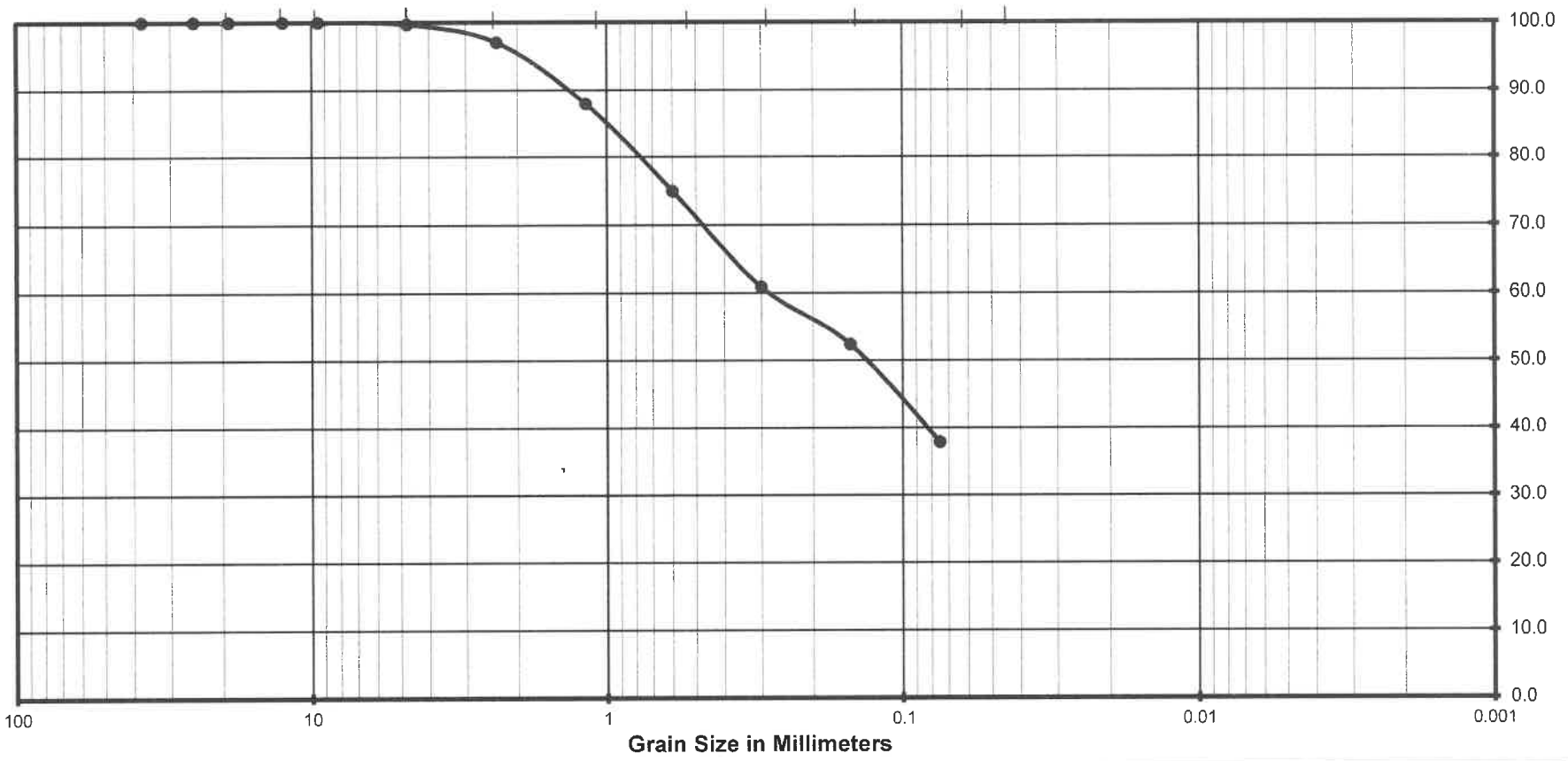
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 2'

Krazan Testing Laboratory

Grain Size Analysis



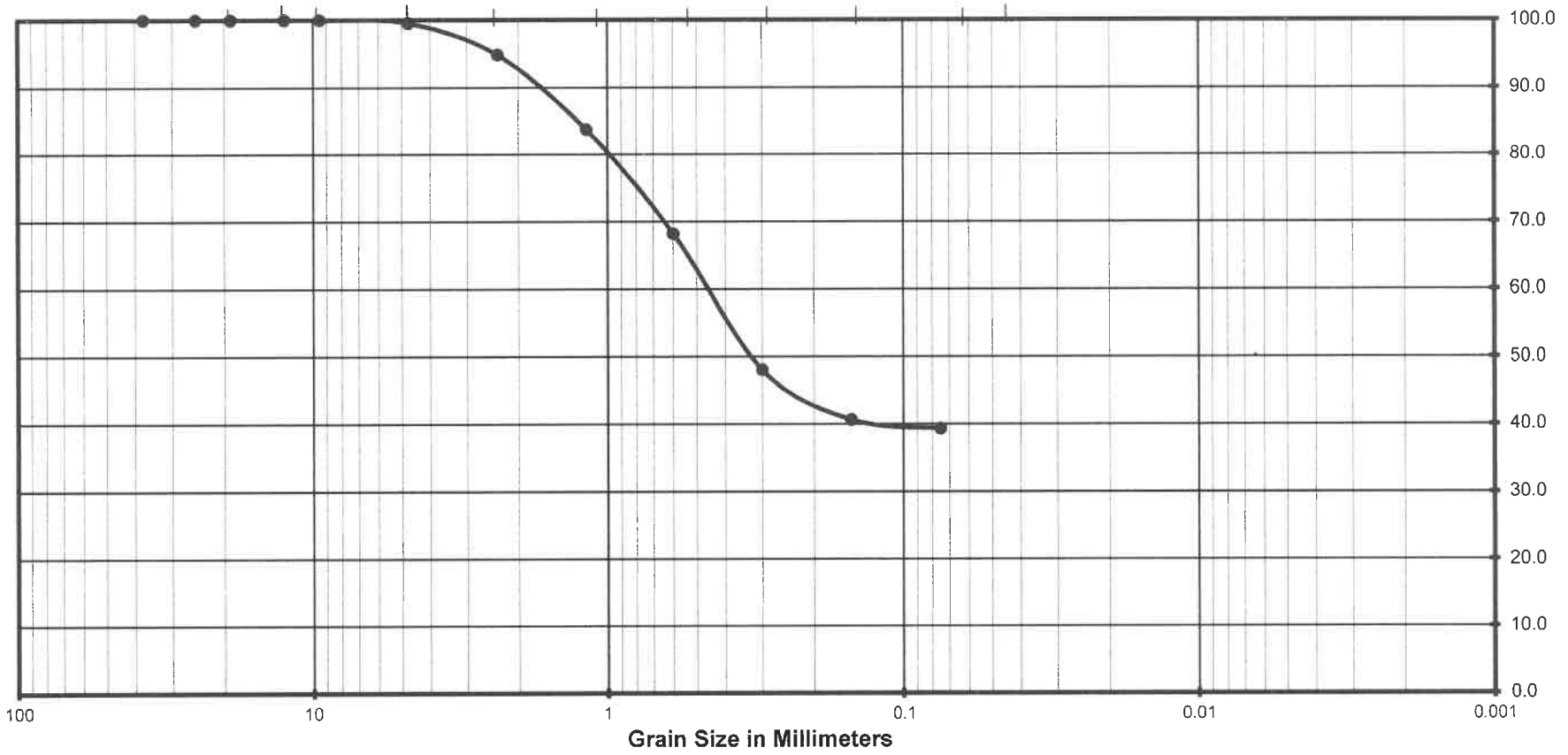
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 5'

