APPENDIX G: PRELIMINARY DRAINAGE STUDY

PRELIMINARY DRAINAGE STUDY

PEN19-0047/LST19-0008
Car Pros-Kia Sales and Service Facility
APN: 488-390-015 & -016

May 2019

PREPARED FOR:

Car Pros Automotive Group
181 S. 333rd Street Building C, Suite 210
Federal Way, WA 98002

PREPARED BY:

Kimley»Horn

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

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KHA Project # 194117001

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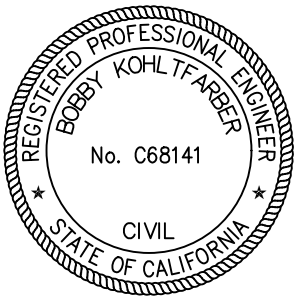
Certification by Engineer or Authorized Qualified Designee

I certify under penalty of law that this document and all attachments were prepared under my jurisdiction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathered the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



05/17/2019

Bobby Kohltfarber, PE — Date

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Appendix B – Existing Hydrology Calculations – 100 Year Rainfall Frequency
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Appendix E – Existing Hydrology Calculations – 2 Year Rainfall Frequency
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Appendix G – Geotechnical Investigation and Percolation Test Results
Appendix H –Hydrology Reference Material

References

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

Section 100

100.0 Introduction

Kimley-Horn and Associates, Inc. (KHA) has been retained to prepare a Preliminary Drainage Study for the proposed Car Pros Kia Sales and Service Facility in the City of Moreno Valley, California. The intention of this report is to comply with the requirements of the Riverside County Hydrology Manual to assist in the development of the existing site.

AES software was used to calculate the appropriate time of concentration for each subarea. The RCFC & WCD Hydrology Manual was utilized to determine runoff coefficients for each drainage area based on land use type, hydrologic soil group, and Antecedent Moisture Condition (AMC). Runoff coefficients for the project were determined using AES (Plate D-5.7 of the RCFC & WCD).

Per Riverside County Stormwater and Water Conservation Tracking Tool, the site consists of Type A and B soil which has a low potential for runoff and a high infiltration capacity. However, based on the Geotechnical Investigation and Percolation Test Results Report prepared by Geocon West, Inc on January 18, 2019 (See Appendix G) it was concluded that infiltration is between the ranges of 0.01 to 0.31 in/hr. Therefore, on-site soils will be classified as D for all calculations.

Due to the nature of the project, this report will be accompanied by a Water Quality Management Plan.

100.1 Project Description

The proposed development consists of the construction of an approximately 43,867 square foot building and associated improvements. The associated improvements include but are not limited to the following: site grading, domestic water service, sanitary sewer service, concrete and asphalt pavement, landscaping and irrigation, underground storm drain system, and modular wetland systems. The proposed development also includes a future car wash, and sales and service facility, which will be part of a later phase and do not alter the imperviousness proposed for the site.

The lot area is approximately 6.19 acres. The project proposes to treat the runoff required per the water quality requirements, as necessary.

The purpose of this report is to provide information regarding the Storm Water Management System (SWMS) design for the proposed development. This investigation was conducted to evaluate the hydrologic conditions in the existing and proposed conditions of the site. Hydraulic calculations to determine the sizing requirements for the proposed on-site drainage system will be provided in the Final Drainage Study.

100.2 Location

The project is located at the northeast corner of Moreno Beach Drive and Auto Mall Drive in Moreno Valley, CA. The project is bounded by a vacant lot to the east, Pettit Street to the north, Auto Mall Drive to the west, and Moreno Beach Drive to the south.

For reference, see **Exhibit 1**, *Location Map*.

100.3 Drainage Characteristics

The site is located in Zone X per the Federal Emergency Management Administration (FEMA) Flood Insurance Rate Map (FIRM) panel 06065C0770G, dated August 28, 2008. Flood Zone X is defined by FEMA as the area determined to be outside the 500-year flood. No portion of the site is located within the special flood hazard area inundated by the 100-year flood.

For reference, see **Exhibit 2**, *FIRM Map.*

100.3.1 Pre-development Condition

The site is currently undeveloped. The existing site has varying topography. The post-development drainage area is comprised of two (2) sub-areas. Approximately half of the site currently drains west and is captured by a 96" RCP along Pettit Street that discharges through an outlet structure adjacent to the site. The other half drains east and is captured by an existing 18" RCP that discharges through an existing headwall at the south-east corner of the site. For both drainage systems, storm water continues east via surface flow until it eventually reaches the Quincy Street Channel.

The existing 96" RCP is referred to as Line G under the Moreno Master Drainage Plan (MDP) and is currently sized to account for the commercial drainage areas proposed to discharge to the system. The existing 18" RCP is currently sized for a 100-year flowrate of 8.7 cfs per Parcel Map 23244 Storm Drain Plans. Reference material is included in Appendix H.

Table 1 shows a summary of the pre-development flows for 10 and 100-year storm events.

Table 1: Existing Hydrology Results

Sub-basin ID	Drainage Area (AC)	Q_{10} (cfs)	Q_{100} (cfs)
DMA-1	2.96	4.12	6.33
DMA-2	3.23	5.58	8.51

For an exhibit of the pre-development drainage condition, see **Exhibit 3**, Existing *Drainage Map*. See Appendix A and B for AES outputs.

100.3.2 Post-development Condition

The proposed development includes the construction of a car sales and service facility accompanied by asphalt pavement, concrete hardscape, and landscaping. The proposed development also includes a future car wash, and an expansion to the sales and service facility, which will be part of a later phase and do not alter the imperviousness proposed for the site. The proposed site grading intends to maintain the existing natural flow pattern by having about half of the site drain into the existing 96" RCP, while the other half drains to the existing headwall at the south-east corner.

The post-development drainage area is comprised of three (3) sub-areas. DMA-1 and DMA-2 are intercepted by two proposed inlets on-site, are treated through proposed modular wetland systems and then discharged to the proposed on-site storm drain system that is proposed to connect to the existing 96" RCP on Pettit Street, which has been sized to accept the discharge from our site with a commercial land use. DMA-1 and DMA-2 are expected to discharge 6.05 cfs under the 100-year condition which is less than the 6.33 cfs that currently discharges to the existing Line G. DMA-3 is intercepted by a proposed inlet on-site, treated through a proposed modular wetland system and then discharged to the proposed on-site storm drain system that is proposed to connect to the existing headwall on the south-east corner. DMA-3 is expected to discharge 8.13 cfs under the 100-year condition which is less than the 8.7 cfs that currently discharges from the existing 18" RCP. See **Exhibit 4**, *Proposed Drainage Map*. The proposed modular wetland systems are limited by their individual flow capacity, which is much lower than the expected flows under a 100-year storm event, but the proprietary systems include a standard by-pass system on all of their models, which will allow high flows to by-pass the treatment process and discharge directly to the storm drain system downstream.

Table 2 shows a summary of the post-development flows for 10 and 100-year storm events.

Table 2: Proposed Hydrology Results

Sub-basin ID	Drainage Area (AC)	Q_{10} (cfs)	Q_{100} (cfs)
DMA-1 & DMA-2	2.05	4.15	6.05
DMA-3	3.64	5.55	8.13

For an exhibit of the post-development drainage condition, see **Exhibit 4**, *Proposed Drainage Map*. See Appendix C and D for AES outputs.

The proposed development has lower peak discharges under the 100-year storm event when compared to the pre-development conditions.

100.4 Storm Water Mitigation

100.4.1 General

The proposed development intends to maintain the commercial land use that was used to size Line G per the Moreno MDP. Additionally, the proposed development does not increase the peak discharges currently exiting the site under the 100-year storm event. Therefore, since the proposed development is not expected to cause adverse effects downstream of the site, the proposed site only proposes to address Riverside County's water quality requirements. The site is required to treat smaller storm rain events and the first flush of larger storms. Due to this the site is subject to hydromodification review. Hydromodification requires mitigation for a significant change in runoff in the post-development condition versus the pre-development condition for the 2-year, 24-hour condition. As discussed in the Water Quality Management Plan, when comparing the two

scenarios (pre and post), the developed runoff does not produce a significant enough increase to require storm water retention. Ultimately, storm water treatment and conveyance are the proposal for the development. Please see the Water Quality Management Plan for reference.

100.5 Conclusion

100.5 Conclusion

In conclusion, the development of the existing site into the proposed Car Pros Kia Sales and Service Facility in the 6.19-acre lot will not increase storm water discharge to the downstream system. The proposed site will use modular wetlands to treat the runoff before being discharged into the existing storm drain pipe on Pettit Street and the headwall located on the south-east corner of the project site.

EXHIBIT 1

Location Map

Trail Ridge Way
Auto Mall Pkwy
Motor Way
Auto Mall Dr
Pettit St
PROJECT SITE
Moreno Beach Dr
Google Earth
© 2018 Google
700 ft
N

EXHIBIT 2

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.