Krazan Testing Laboratory

Grain Size Analysis



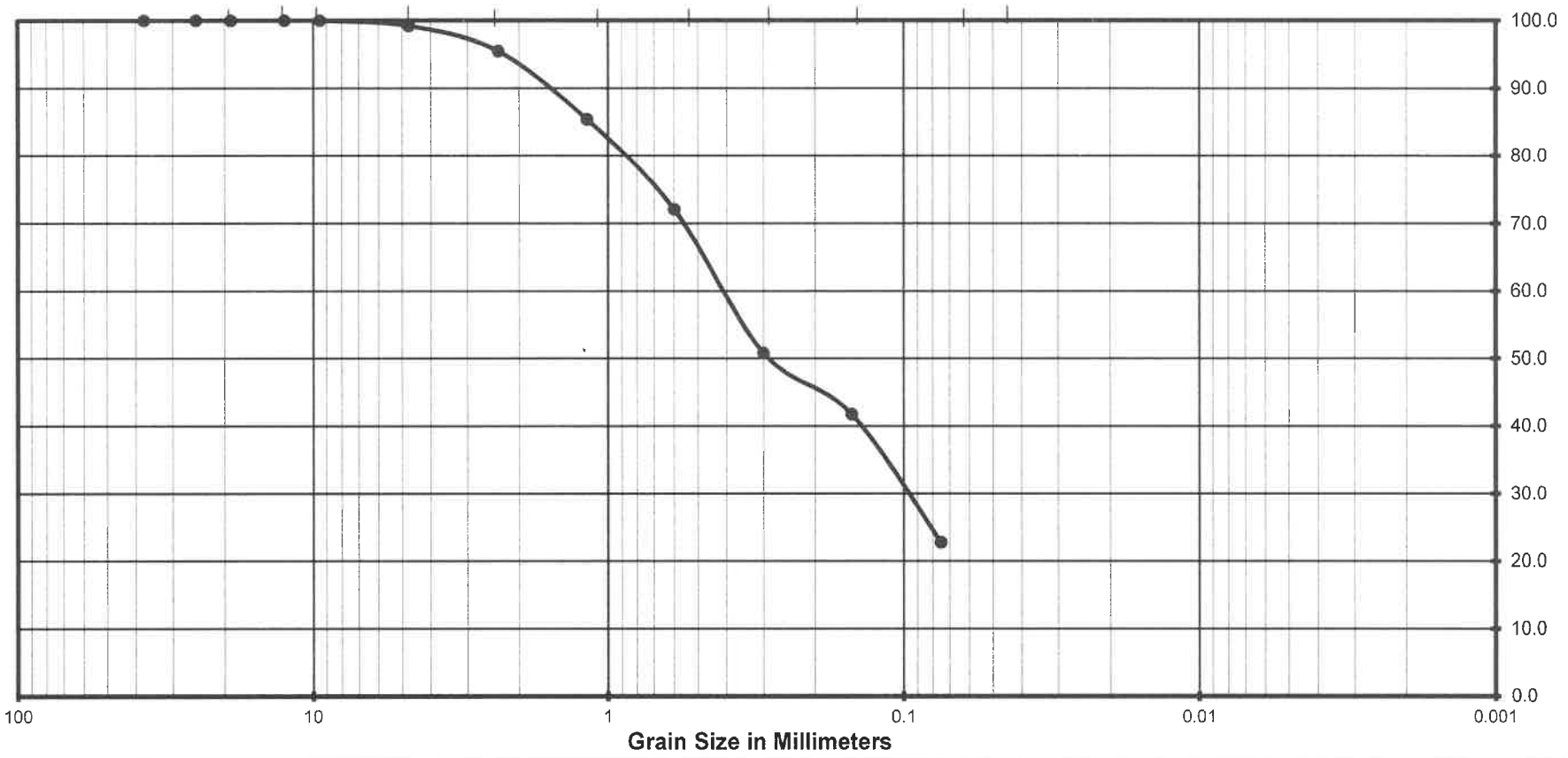
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 10'

Krazan Testing Laboratory

Grain Size Analysis



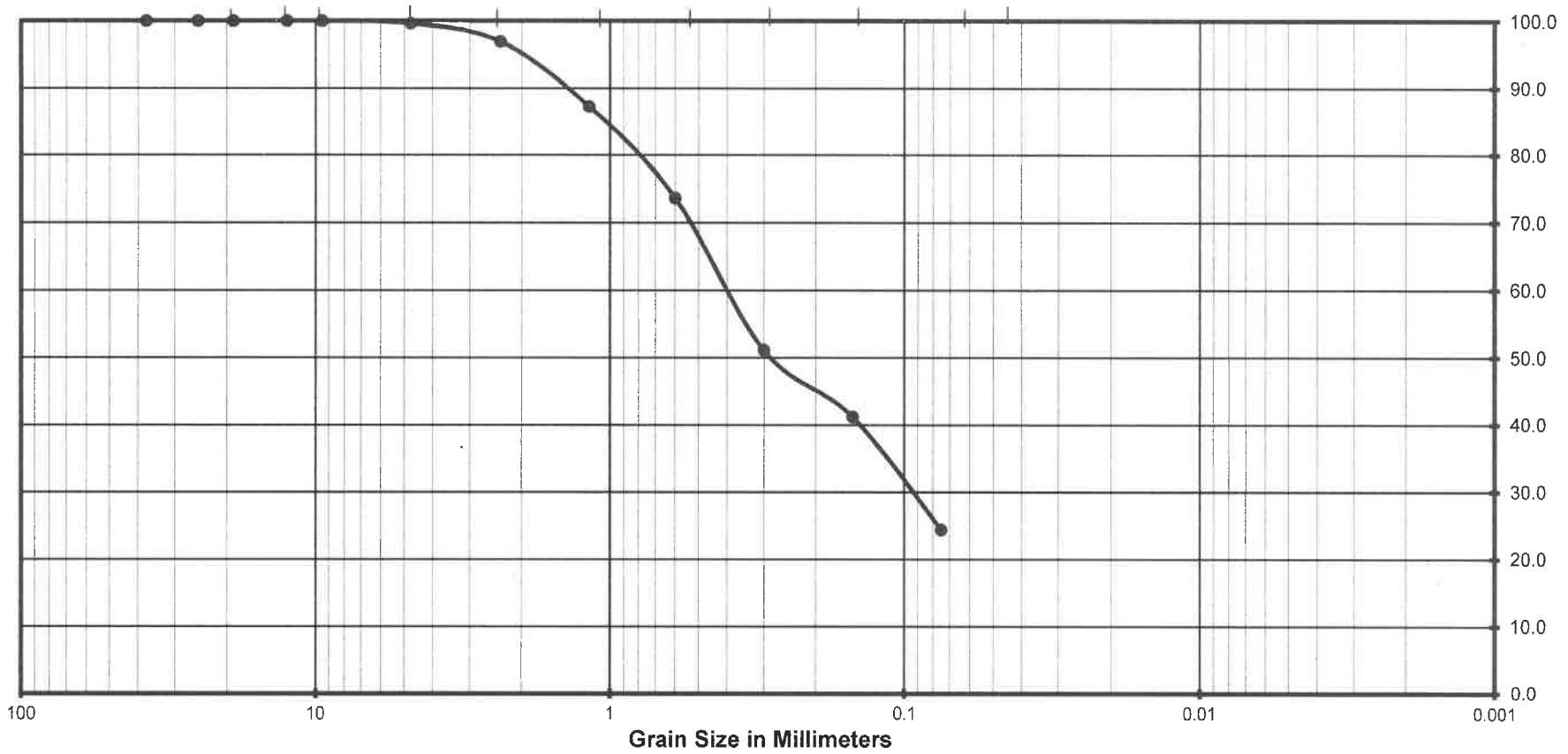
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 15'

Krazan Testing Laboratory

Grain Size Analysis



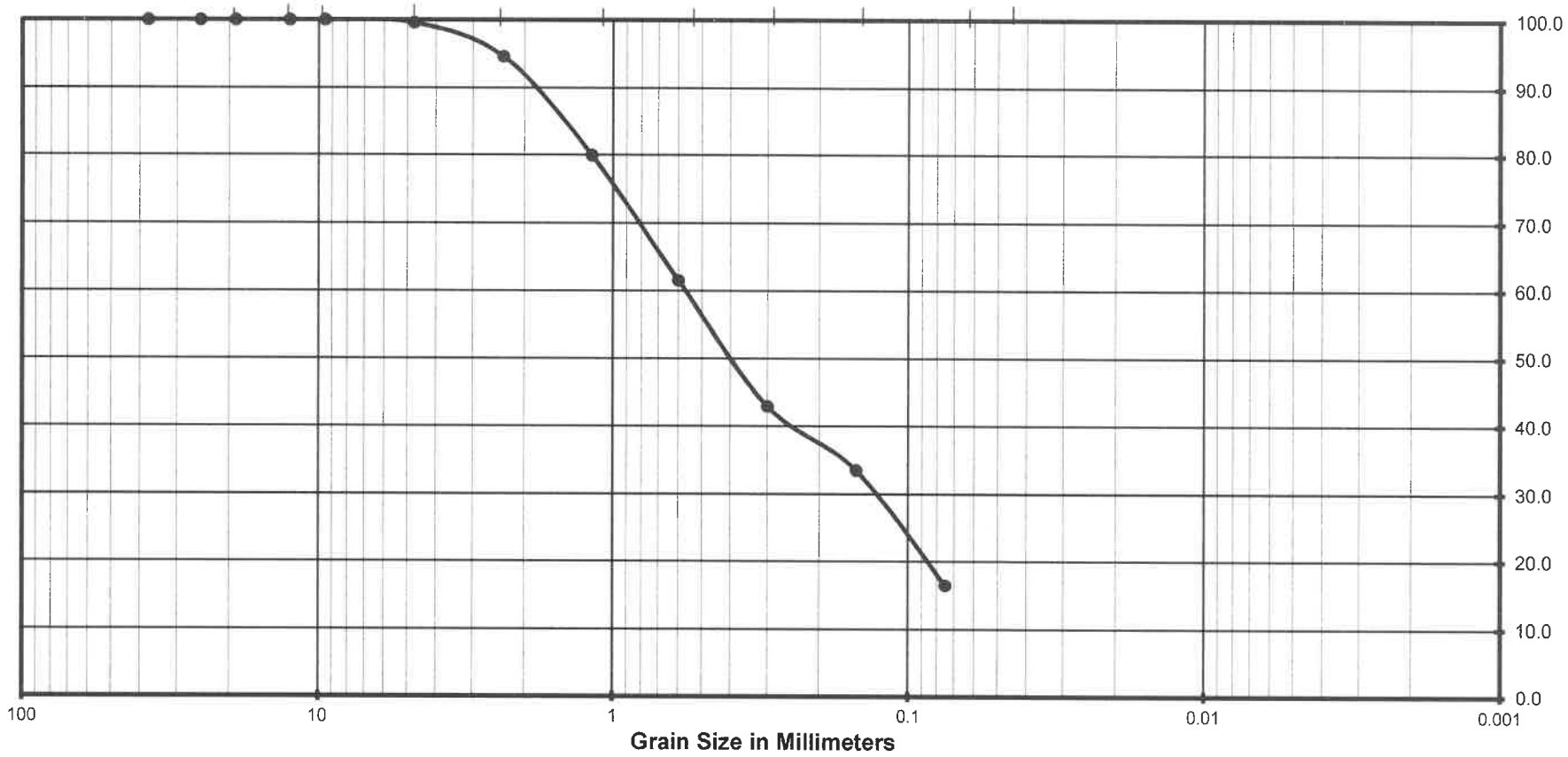
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 20'