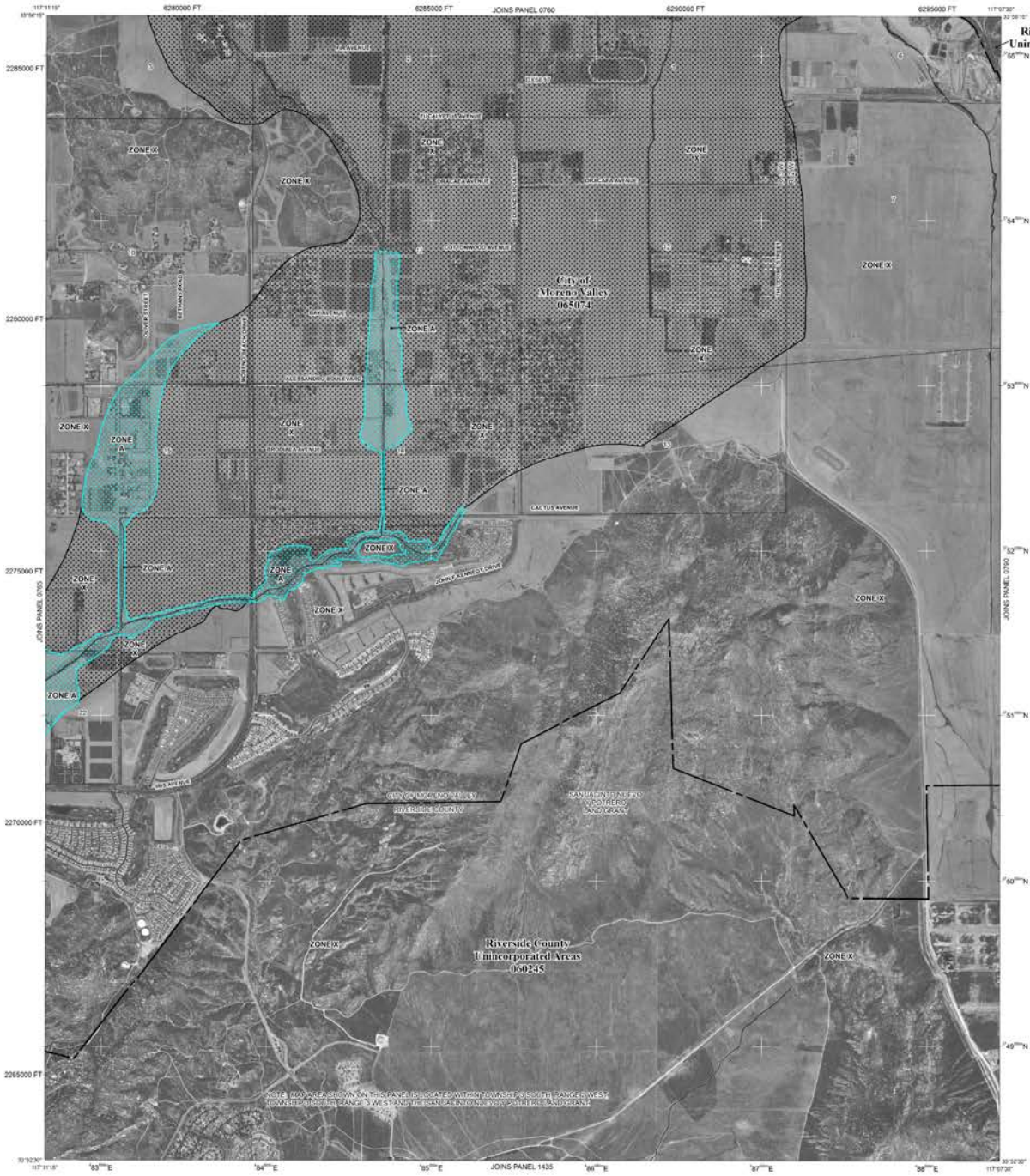
This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As 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 equalled 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
- 4276000mN — 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 0770G

FIRM
FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 770 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MORENO VALLEY, CITY OF	065074	0770	G
RIVERSIDE COUNTY	060245	0770	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
06065C0770G

EFFECTIVE DATE
AUGUST 28, 2008

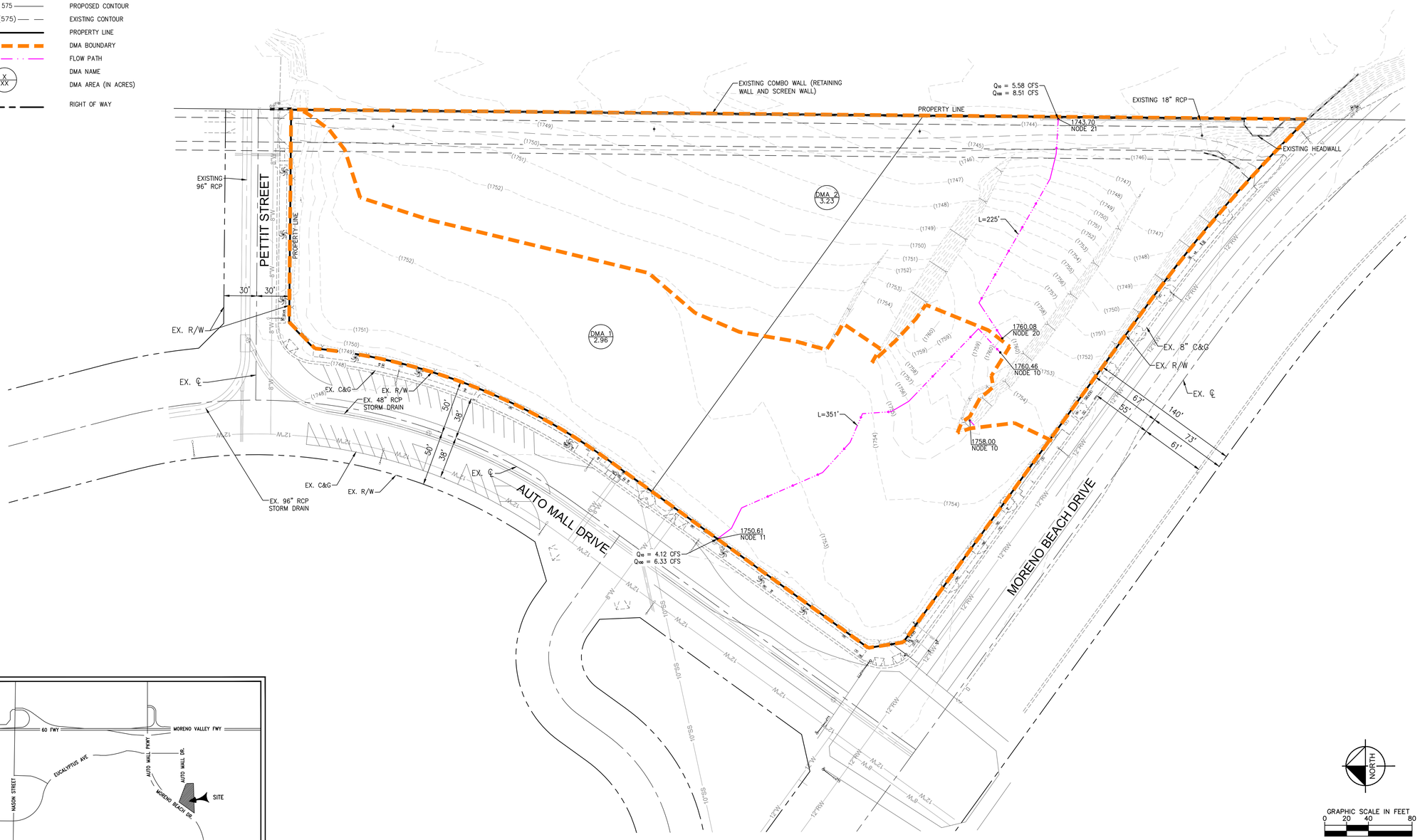
Federal Emergency Management Agency

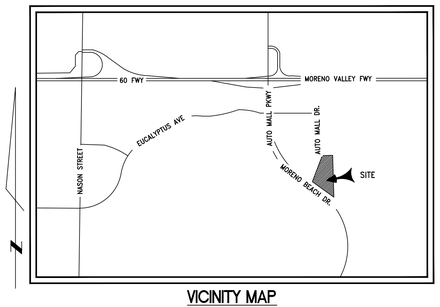
EXHIBIT 3

Existing Drainage Map

LEGEND

575	PROPOSED CONTOUR
(575)	EXISTING CONTOUR
	PROPERTY LINE
	DMA BOUNDARY
	FLOW PATH
XX	DMA NAME
X.XX	DMA AREA (IN ACRES)
	RIGHT OF WAY





VICINITY MAP
NTS

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80
SCALE 1" = 40'