Krazan Testing Laboratory

Grain Size Analysis



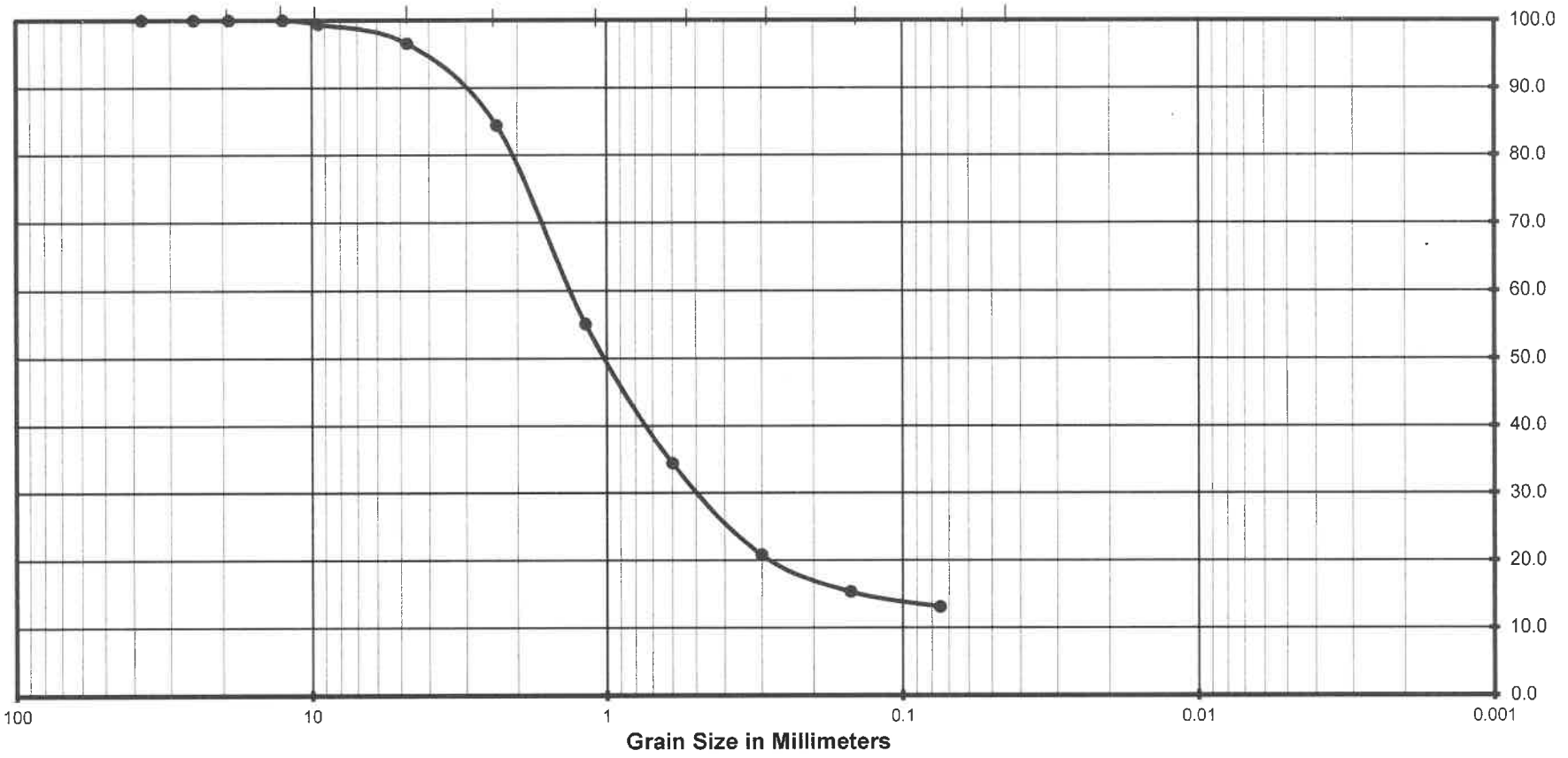
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 25'

Krazan Testing Laboratory

Grain Size Analysis



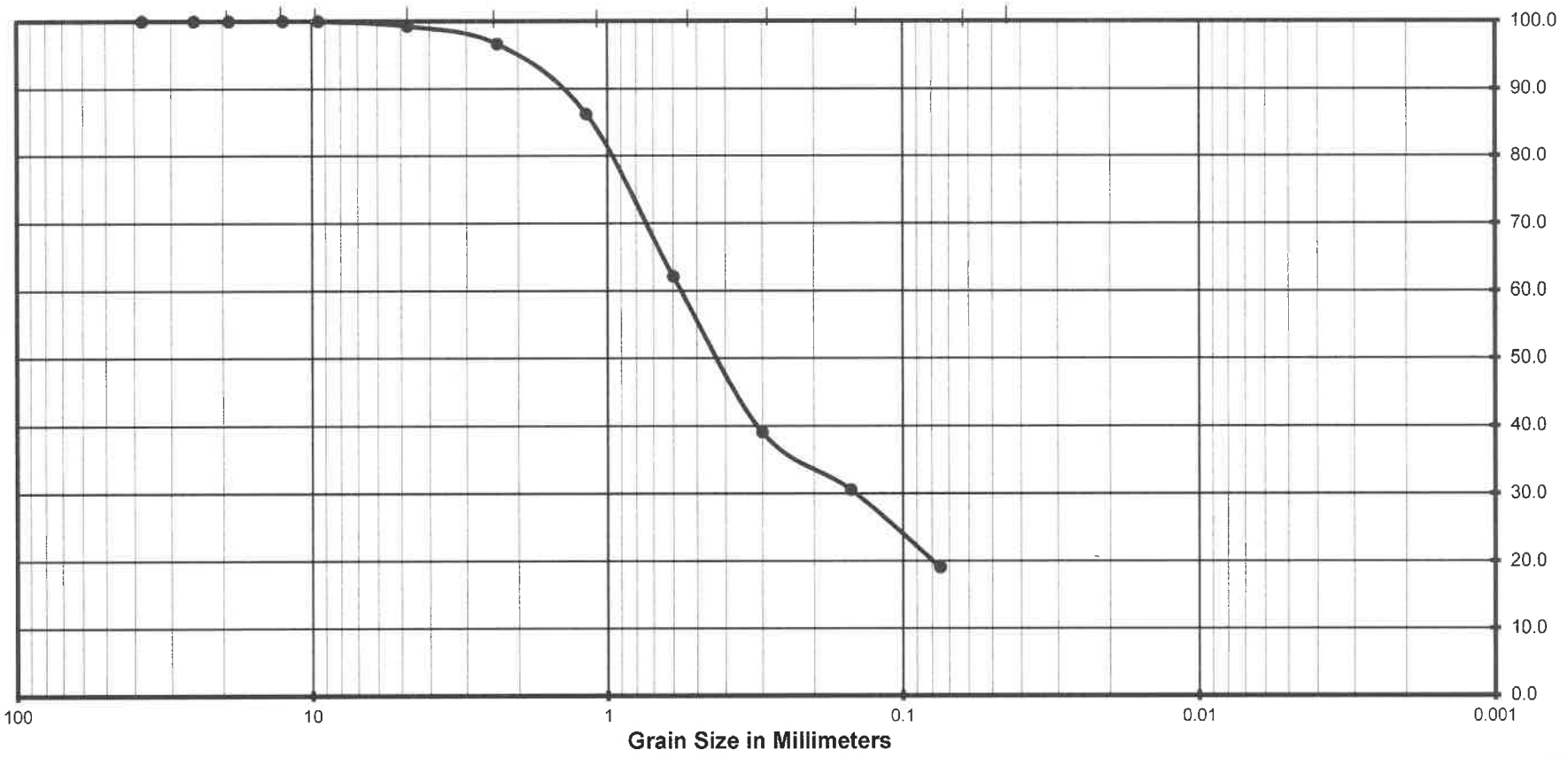
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM/SP
Sample Number	B-7 @ 30'