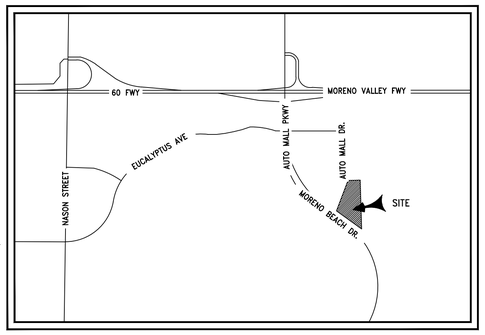
PEN 19-0047/LST19-0008

Kimley»Horn

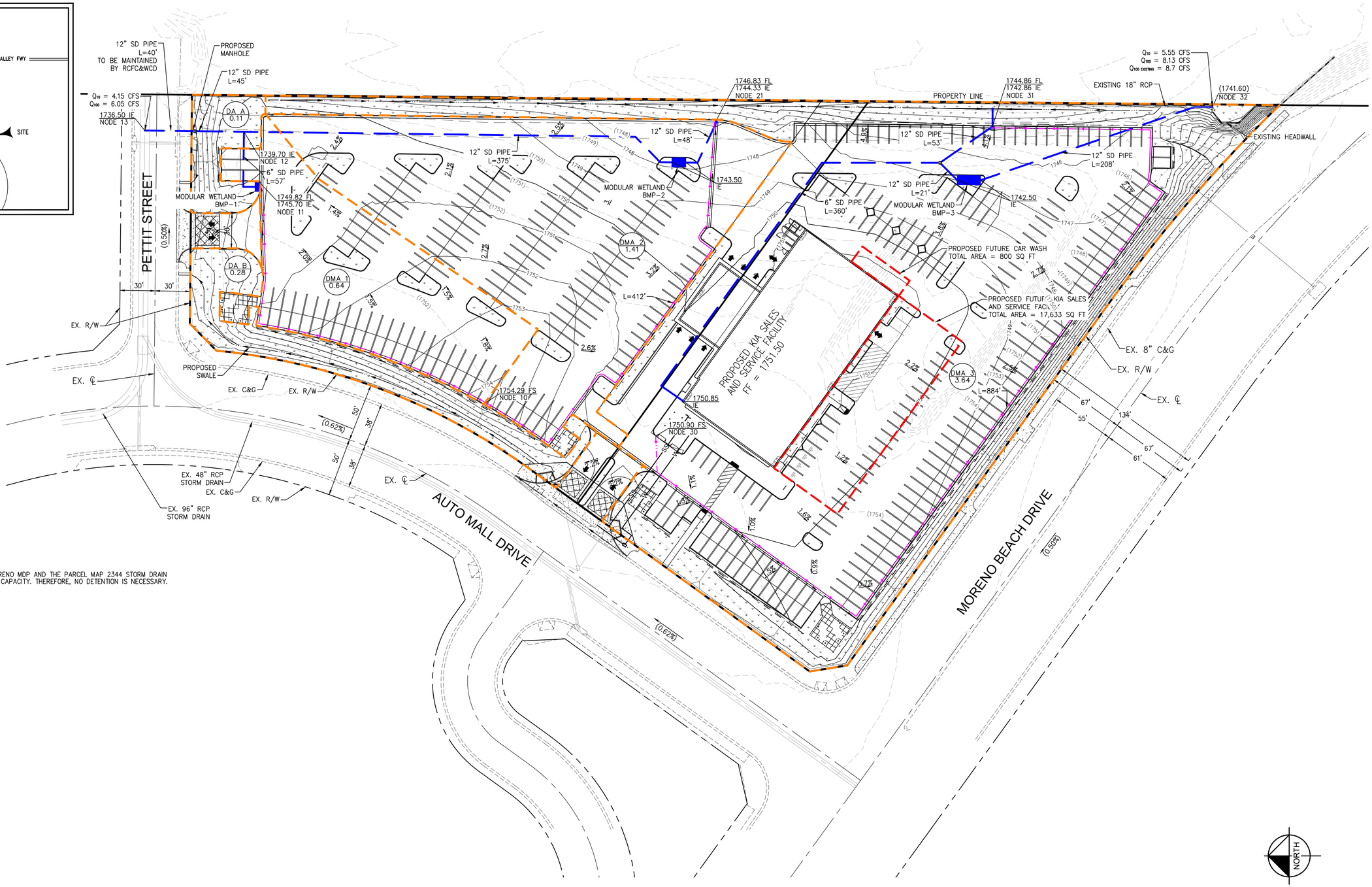
EXISTING DRAINAGE MAP
CAR PROS KIA SALES AND SERVICE FACILITY
5/17/2019

EXHIBIT 4

Proposed Drainage Map



VICINITY MAP
NTS



LEGEND

575	PROPOSED CONTOUR
(575)	EXISTING CONTOUR
	PROPERTY LINE
	DMA BOUNDARY
	FUTURE EXPANSION AREAS
	PROPOSED STORM DRAIN
	FLOW PATH
X / XX	DMA NAME / DMA AREA (IN ACRES)
	RIGHT OF WAY
	PROPOSED LANDSCAPE

NOTE: RECEIVING STORM DRAINS HAVE A SPECIFIED CAPACITY PER THE MORENO MDP AND THE PARCEL MAP 2344 STORM DRAIN PLANS. UNMITIGATED RUNOFF FROM THE PROJECT SITE IS LESS THAN THE CAPACITY. THEREFORE, NO DETENTION IS NECESSARY.

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80
SCALE 1" = 40'

PEN 19-0047/LST19-0008

Kimley»Horn

PROPOSED DRAINAGE MAP
CAR PROS KIA SALES AND SERVICE FACILITY
5/17/2019

EXHIBIT 5

Preliminary Grading and Drainage Plans

CITY OF MORENO VALLEY
PLOT PLAN FOR
CAR PROS - KIA SALES AND SERVICE FACILITY

OWNER / APPLICANT:
MV HOLDINGS, LLC
181 S. 333RD STREET # C
FEDERAL WAY, WA 98003

OWNER'S REPRESENTATIVE / CONTACT
EPD SOLUTIONS
2030 MAIN STREET # 1200
IRVINE, CA 92614
(949) 278-5413
ANDREA ARCILLA
ANDREA@EPDSOLUTIONS.COM

ENGINEER
KIMLEY HORN & ASSOCIATES, INC.
3880 LEMON STREET # 420
RIVERSIDE, CA 92501
ATTN: BOBBY KOHLTFARBER
(951) 543-9870
BOBBY.KOHLTFARBER@KIMLEY-HORN.COM

SURVEY
GRENIER AND SONS
28212 HORIZON CT
SUN CITY, CA 92585
ATTN: ANDY GRENIER, LS 7891
(951) 543-8462
ANDYG@GRENIER-AND-SONS.COM

SURVEY DATE
FEBRUARY 19, 2019

DATE PREPARED
5/17/19

ARCHITECT
CARLILE COATSWORTH ARCHITECTS, INC.
2495 CAMPUS DRIVE, 2ND FLOOR
ORVINE, CA 92612
(949) 833-1930
JAMIE C. POLADIAN, AIA

LEGAL DESCRIPTION
PARCEL 7 AND 8 OF PARCEL MAP NO. 23244, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 161, PAGES 16 THROUGH 24 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

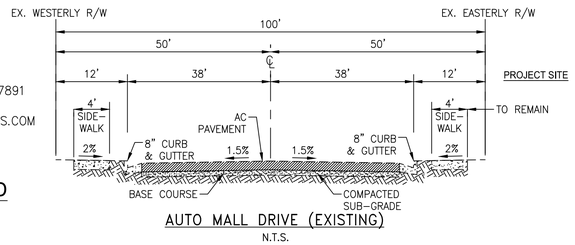
FEMA
THE SUBJECT PROPERTY LIES WITHIN ZONE "X" - AREAS OF 0.2% ANNUAL CHANCE FLOOD SHOWN ON FLOOD INSURANCE RATE MAP PREPARED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY, COMMUNITY.PANEL NUMBER 06065C0770G, WHICH BEARS AN EFFECTIVE DATE AUGUST 28, 2008.

PROPERTY ADDRESS
NORTHEAST CORNER OF AUTO MALL DRIVE AND MORENO BEACH DRIVE INTERSECTION IN THE CITY OF MORENO VALLEY, CALIFORNIA.

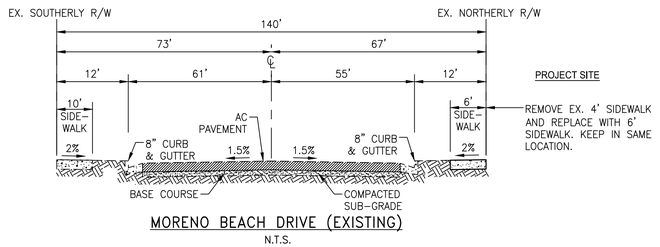
EASEMENTS
- ITEM 2D: THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM MORENO BEACH DRIVE, SUCH RIGHTS HAVING BEEN RELINQUISHED BY PARCEL MAP NO. 23244.
- ITEM 6D: AN EASEMENT GRANTED TO SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION FOR ELECTRIC SYSTEMS AND COMMUNICATION SYSTEMS PURPOSES RECORDED JULY 3, 1990 AS INSTRUMENT NO. 246837, OFFICIAL RECORDS.
- ITEM 8D: AN EASEMENT GRANTED TO GENERAL TELEPHONE COMPANY OF CALIFORNIA, A CORPORATION AND EASTERN MUNICIPAL WATER DISTRICT. A MUNICIPAL WATER DISTRICT FOR UTILITY PURPOSES RECORDED JUNE 22, 1990 AS INSTRUMENT NO. 231986, OFFICIAL RECORDS.
- ITEM 3C: AN EASEMENT FOR LANDSCAPE PURPOSES AS SHOWN OR AS OFFERED FOR DEDICATION ON PARCEL MAP 23244.
- ITEM 5C: AN EASEMENT GRANTED TO GENERAL TELEPHONE COMPANY OF CALIFORNIA, A CORPORATION AND EASTERN MUNICIPAL WATER DISTRICT. A MUNICIPAL WATER DISTRICT FOR UTILITY PURPOSES RECORDED JUNE 22, 1990 AS INSTRUMENT NO. 231986, OFFICIAL RECORDS.
- ITEM 6C: AN EASEMENT GRANTED TO SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION FOR ELECTRIC SYSTEMS AND COMMUNICATION SYSTEMS PURPOSES RECORDED JULY 3,1990 AS INSTRUMENT NO. 246837, OFFICIAL RECORDS.

UTILITIES
WATER:	EASTERN MUNICIPAL WATER DISTRICT (800) 426-3693
SEWER	EASTERN MUNICIPAL WATER DISTRICT (800) 426-3693
TELEPHONE:	FRONTIER COMMUNICATIONS (855) 679-3074
GAS:	THE GAS COMPANY (800) 427-2200
ELECTRIC:	SO. CAL. EDISON CO. (800) 684-8123
CABLE:	SPECTRUM CABLE CO. (855) 757-7328

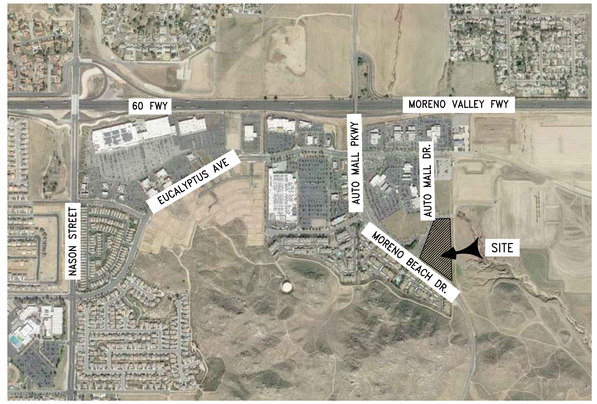
GENERAL NOTES:
1. ALL ROOF DRAINS TO DRAIN TO CONCRETE SPLASH PAD.
2. ROOF DRAINS TO BE DIRECTED TO A LANDSCAPE AREA.



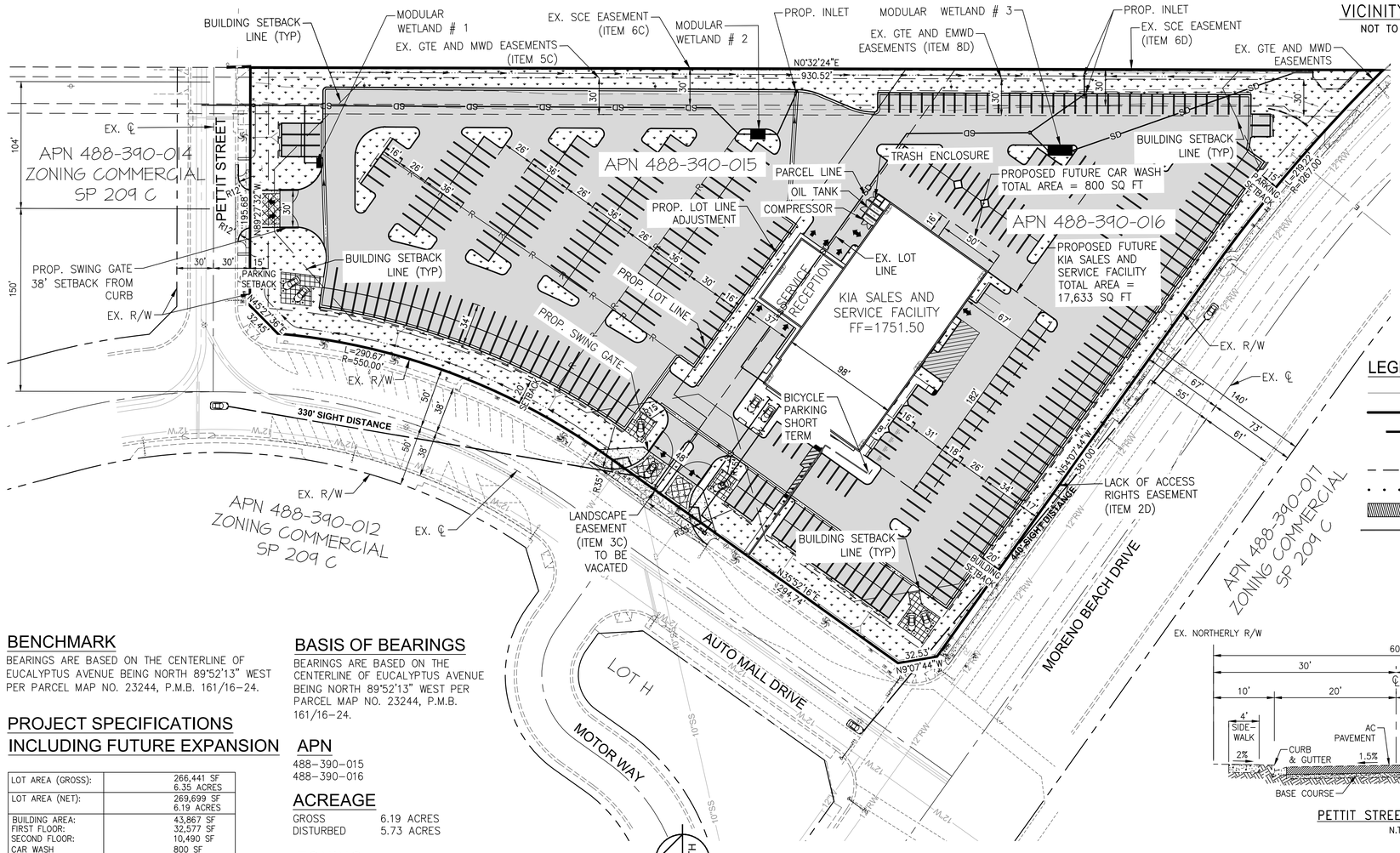
AUTO MALL DRIVE (EXISTING)
N.T.S.



MORENO BEACH DRIVE (EXISTING)
N.T.S.



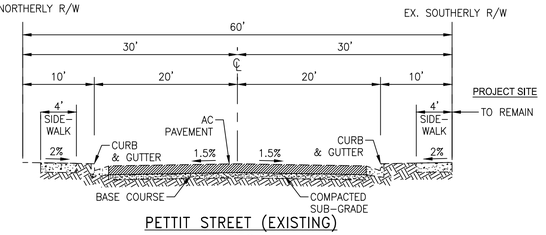
VICINITY MAP
NOT TO SCALE



GRAPHIC SCALE IN FEET
0 25 50 100
SCALE 1" = 50'

ABBREVIATIONS:
AC	ACRES
APN	ASSESSOR'S PARCEL NUMBER
BLDG	BUILDING
CO	CLEAN OUT
EX	EXISTING
EG	EXISTING GROUND
FF	FINISHED FLOOR ELEVATION
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
FS	FINISHED SURFACE
FW	FIRE WATER
GB	GRADE BREAK
INV	INVERT
MH	MANHOLE
POC	POINT OF CONNECTION
PROP	PROPOSED
RL	RIDGE LINE
R/W	RIGHT-OF-WAY
SF	SQUARE FEET
STBK	SETBACK
SWLK	SIDEWALK
TC	TOP OF CURB
TRW	TOP OF RETAINING WALL
TYP	TYPICAL
C&G	CURB AND GUTTER

LEGEND
- CENTERLINE
- RIGHT-OF-WAY (R/W)
- STRIPING
- PROP. LIGHT
- FUTURE EXPANSION BLDG LIMITS
- ACCESSIBLE PATH OF TRAVEL
- 4' R/W DEDICATION
- BICYCLE PATH OF TRAVEL



PETTIT STREET (EXISTING)
N.T.S.

BENCHMARK
BEARINGS ARE BASED ON THE CENTERLINE OF EUCALYPTUS AVENUE BEING NORTH 89°52'13" WEST PER PARCEL MAP NO. 23244, P.M.B. 161/16-24.

BASIS OF BEARINGS
BEARINGS ARE BASED ON THE CENTERLINE OF EUCALYPTUS AVENUE BEING NORTH 89°52'13" WEST PER PARCEL MAP NO. 23244, P.M.B. 161/16-24.

PROJECT SPECIFICATIONS INCLUDING FUTURE EXPANSION

LOT AREA (GROSS):		266,441 SF 6.35 ACRES
LOT AREA (NET):		269,699 SF 6.19 ACRES
BUILDING AREA: FIRST FLOOR: SECOND FLOOR: CAR WASH		43,867 SF 32,577 SF 10,490 SF 800 SF
COVERAGE (ON NET):		12.38%
FLOOR AREA RATIO	(ON NET):	16.27%
PARKING REQUIRED: 24,414 SF @ 1 / 2,000 SF		22 SPACES
PARKING PROVIDED STANDARD: ADA		56 SPACES 52 SPACES 4 SPACES
LANDSCAPE PROVIDED:		60,680 SF (22.5%)

APN
488-390-015
488-390-016

ACREAGE
GROSS 6.19 ACRES
DISTURBED 5.73 ACRES

ZONING
SP 209-C
COMMERCIAL

CONTOUR INTERVAL
1'

IMPORTANT NOTICE
SECTION 4216/4217 OF THE GOVERNMENT CODE REQUIRES A DIG ALERT IDENTIFICATION NUMBER TO BE ISSUED BEFORE A "PERMIT TO EXCAVATE" WILL BE VALID.
UNDERGROUND SERVICE ALERT
TOLL FREE 1-800-422-4133
TWO WORKING DAYS BEFORE YOU DIG

DRAWN BY	RS
DESIGN BY	RS
CHECKED BY	BK

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3880 LEMON STREET, SUITE 420
RIVERSIDE, CA 92501
PHONE: (951) 543-9868
WWW.KIMLEY-HORN.COM

BOBBY KOHLTFARBER No. C68141 CIVIL

CITY OF MORENO VALLEY
PLOT PLAN
FOR
CAR PROS - KIA SALES AND SERVICE FACILITY
COVER SHEET

1
SHEET 1 OF 3
CITY I.D. NO.
PEN19-0047

PEN19-0047

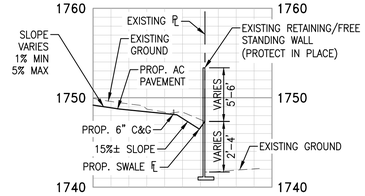
\\RIVFP01\CA_RIV\RIV_LDEV\194117001_CCA_KIA_MORENO_VALLEY_\CAD\PLANSHEETS\PRELIMINARY FOR CUP SUBMITTAL\1 COVER SHEET CUP.DWG 5/17/2019 11:18:40 AM 3RD REVIEW

WALL NOTE:

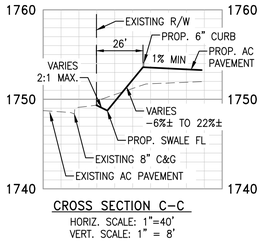
ADDITIONAL COURSES TO BE ADDED TO EXISTING WALL TO MAKE IT A MINIMUM OF 6' HIGH MEASURED FROM THE FINISH GRADE. IF SCE OWNS THE WALL, AN APPROVAL SHALL BE OBTAINED FROM SCE PRIOR TO ADDING COURSES FOR PROPER CLEARANCE TO THE EXISTING POWER LINES.

LEGEND

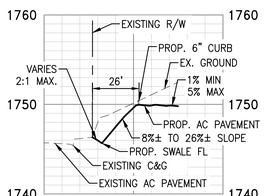
- CENTERLINE
- RIGHT-OF-WAY (R/W)
- STRIPING
- PROP. LIGHT
- 4' R/W DEDICATION
- FIRE TRUCK/DELIVERY TRUCK/ TRASH TRUCK CIRCULATION PER CALTRANS DESIGN MANUAL TURN TEMPLATES
- PROPOSED LOT LINE ADJUSTMENT



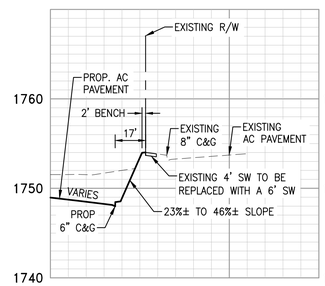
CROSS SECTION A–A
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1" = 8'



CROSS SECTION C–C
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1" = 8'



CROSS SECTION B–B
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1" = 8'



CROSS SECTION D–D
HORIZ. SCALE: 1"=40'
VERT. SCALE: 1" = 8'

ESTIMATED EARTHWORK QUANTITIES

CUT:	19,600 CY
FILL:	1,215 CY
NET:	18,385 CY – EXPORT

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.

ROOF DRAIN KEY NOTES:

1. INTERNAL ROOF DRAIN TO BE CONNECTED TOGETHER UNDER THE ROOF AND ROUTED TO ADJACENT LANDSCAPE AREAS.
2. EXTERNAL ROOF DRAIN TO BE CONNECTED TO STORM DRAIN SYSTEM AS SHOWN.