Krazan Testing Laboratory

Grain Size Analysis



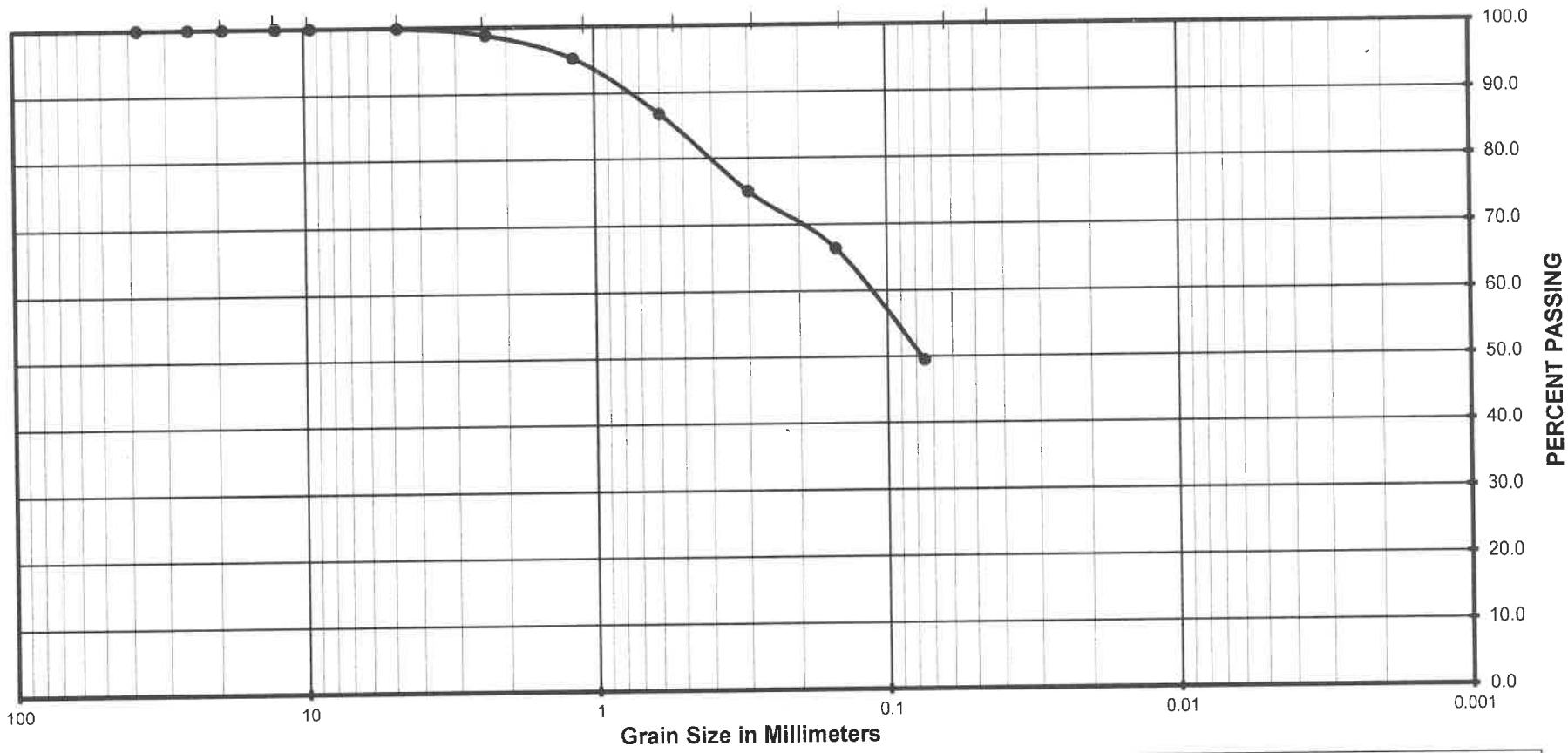
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 35'

Krazan Testing Laboratory

Grain Size Analysis



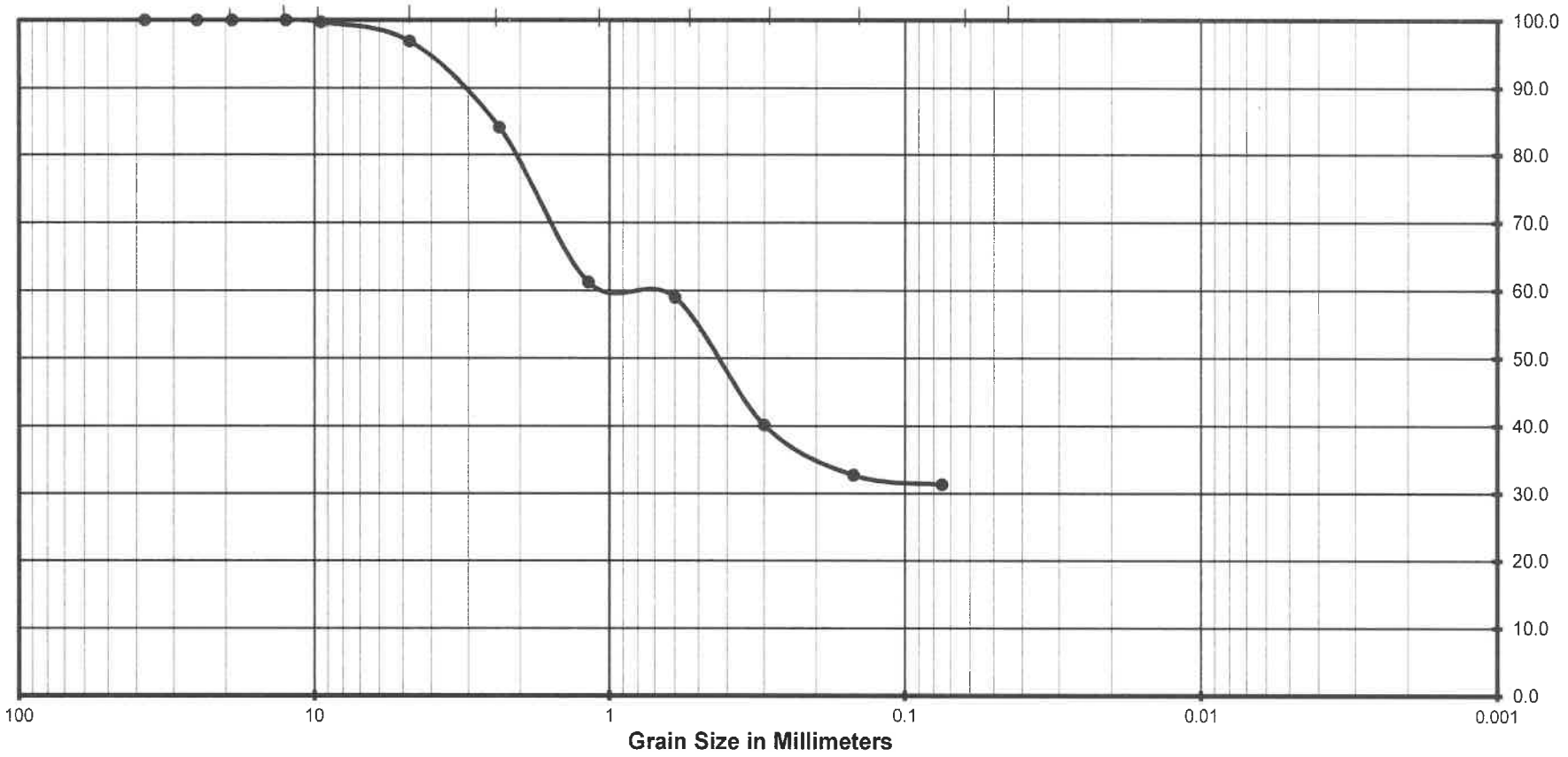
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM/ML
Sample Number	B-7 @ 40'

Krazan Testing Laboratory

Grain Size Analysis



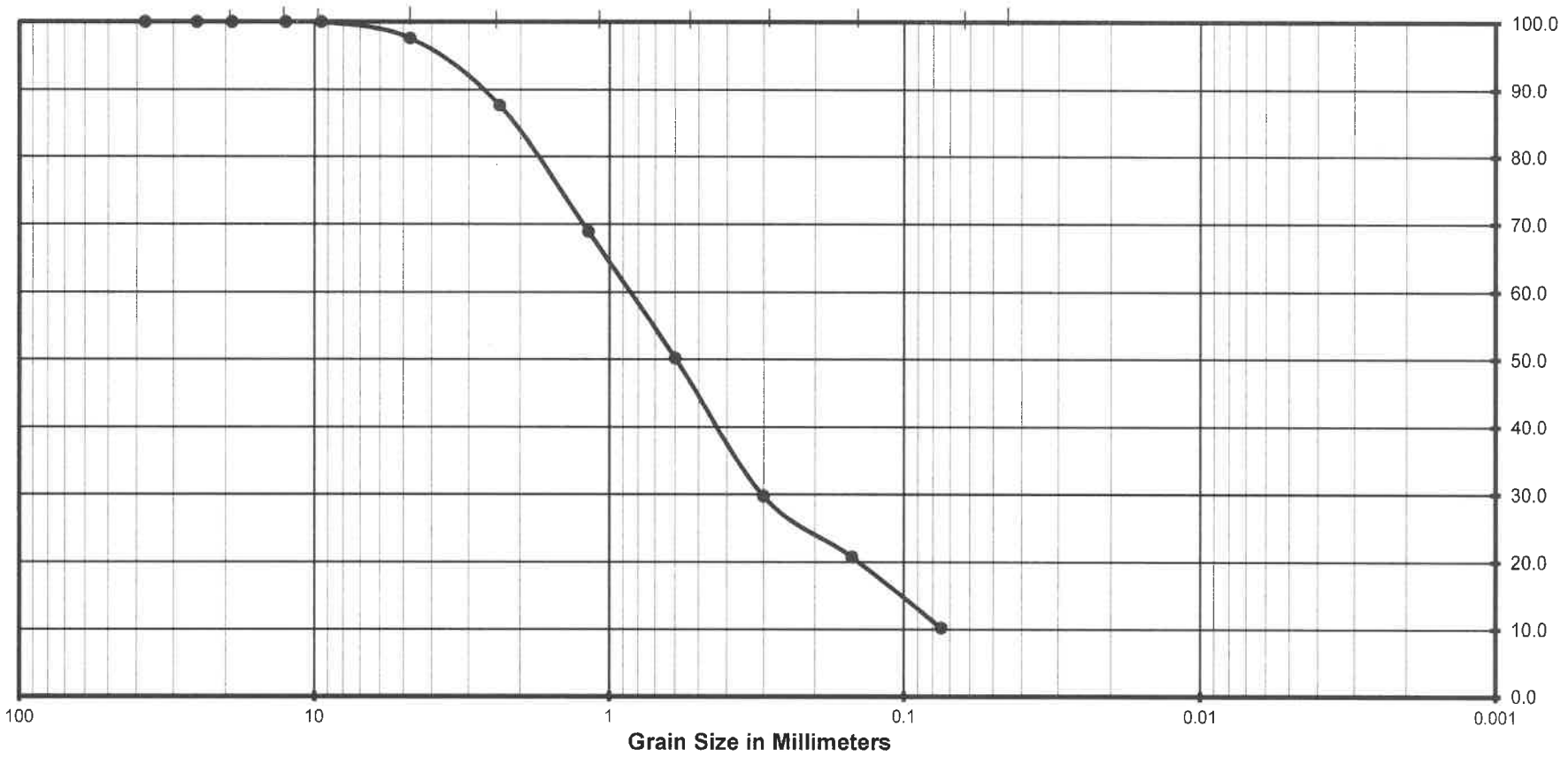
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Pesnke Moreno Valley
Project Number	11221093
Soil Classification	SM
Sample Number	B-7 @ 45'

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Penske Moreno Valley
Project Number	11221093
Soil Classification	SM-SP
Sample Number	B-7 @ 50'