NOTES:

1– A COMMUNICATION CONDUIT ALONG PROJECT FRONTAGE ON MORENO BEACH DRIVE MAY BE REQUIRED PER CITY STANDARD NO. MVSI–186–0
2–FOR–SALE VEHICLE LOADING/UNLOADING SHALL BE DONE ON–SITE WITHIN THE PROJECT PARKING LOT
3–NO PARKING SIGNS SHALL BE INSTALLED ON PETTIT STREET

IMPORTANT NOTICE
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UNDERGROUND SERVICE ALERT
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TWO WORKING DAYS BEFORE YOU DIG

GRAPHIC SCALE IN FEET
0 20 40 80
SCALE 1" = 40'

DRAWN BY	RS
DESIGN BY	RS
CHECKED BY	BK

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BOBBY KOHLTFARBER No. C68141 CIVIL

CITY OF MORENO VALLEY

PLOT PLAN FOR CAR PROS – KIA SALES AND SERVICE FACILITY CONCEPTUAL GRADING PLAN

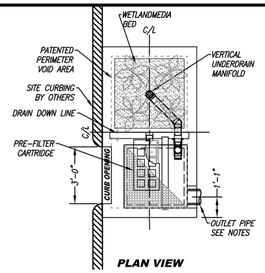
SHEET 2 OF 3
CITY I.D. NO. PEN19-0047

PEN19-0047

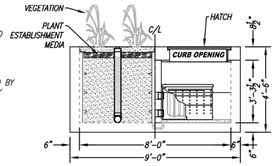
3RD REVIEW

\\RIVFP01\CA_RIV\RIV_LDEV\194117001_CCA_KIA_MORENO_VALLEY_\CAD\PLANSHEETS\PRELIMINARY FOR CUP SUBMITTAL\2 GRADING SHEET CUP.DWG 5/17/2019 12:25:52 PM

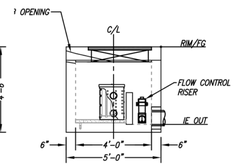
SITE SPECIFIC DATA			
PROJECT NUMBER	194117001		
ORDER NUMBER			
PROJECT NAME	CAR PROS KIA		
PROJECT LOCATION	MORENO VALLEY		
STRUCTURE ID	BMP-1		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
N/A	0.1		
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE		1.97	
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	1745.7	HDPE	6"
INLET PIPE 2			
OUTLET PIPE	1745.7	HDPE	6"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	1749.8	1749.8	1749.8
SURFACE LOAD	PEDESTRIAN	OPEN PLANTER	PEDESTRIAN
FRAME & COVER	36" X 36"	N/A	N/A
WETLANDMEDIA VOLUME (CY)			TBD
ORIFICE SIZE (DIA. INCHES)			TBD
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



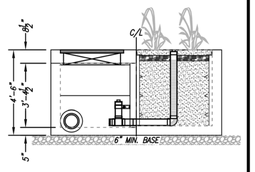
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.115
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

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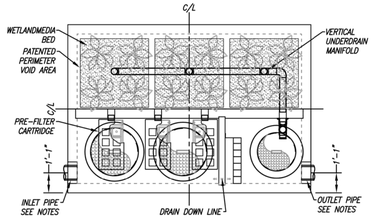
Bio Clean — A Forterra Company

MWS-L-4-8-C
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

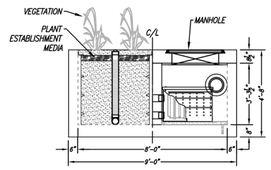
BMP-1
N.T.S.

3

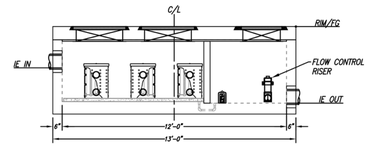
SITE SPECIFIC DATA			
PROJECT NUMBER	194117001		
ORDER NUMBER			
PROJECT NAME	CAR PROS KIA		
PROJECT LOCATION	MORENO VALLEY		
STRUCTURE ID	BMP-2		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
N/A	0.3		
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE		4.26	
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	1743.5	HDPE	12"
INLET PIPE 2			
OUTLET PIPE	1743.5	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	1747.6	1747.6	1747.6
SURFACE LOAD	PEDESTRIAN	OPEN PLANTER	PEDESTRIAN
FRAME & COVER	2EA ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			TBD
ORIFICE SIZE (DIA. INCHES)			TBD
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



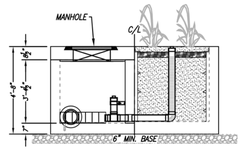
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.346
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

INSTALLATION NOTES

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2. UNIT MUST BE INSTALLED ON LEVEL BASS. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
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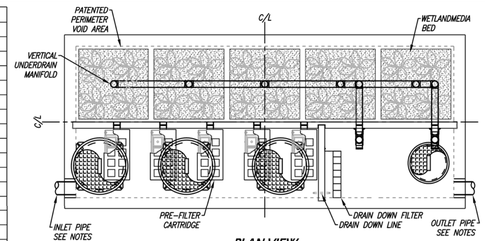
Bio Clean — A Forterra Company

MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

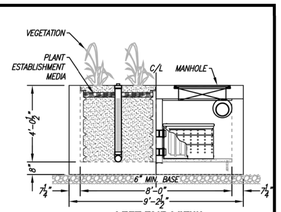
BMP-2
N.T.S.

4

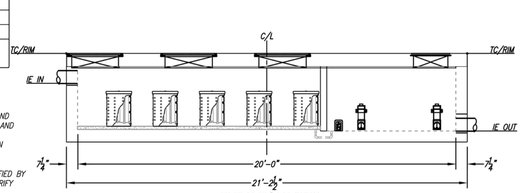
SITE SPECIFIC DATA			
PROJECT NAME	CAR PROS KIA		
PROJECT LOCATION	MORENO VALLEY		
STRUCTURE ID	BMP-3		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
N/A	0.5		
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE		8.13	
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	1742.5	HDPE	12"
INLET PIPE 2			
OUTLET PIPE	1742.5	HDPE	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	1746.6	1746.6	1746.6
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			11.85
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.43"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



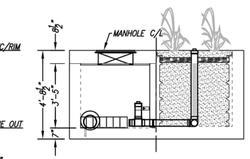
PLAN VIEW



LEFT END VIEW
BIOFILTRATION/PRETREATMENT



ELEVATION VIEW



RIGHT END VIEW
DISCHARGE/BIOFILTRATION

TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,360; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

PROPRIETARY AND CONFIDENTIAL: THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MODULAR WETLANDS SYSTEMS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MODULAR WETLANDS SYSTEMS IS PROHIBITED.

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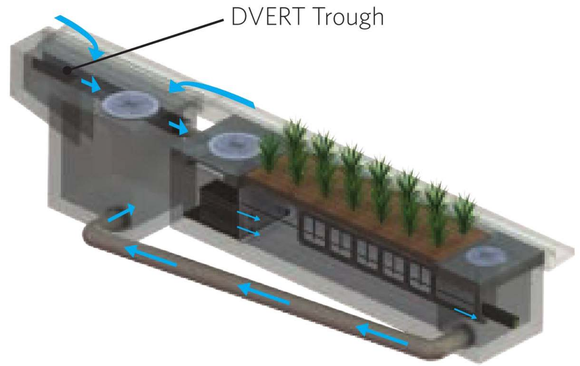
MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BMP-3
N.T.S.

5

DVERT LOW FLOW DIVERSION



MODULAR WETLAND BYPASS SYSTEM
N.T.S.

PEN19-0047

DRAWN BY: RS	Kimley»Horn	ROBERT KOHLTARBER No. C68141 CIVIL	CITY OF MORENO VALLEY
DESIGN BY: RS	© 2018 KIMLEY-HORN AND ASSOCIATES, INC. 3880 LEMON STREET, SUITE 420 RIVERSIDE, CA 92501 PHONE: (951) 543-9868 WWW.KIMLEY-HORN.COM		PLOT PLAN FOR CAR PROS – KIA SALES AND SERVICE FACILITY DETAILS
CHECKED BY: BK			SHEET 3 OF 3 — CITY I.D. NO. PEN19-0047

3RD REVIEW

\\RIVFP01\CA_RIV_RIV_LDEV\194117001_CCA_KIA_MORENO_VALLEY_\CAD\PLANSHEETS\PRELIMINARY FOR CUP SUBMITTAL\3 DETAIL SHEET CUP.DWG 5/17/2019 10:38:19 AM

APPENDIX A

Existing Hydrology Calculations
10 Year Rainfall Frequency

```
**************************************************************************
  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                     (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                     (Rational Tabling Version 18.0)
                  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```


```
 ************************** DESCRIPTION OF STUDY **************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                 *
* XO 5/16/19                                                              *
* KMV10E.RES                                                              *
 **************************************************************************
```


```
  FILE NAME: KMV10E.DAT
  TIME/DATE OF STUDY: 10:53 05/16/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.828
  SLOPE OF INTENSITY DURATION CURVE = 0.5004
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    VALLEY S-GRAPH USED.
    *24-HOUR (15-MINUTE PERIOD) DESIGN STORM USED.
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   0.67
    USER-SPECIFIED DEPTH-AREA REDUCTION FACTOR:
      FOR 24-HOUR RAINFALL DEPTH =  1.00
    LOW LOSS RATE PERCENTAGE =  0.85
    MINIMUM LOSS RATE PERCENTAGE FOR 24-HOUR STORM =  0.05
  *PRECIPITATION ZONE NUMBER (PZN) = 2.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  0.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   351.00
  UPSTREAM ELEVATION(FEET) =     60.46
  DOWNSTREAM ELEVATION(FEET) =     50.61
  ELEVATION DIFFERENCE(FEET) =      9.85
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.906
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"      D        2.96     0.7298       85   11.35
  SUBAREA RUNOFF(CFS) =      4.12
  TOTAL AREA(ACRES) =      2.96   TOTAL RUNOFF(CFS) =      4.12

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   225.00
  UPSTREAM ELEVATION(FEET) =     60.10
  DOWNSTREAM ELEVATION(FEET) =     43.70
  ELEVATION DIFFERENCE(FEET) =     16.40
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.292
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"      D        3.23     0.7538       85    7.85
  SUBAREA RUNOFF(CFS) =      5.58
  TOTAL AREA(ACRES) =      3.23   TOTAL RUNOFF(CFS) =      5.58
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.2  TC(MIN.) =      7.85
  PEAK FLOW RATE(CFS)   =       5.58
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX B