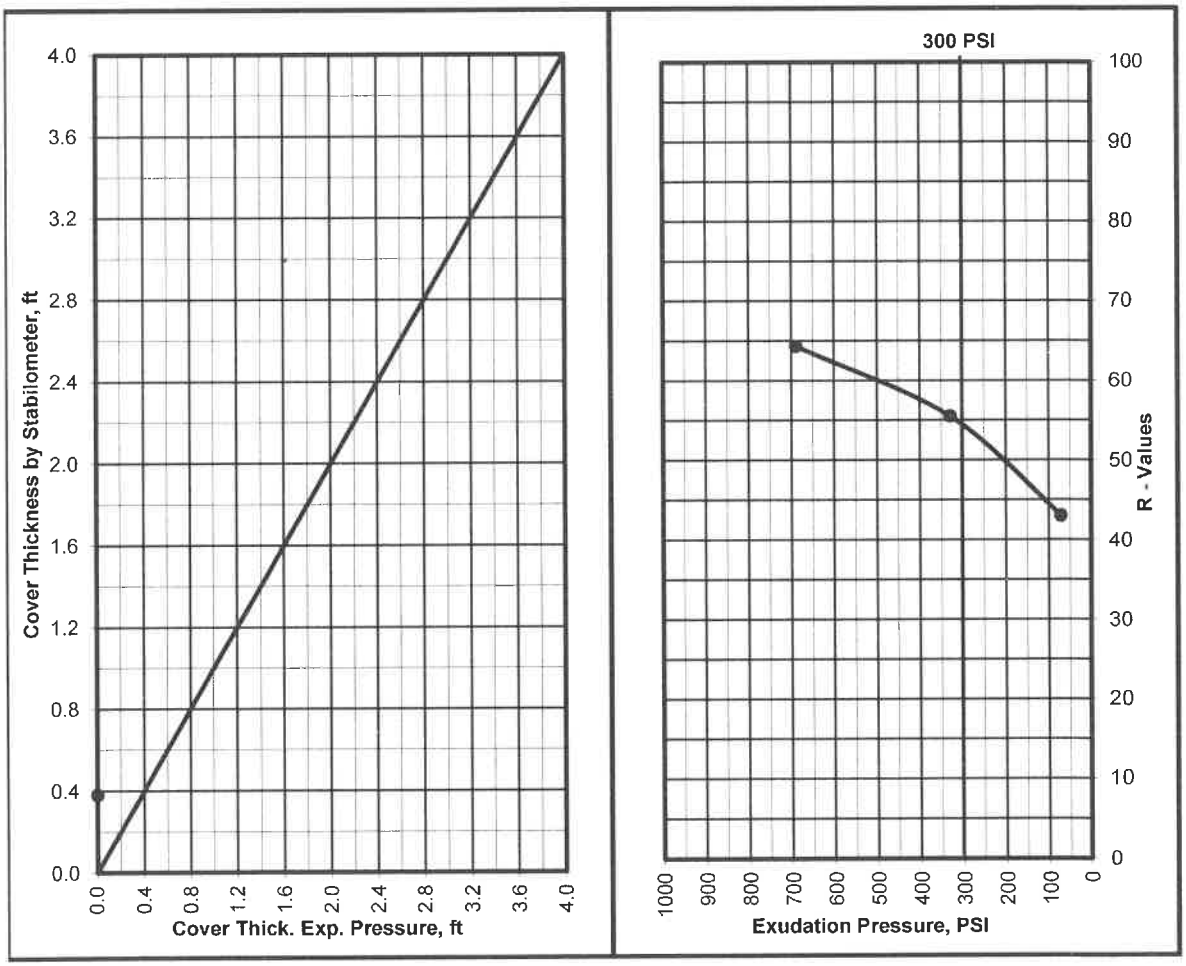
Krazan Testing Laboratory

R - VALUE TEST
ASTM D - 2844 / CAL 301

Project Number	:	11221093
Project Name	:	Penske Truck Leasing Moreno Valley
Date	:	9/1/2021
Sample Location/Curve Number	:	Bulk Sample
Soil Classification	:	Silty Sand

TEST	A	B	C
Percent Moisture @ Compaction, %	13.4	14.2	16.0
Dry Density, lbm/cu.ft.	119.7	119.1	118.4
Exudation Pressure, psi	689	330	72
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	64	56	43

R Value at 300 PSI Exudation Pressure	**55**
R Value by Expansion Pressure (TI =): 5	**Expansion Pressure nil**



Krazan Testing Laboratory

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949)336-6544

DATE: 09/10/2021

Krazan & Associates, Inc.
1100 Olympic Drive, Ste. 103
Corona, CA 92881

P.O. NO: Verbal

LAB NO: C-5219

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No: 11221093
Project Name: Penske Truck Leasing, Jurupa Valley
Sample ID: B-9 @ 0-5'

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

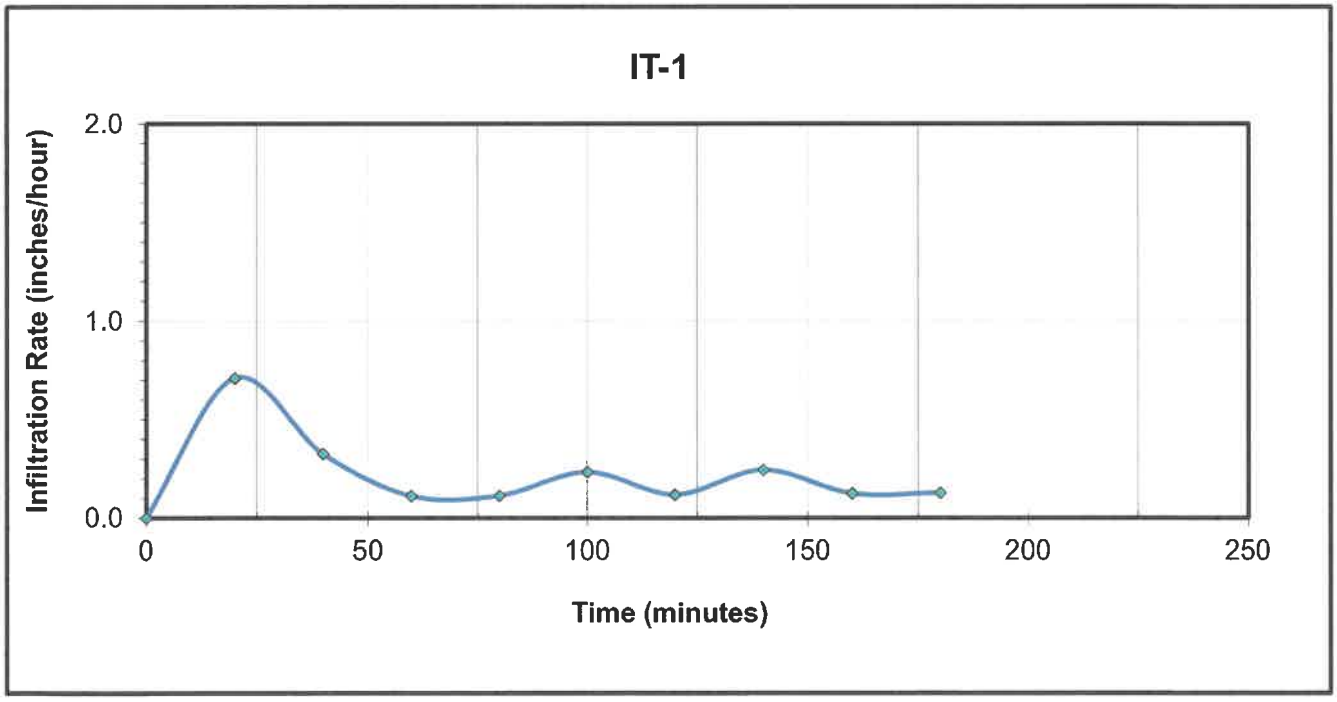
pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
8.0	1,900	296	71