Existing Hydrology Calculations
100 Year Rainfall Frequency

```
******************************************************************************
  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                     (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                     (Rational Tabling Version 18.0)
                  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```


```
 ************************** DESCRIPTION OF STUDY **************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                 *
* XO 5/16/19                                                              *
* KMV100E.RES                                                             *
 *************************************************************************
```


```
  FILE NAME: KMV100E.DAT
  TIME/DATE OF STUDY: 10:31 05/16/2019
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.200
  SLOPE OF INTENSITY DURATION CURVE = 0.5001
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    VALLEY S-GRAPH USED.
    *24-HOUR (15-MINUTE PERIOD) DESIGN STORM USED.
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   0.67
    USER-SPECIFIED DEPTH-AREA REDUCTION FACTOR:
      FOR 24-HOUR RAINFALL DEPTH =  1.00
    LOW LOSS RATE PERCENTAGE =  0.85
    MINIMUM LOSS RATE PERCENTAGE FOR 24-HOUR STORM =  0.05
  *PRECIPITATION ZONE NUMBER (PZN) = 3.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  0.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   351.00
  UPSTREAM ELEVATION(FEET) =     60.46
  DOWNSTREAM ELEVATION(FEET) =     50.61
  ELEVATION DIFFERENCE(FEET) =      9.85
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.760
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"      D        2.96     0.7752       85   11.35
  SUBAREA RUNOFF(CFS) =      6.33
  TOTAL AREA(ACRES) =      2.96   TOTAL RUNOFF(CFS) =      6.33

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   225.00
  UPSTREAM ELEVATION(FEET) =     60.08
  DOWNSTREAM ELEVATION(FEET) =     43.70
  ELEVATION DIFFERENCE(FEET) =     16.38
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.318
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"      D        3.23     0.7937       85    7.85
  SUBAREA RUNOFF(CFS) =      8.51
  TOTAL AREA(ACRES) =      3.23   TOTAL RUNOFF(CFS) =      8.51
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.2  TC(MIN.) =      7.85
  PEAK FLOW RATE(CFS)   =       8.51
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C

Proposed Hydrology Calculations
10 Year Rainfall Frequency

```
**************************************************************************
  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                     (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                     (Rational Tabling Version 18.0)
                  Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:
```


```
 ************************** DESCRIPTION OF STUDY **************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                 *
* XO 5/16/19                                                              *
* KMV10P.RES                                                              *
 **************************************************************************
```


```
  FILE NAME: KMV10P.DAT
  TIME/DATE OF STUDY: 10:55 05/16/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.828
  SLOPE OF INTENSITY DURATION CURVE = 0.5004
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    VALLEY S-GRAPH USED.
    *24-HOUR (15-MINUTE PERIOD) DESIGN STORM USED.
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   0.67
    USER-SPECIFIED DEPTH-AREA REDUCTION FACTOR:
      FOR 24-HOUR RAINFALL DEPTH =  1.00
    LOW LOSS RATE PERCENTAGE =  0.85
    MINIMUM LOSS RATE PERCENTAGE FOR 24-HOUR STORM =  0.05
  *PRECIPITATION ZONE NUMBER (PZN) = 2.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  0.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   324.00
  UPSTREAM ELEVATION(FEET) =     54.30
  DOWNSTREAM ELEVATION(FEET) =     49.80
  ELEVATION DIFFERENCE(FEET) =      4.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.393
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  COMMERCIAL                 D        0.64     0.8859       75    7.20
  SUBAREA RUNOFF(CFS) =      1.36
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      1.36

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    45.70  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =    57.00   MANNING'S N =  0.015
```

```
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.02
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.36
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    7.30
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   412.00
  UPSTREAM ELEVATION(FEET) =     54.30
  DOWNSTREAM ELEVATION(FEET) =     46.80
  ELEVATION DIFFERENCE(FEET) =      7.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.343
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  COMMERCIAL                 D        1.41     0.8857       75    7.51
  SUBAREA RUNOFF(CFS) =      2.93
  TOTAL AREA(ACRES) =      1.41   TOTAL RUNOFF(CFS) =      2.93

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.30  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =   423.00   MANNING'S N =  0.015
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.65
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.93
  PIPE TRAVEL TIME(MIN.) =   1.52    Tc(MIN.) =    9.02
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     835.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        2.93     9.02       2.137        1.41
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     835.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        1.36     7.30       2.376        0.64
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     381.00 FEET.

****************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
********************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       3.73       7.30        2.376
     2       4.15       9.02        2.137

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       4.15   Tc(MIN.) =    9.02
 TOTAL AREA(ACRES) =        2.0

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    39.70  DOWNSTREAM(FEET) =    36.50
 FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.015
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.24
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.15
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    9.20
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     920.00 FEET.
```

```
**************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
--------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   884.00
 UPSTREAM ELEVATION(FEET) =     50.90
 DOWNSTREAM ELEVATION(FEET) =     44.90
 ELEVATION DIFFERENCE(FEET) =      6.00
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.766
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
      LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
 APARTMENTS                 D        3.64     0.8638       75   13.21
 SUBAREA RUNOFF(CFS) =      5.55
 TOTAL AREA(ACRES) =      3.64   TOTAL RUNOFF(CFS) =      5.55

**************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
--------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    42.86  DOWNSTREAM(FEET) =    41.60
 FLOW LENGTH(FEET) =   282.00   MANNING'S N =  0.015
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.90
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.55
 PIPE TRAVEL TIME(MIN.) =   1.20    Tc(MIN.) =   14.42
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1166.00 FEET.
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        3.6  TC(MIN.) =     14.42
 PEAK FLOW RATE(CFS)   =       5.55
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

APPENDIX D

Proposed Hydrology Calculations
100 Year Rainfall Frequency

```
**************************************************************************
  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                     (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                     (Rational Tabling Version 18.0)
                  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:
```


```
 ************************** DESCRIPTION OF STUDY **************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                 *
* XO 5/16/19                                                              *
* KMV100P.RES                                                             *
 **************************************************************************
```


```
  FILE NAME: KMV100P.DAT
  TIME/DATE OF STUDY: 10:32 05/16/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.200
  SLOPE OF INTENSITY DURATION CURVE = 0.5001
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    VALLEY S-GRAPH USED.
    *24-HOUR (15-MINUTE PERIOD) DESIGN STORM USED.
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   0.67
    USER-SPECIFIED DEPTH-AREA REDUCTION FACTOR:
      FOR 24-HOUR RAINFALL DEPTH =  1.00
    LOW LOSS RATE PERCENTAGE =  0.85
    MINIMUM LOSS RATE PERCENTAGE FOR 24-HOUR STORM =  0.05
  *PRECIPITATION ZONE NUMBER (PZN) = 3.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  0.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   324.00
  UPSTREAM ELEVATION(FEET) =     54.30
  DOWNSTREAM ELEVATION(FEET) =     49.80
  ELEVATION DIFFERENCE(FEET) =      4.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.465
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  COMMERCIAL                 D        0.64     0.8898       75    7.20
  SUBAREA RUNOFF(CFS) =      1.97
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      1.97

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    45.70  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =    57.00   MANNING'S N =  0.015
```

```
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.11
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.97
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    7.29
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   412.00
  UPSTREAM ELEVATION(FEET) =     54.30
  DOWNSTREAM ELEVATION(FEET) =     46.80
  ELEVATION DIFFERENCE(FEET) =      7.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.393
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  COMMERCIAL                 D        1.41     0.8896       75    7.51
  SUBAREA RUNOFF(CFS) =      4.26
  TOTAL AREA(ACRES) =      1.41   TOTAL RUNOFF(CFS) =      4.26

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.30  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =   423.00   MANNING'S N =  0.015
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.19
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.26
  PIPE TRAVEL TIME(MIN.) =   1.36    Tc(MIN.) =    8.87
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     835.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        4.26     8.87       3.122        1.41
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     835.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        1.97     7.29       3.443        0.64
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     381.00 FEET.

****************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
********************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       5.47       7.29        3.443
     2       6.05       8.87        3.122

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       6.05   Tc(MIN.) =    8.87
 TOTAL AREA(ACRES) =        2.0

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    39.70  DOWNSTREAM(FEET) =    36.50
 FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.015
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.08
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.05
 PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    9.02
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     920.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   884.00
  UPSTREAM ELEVATION(FEET) =     50.90
  DOWNSTREAM ELEVATION(FEET) =     44.90
  ELEVATION DIFFERENCE(FEET) =      6.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.557
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  APARTMENTS                 D        3.64     0.8734       75   13.21
  SUBAREA RUNOFF(CFS) =      8.13
  TOTAL AREA(ACRES) =      3.64   TOTAL RUNOFF(CFS) =      8.13

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    42.86  DOWNSTREAM(FEET) =    41.60
  FLOW LENGTH(FEET) =   282.00   MANNING'S N =  0.015
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.31
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.13
  PIPE TRAVEL TIME(MIN.) =   1.09    Tc(MIN.) =   14.30
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1166.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.6  TC(MIN.) =     14.30
  PEAK FLOW RATE(CFS)   =       8.13
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX E

Existing Hydrology Calculations
2 Year Rainfall Frequency

```
**************************************************************************
  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                     (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                     (Rational Tabling Version 18.0)
                  Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                *
* XO 5/16/19                                                             *
* KMV2E.RES                                                              *
 **************************************************************************

  FILE NAME: KMV2E.DAT
  TIME/DATE OF STUDY: 10:33 05/16/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.554
  SLOPE OF INTENSITY DURATION CURVE = 0.5004
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    VALLEY S-GRAPH USED.
    *24-HOUR (15-MINUTE PERIOD) DESIGN STORM USED.
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   0.67
    USER-SPECIFIED DEPTH-AREA REDUCTION FACTOR:
      FOR 24-HOUR RAINFALL DEPTH =  1.00
    LOW LOSS RATE PERCENTAGE =  0.85
    MINIMUM LOSS RATE PERCENTAGE FOR 24-HOUR STORM =  0.05
  *PRECIPITATION ZONE NUMBER (PZN) = 2.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  0.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   351.00
  UPSTREAM ELEVATION(FEET) =     60.46
  DOWNSTREAM ELEVATION(FEET) =     50.61
  ELEVATION DIFFERENCE(FEET) =      9.85
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.276
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"      D        2.96     0.6675       85   11.35
  SUBAREA RUNOFF(CFS) =      2.52
  TOTAL AREA(ACRES) =      2.96   TOTAL RUNOFF(CFS) =      2.52

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   225.00
  UPSTREAM ELEVATION(FEET) =     60.10
  DOWNSTREAM ELEVATION(FEET) =     43.70
  ELEVATION DIFFERENCE(FEET) =     16.40
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.534
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"      D        3.23     0.6978       85    7.85
  SUBAREA RUNOFF(CFS) =      3.46
  TOTAL AREA(ACRES) =      3.23   TOTAL RUNOFF(CFS) =      3.46
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.2  TC(MIN.) =      7.85
  PEAK FLOW RATE(CFS)   =       3.46
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2011 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 18.0)
                 Release Date: 05/01/2011  License ID 1499

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                *
* XO 5/16/19                                                             *
* KMV2EU.RES                                                             *
 ************************************************************************

  FILE NAME: KMV2EU.DAT
  TIME/DATE OF STUDY: 11:21 05/16/2019
```

```
**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =       2.960 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
  Warning: Watershed Area is less than 10 acres
         *USER ENTERED "LAG" TIME =    0.151 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.050
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.010
```

KMV2EU.RES

USER-ENTERED RAINFALL = 1.70 INCHES
RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 1.0000

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 165.235

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	36.518	4.357
2	82.578	5.496
3	92.837	1.224
4	97.269	0.529
5	98.950	0.201
6	99.520	0.068
7	99.808	0.034
8	99.952	0.017
9	100.000	0.006

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0034	0.0017	0.0017
2	0.0051	0.0025	0.0025
3	0.0051	0.0025	0.0025
4	0.0068	0.0034	0.0034
5	0.0051	0.0025	0.0025
6	0.0051	0.0025	0.0025
7	0.0051	0.0025	0.0025
8	0.0068	0.0034	0.0034
9	0.0068	0.0034	0.0034
10	0.0068	0.0034	0.0034
11	0.0085	0.0042	0.0042
12	0.0085	0.0042	0.0042
13	0.0085	0.0042	0.0042
14	0.0085	0.0042	0.0042

15	0.0085	0.0042	0.0042
16	0.0102	0.0051	0.0051
17	0.0102	0.0051	0.0051
18	0.0119	0.0059	0.0059
19	0.0119	0.0059	0.0059
20	0.0136	0.0068	0.0068
21	0.0102	0.0051	0.0051
22	0.0119	0.0059	0.0059
23	0.0136	0.0068	0.0068
24	0.0136	0.0068	0.0068
25	0.0153	0.0076	0.0076
26	0.0153	0.0076	0.0076
27	0.0170	0.0085	0.0085
28	0.0170	0.0085	0.0085
29	0.0170	0.0085	0.0085
30	0.0187	0.0093	0.0093
31	0.0204	0.0102	0.0102
32	0.0221	0.0110	0.0110
33	0.0255	0.0127	0.0127
34	0.0255	0.0127	0.0127
35	0.0272	0.0136	0.0136
36	0.0289	0.0144	0.0144
37	0.0323	0.0147	0.0176
38	0.0340	0.0143	0.0197
39	0.0357	0.0140	0.0217
40	0.0374	0.0137	0.0237
41	0.0255	0.0127	0.0127
42	0.0255	0.0127	0.0127
43	0.0340	0.0128	0.0212
44	0.0340	0.0125	0.0215
45	0.0323	0.0122	0.0201
46	0.0323	0.0119	0.0204
47	0.0289	0.0116	0.0173
48	0.0306	0.0114	0.0192
49	0.0425	0.0111	0.0314
50	0.0442	0.0108	0.0334
51	0.0476	0.0105	0.0371
52	0.0493	0.0103	0.0390
53	0.0578	0.0100	0.0478
54	0.0578	0.0097	0.0481
55	0.0391	0.0095	0.0296
56	0.0391	0.0092	0.0299
57	0.0459	0.0089	0.0370
58	0.0442	0.0087	0.0355
59	0.0442	0.0084	0.0358
60	0.0425	0.0082	0.0343
61	0.0408	0.0080	0.0328
62	0.0391	0.0077	0.0314

63	0.0323	0.0075	0.0248
64	0.0323	0.0073	0.0250
65	0.0068	0.0034	0.0034
66	0.0068	0.0034	0.0034
67	0.0051	0.0025	0.0025
68	0.0051	0.0025	0.0025
69	0.0085	0.0042	0.0042
70	0.0085	0.0042	0.0042
71	0.0085	0.0042	0.0042
72	0.0068	0.0034	0.0034
73	0.0068	0.0034	0.0034
74	0.0068	0.0034	0.0034
75	0.0051	0.0025	0.0025
76	0.0034	0.0017	0.0017
77	0.0051	0.0025	0.0025
78	0.0068	0.0034	0.0034
79	0.0051	0.0025	0.0025
80	0.0034	0.0017	0.0017
81	0.0051	0.0025	0.0025
82	0.0051	0.0025	0.0025
83	0.0051	0.0025	0.0025
84	0.0034	0.0017	0.0017
85	0.0051	0.0025	0.0025
86	0.0034	0.0017	0.0017
87	0.0051	0.0025	0.0025
88	0.0034	0.0017	0.0017
89	0.0051	0.0025	0.0025
90	0.0034	0.0017	0.0017
91	0.0034	0.0017	0.0017
92	0.0034	0.0017	0.0017
93	0.0034	0.0017	0.0017
94	0.0034	0.0017	0.0017
95	0.0034	0.0017	0.0017
96	0.0034	0.0017	0.0017

TOTAL STORM RAINFALL(INCHES) = 1.70
TOTAL SOIL-LOSS(INCHES) = 0.61
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.09

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.1504
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.2688

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2 4 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0002	0.01	Q	.	.	.	.
0.333	0.0003	0.02	Q	.	.	.	.
0.417	0.0004	0.02	Q	.	.	.	.
0.500	0.0006	0.02	Q	.	.	.	.
0.583	0.0008	0.03	Q	.	.	.	.
0.667	0.0010	0.03	Q	.	.	.	.
0.750	0.0011	0.03	Q	.	.	.	.
0.833	0.0014	0.03	Q	.	.	.	.
0.917	0.0016	0.03	Q	.	.	.	.
1.000	0.0018	0.03	Q	.	.	.	.
1.083	0.0021	0.03	Q	.	.	.	.
1.167	0.0023	0.03	Q	.	.	.	.
1.250	0.0025	0.03	Q	.	.	.	.
1.333	0.0027	0.03	Q	.	.	.	.
1.417	0.0030	0.03	Q	.	.	.	.
1.500	0.0032	0.03	Q	.	.	.	.
1.583	0.0034	0.03	Q	.	.	.	.
1.667	0.0036	0.03	Q	.	.	.	.
1.750	0.0038	0.03	Q	.	.	.	.
1.833	0.0040	0.03	Q	.	.	.	.
1.917	0.0043	0.03	Q	.	.	.	.
2.000	0.0045	0.03	Q	.	.	.	.
2.083	0.0048	0.04	Q	.	.	.	.
2.167	0.0051	0.04	Q	.	.	.	.
2.250	0.0053	0.04	Q	.	.	.	.
2.333	0.0056	0.04	Q	.	.	.	.
2.417	0.0059	0.04	Q	.	.	.	.
2.500	0.0061	0.04	Q	.	.	.	.
2.583	0.0065	0.04	Q	.	.	.	.
2.667	0.0068	0.04	QV	.	.	.	.
2.750	0.0071	0.04	QV	.	.	.	.
2.833	0.0074	0.05	QV	.	.	.	.
2.917	0.0077	0.05	QV	.	.	.	.
3.000	0.0081	0.05	QV	.	.	.	.
3.083	0.0084	0.05	QV	.	.	.	.
3.167	0.0088	0.05	QV	.	.	.	.
3.250	0.0091	0.05	QV	.	.	.	.
3.333	0.0094	0.05	QV	.	.	.	.
3.417	0.0098	0.05	QV	.	.	.	.

3.500	0.0101	0.05	QV	.	.	.	.
3.583	0.0105	0.05	QV	.	.	.	.
3.667	0.0108	0.05	QV	.	.	.	.
3.750	0.0112	0.05	QV	.	.	.	.
3.833	0.0116	0.05	QV	.	.	.	.
3.917	0.0119	0.05	QV	.	.	.	.
4.000	0.0123	0.05	QV	.	.	.	.
4.083	0.0127	0.06	QV	.	.	.	.
4.167	0.0131	0.06	QV	.	.	.	.
4.250	0.0135	0.06	Q V	.	.	.	.
4.333	0.0140	0.06	Q V	.	.	.	.
4.417	0.0144	0.06	Q V	.	.	.	.
4.500	0.0148	0.06	Q V	.	.	.	.
4.583	0.0153	0.07	Q V	.	.	.	.
4.667	0.0158	0.07	Q V	.	.	.	.
4.750	0.0163	0.07	Q V	.	.	.	.
4.833	0.0168	0.07	Q V	.	.	.	.
4.917	0.0173	0.07	Q V	.	.	.	.
5.000	0.0178	0.07	Q V	.	.	.	.
5.083	0.0183	0.07	Q V	.	.	.	.
5.167	0.0188	0.07	Q V	.	.	.	.
5.250	0.0193	0.07	Q V	.	.	.	.
5.333	0.0197	0.07	Q V	.	.	.	.
5.417	0.0202	0.07	Q V	.	.	.	.
5.500	0.0207	0.07	Q V	.	.	.	.
5.583	0.0212	0.07	Q V	.	.	.	.
5.667	0.0217	0.07	Q V	.	.	.	.
5.750	0.0222	0.07	Q V	.	.	.	.
5.833	0.0227	0.08	Q V	.	.	.	.
5.917	0.0233	0.08	Q V	.	.	.	.
6.000	0.0238	0.08	Q V	.	.	.	.
6.083	0.0244	0.08	Q V	.	.	.	.
6.167	0.0250	0.08	Q V	.	.	.	.
6.250	0.0256	0.08	Q V	.	.	.	.
6.333	0.0262	0.09	Q V	.	.	.	.
6.417	0.0268	0.09	Q V	.	.	.	.
6.500	0.0274	0.09	Q V	.	.	.	.
6.583	0.0281	0.09	Q V	.	.	.	.
6.667	0.0287	0.09	Q V	.	.	.	.
6.750	0.0294	0.09	Q V	.	.	.	.
6.833	0.0300	0.10	Q V	.	.	.	.
6.917	0.0307	0.10	Q V	.	.	.	.
7.000	0.0314	0.10	Q V	.	.	.	.
7.083	0.0321	0.10	Q V	.	.	.	.
7.167	0.0328	0.10	Q V	.	.	.	.
7.250	0.0335	0.10	Q V	.	.	.	.
7.333	0.0342	0.10	Q V	.	.	.	.
7.417	0.0349	0.10	Q V	.	.	.	.