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

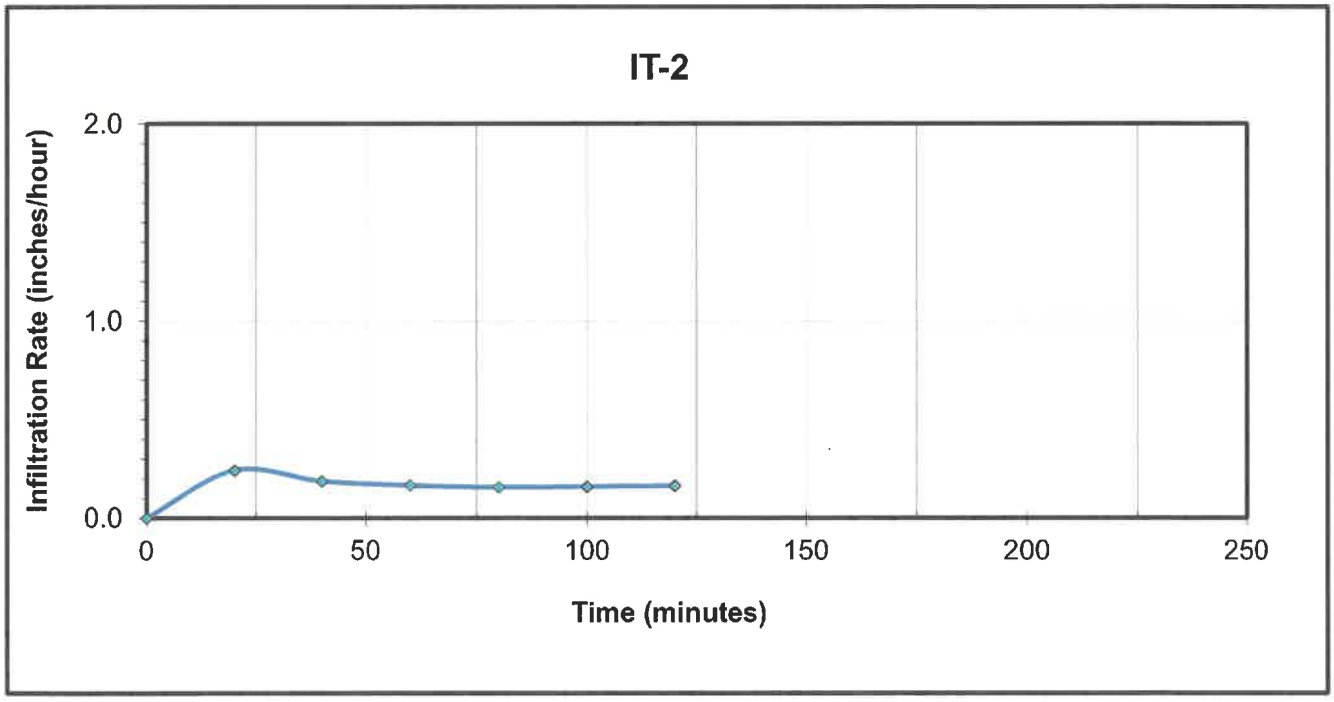
RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11221093**				**Date**	**9/13/2021**
Project Name	Penske Truck Leasing Moreno Valley					
Project Address						
Test No:	IT-1	**Total Depth (in.)**		120	**Test Size (in)**	10
Depth To Water	>>50'	**Soil Classification**		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		45.00	--	--
1	20.00	20.00	45.00	52.00	7.00	0.71
2	40.00	20.00	52.00	55.00	3.00	0.33
3	60.00	20.00	55.00	56.00	1.00	0.11
4	80.00	20.00	56.00	57.00	1.00	0.11
5	100.00	20.00	57.00	59.00	2.00	0.23
6	120.00	20.00	59.00	60.00	1.00	0.12
7	140.00	20.00	60.00	62.00	2.00	0.24
8	160.00	20.00	62.00	63.00	1.00	0.13
9	180.00	20.00	63.00	64.00	1.00	0.13
	Infiltration Rate in Inches per Hour					**0.11**



RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11221093**				**Date**	**9/13/2021**
Project Name	Penske Truck Leasing Moreno Valley					
Project Address						
Test No:	IT-2	**Total Depth (in.)**		60	**Test Size (in)**	10
Depth To Water	>>50'	**Soil Classification**		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		31.00	--	--
1	20.00	20.00	31.00	32.00	1.00	0.24
2	40.00	20.00	32.00	32.75	0.75	0.19
3	60.00	20.00	32.75	33.40	0.65	0.17
4	80.00	20.00	33.40	34.00	0.60	0.16
5	100.00	20.00	34.00	34.60	0.60	0.16
6	120.00	20.00	34.60	35.20	0.60	0.16
	Infiltration Rate in Inches per Hour					**0.16**



APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 95 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 95 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 95 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

APPENDIX C

PAVEMENT SPECIFICATIONS

1. DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to is the 2018 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

2. SCOPE OF WORK - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically notes as "Work Not Included."

3. PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 90 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

4. UNTREATED AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class 2 material, 1½ inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent. The aggregate base material shall be spread and compacted in accordance with Section 26 of the Standard Specifications. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

5. AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class 2 material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent, and it shall be spread and compacted in accordance with Section 25 of the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

6. ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39.

The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a combination steel-wheel and pneumatic rollers, as described in Section 39-6. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.