7.500	0.0357	0.10	Q	V	.	.	.	.
7.583	0.0364	0.11	Q	V	.	.	.	.
7.667	0.0372	0.11	Q	V	.	.	.	.
7.750	0.0380	0.11	Q	V	.	.	.	.
7.833	0.0388	0.12	Q	V	.	.	.	.
7.917	0.0397	0.12	Q	V	.	.	.	.
8.000	0.0405	0.12	Q	V	.	.	.	.
8.083	0.0415	0.14	Q	V	.	.	.	.
8.167	0.0424	0.14	Q	V	.	.	.	.
8.250	0.0434	0.14	Q	V	.	.	.	.
8.333	0.0444	0.15	Q	V	.	.	.	.
8.417	0.0454	0.15	Q	V	.	.	.	.
8.500	0.0464	0.15	Q	V	.	.	.	.
8.583	0.0475	0.15	Q	V	.	.	.	.
8.667	0.0485	0.15	Q	V	.	.	.	.
8.750	0.0496	0.15	Q	V	.	.	.	.
8.833	0.0507	0.16	Q	V	.	.	.	.
8.917	0.0518	0.16	Q	V	.	.	.	.
9.000	0.0530	0.16	Q	V	.	.	.	.
9.083	0.0542	0.18	Q	V	.	.	.	.
9.167	0.0555	0.18	Q	V	.	.	.	.
9.250	0.0568	0.18	Q	V	.	.	.	.
9.333	0.0582	0.21	Q	V	.	.	.	.
9.417	0.0597	0.21	Q	V	.	.	.	.
9.500	0.0611	0.21	Q	V	.	.	.	.
9.583	0.0627	0.24	Q	V	.	.	.	.
9.667	0.0644	0.24	Q	V	.	.	.	.
9.750	0.0660	0.24	Q	V	.	.	.	.
9.833	0.0678	0.26	.Q	V	.	.	.	.
9.917	0.0696	0.26	.Q	V	.	.	.	.
10.000	0.0714	0.26	.Q	V	.	.	.	.
10.083	0.0729	0.23	Q	V	.	.	.	.
10.167	0.0745	0.23	Q	V	.	.	.	.
10.250	0.0761	0.23	Q	V	.	.	.	.
10.333	0.0773	0.17	Q	.V	.	.	.	.
10.417	0.0785	0.17	Q	.V	.	.	.	.
10.500	0.0796	0.17	Q	.V	.	.	.	.
10.583	0.0810	0.20	Q	. V	.	.	.	.
10.667	0.0824	0.20	Q	. V	.	.	.	.
10.750	0.0837	0.20	Q	. V	.	.	.	.
10.833	0.0854	0.24	Q	. V	.	.	.	.
10.917	0.0870	0.24	Q	. V	.	.	.	.
11.000	0.0887	0.24	Q	. V	.	.	.	.
11.083	0.0903	0.24	Q	. V	.	.	.	.
11.167	0.0920	0.24	Q	. V	.	.	.	.
11.250	0.0937	0.24	Q	. V	.	.	.	.
11.333	0.0954	0.24	Q	. V	.	.	.	.
11.417	0.0970	0.24	Q	. V	.	.	.	.

11.500	0.0987	0.24	Q	. V . . .

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TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
11.583	0.1003	0.23	Q	. V	.	.	.
11.667	0.1018	0.23	Q	. V	.	.	.
11.750	0.1034	0.23	Q	. V	.	.	.
11.833	0.1049	0.22	Q	. V	.	.	.
11.917	0.1065	0.22	Q	. V	.	.	.
12.000	0.1080	0.22	Q	. V	.	.	.
12.083	0.1099	0.28	.Q	. V	.	.	.
12.167	0.1118	0.28	.Q	. V	.	.	.
12.250	0.1138	0.28	.Q	. V	.	.	.
12.333	0.1162	0.36	.Q	. V	.	.	.
12.417	0.1187	0.36	.Q	. V	.	.	.
12.500	0.1212	0.36	.Q	. V	.	.	.
12.583	0.1239	0.40	.Q	. V	.	.	.
12.667	0.1267	0.40	.Q	. V	.	.	.
12.750	0.1294	0.40	.Q	. V	.	.	.
12.833	0.1324	0.44	.Q	. V	.	.	.
12.917	0.1355	0.44	.Q	. V	.	.	.
13.000	0.1385	0.44	.Q	. V	.	.	.
13.083	0.1419	0.49	.Q	. V	.	.	.
13.167	0.1453	0.49	.Q	. V	.	.	.
13.250	0.1487	0.49	.Q	. V	.	.	.
13.333	0.1525	0.55	. Q	. V	.	.	.
13.417	0.1563	0.55	. Q	. V	.	.	.
13.500	0.1601	0.55	. Q	. V	.	.	.
13.583	0.1634	0.48	.Q	. V	.	.	.
13.667	0.1667	0.48	.Q	. V	.	.	.
13.750	0.1700	0.48	.Q	. V	.	.	.
13.833	0.1727	0.39	.Q	. V	.	.	.
13.917	0.1754	0.39	.Q	. V	.	.	.
14.000	0.1781	0.39	.Q	. V	.	.	.
14.083	0.1809	0.40	.Q	. V	.	.	.
14.167	0.1836	0.40	.Q	. V	.	.	.
14.250	0.1864	0.40	.Q	. V	.	.	.
14.333	0.1893	0.43	.Q	. V	.	.	.
14.417	0.1922	0.43	.Q	. V	.	.	.
14.500	0.1952	0.43	.Q	. V	.	.	.
14.583	0.1981	0.42	.Q	. V	.	.	.
14.667	0.2010	0.42	.Q	. V	.	.	.
14.750	0.2039	0.42	.Q	. V	.	.	.
14.833	0.2068	0.42	.Q	. V	.	.	.
14.917	0.2097	0.42	.Q	. V	.	.	.
15.000	0.2126	0.42	.Q	. V	.	.	.
15.083	0.2154	0.41	.Q	. V	.	.	.

15.167	0.2182	0.41	.Q	.	.	. V	.
15.250	0.2210	0.41	.Q	.	.	. V	.
15.333	0.2237	0.39	.Q	.	.	. V	.
15.417	0.2264	0.39	.Q	.	.	. V	.
15.500	0.2290	0.39	.Q	.	.	. V	.
15.583	0.2314	0.35	.Q	.	.	. V	.
15.667	0.2339	0.35	.Q	.	.	. V	.
15.750	0.2363	0.35	.Q	.	.	. V	.
15.833	0.2384	0.31	.Q	.	.	. V	.
15.917	0.2406	0.31	.Q	.	.	. V	.
16.000	0.2427	0.31	.Q	.	.	. V	.
16.083	0.2442	0.21	Q	.	.	. V	.
16.167	0.2456	0.21	Q	.	.	. V	.
16.250	0.2471	0.21	Q	.	.	. V	.
16.333	0.2477	0.09	Q	.	.	. V	.
16.417	0.2483	0.09	Q	.	.	. V	.
16.500	0.2489	0.09	Q	.	.	. V	.
16.583	0.2493	0.06	Q	.	.	. V	.
16.667	0.2497	0.06	Q	.	.	. V	.
16.750	0.2501	0.06	Q	.	.	. V	.
16.833	0.2503	0.04	Q	.	.	. V	.
16.917	0.2506	0.04	Q	.	.	. V	.
17.000	0.2509	0.04	Q	.	.	. V	.
17.083	0.2512	0.04	Q	.	.	. V	.
17.167	0.2514	0.04	Q	.	.	. V	.
17.250	0.2517	0.04	Q	.	.	. V	.
17.333	0.2521	0.05	Q	.	.	. V	.
17.417	0.2524	0.05	Q	.	.	. V	.
17.500	0.2527	0.05	Q	.	.	. V	.
17.583	0.2531	0.05	Q	.	.	. V	.
17.667	0.2534	0.05	Q	.	.	. V	.
17.750	0.2538	0.05	Q	.	.	. V	.
17.833	0.2541	0.05	Q	.	.	. V	.
17.917	0.2544	0.05	Q	.	.	. V	.
18.000	0.2547	0.05	Q	.	.	. V	.
18.083	0.2550	0.04	Q	.	.	. V	.
18.167	0.2553	0.04	Q	.	.	. V	.
18.250	0.2556	0.04	Q	.	.	. V	.
18.333	0.2559	0.04	Q	.	.	. V	.
18.417	0.2562	0.04	Q	.	.	. V	.
18.500	0.2564	0.04	Q	.	.	. V	.
18.583	0.2567	0.04	Q	.	.	. V	.
18.667	0.2570	0.04	Q	.	.	. V	.
18.750	0.2572	0.04	Q	.	.	. V	.
18.833	0.2574	0.03	Q	.	.	. V	.
18.917	0.2576	0.03	Q	.	.	. V	.
19.000	0.2578	0.03	Q	.	.	. V	.
19.083	0.2580	0.03	Q	.	.	. V	.

19.167	0.2582	0.03	Q	.	.	.	V .
19.250	0.2584	0.03	Q	.	.	.	V .
19.333	0.2586	0.03	Q	.	.	.	V .
19.417	0.2588	0.03	Q	.	.	.	V .
19.500	0.2590	0.03	Q	.	.	.	V .
19.583	0.2593	0.03	Q	.	.	.	V .
19.667	0.2595	0.03	Q	.	.	.	V .
19.750	0.2598	0.03	Q	.	.	.	V .
19.833	0.2600	0.03	Q	.	.	.	V .
19.917	0.2601	0.03	Q	.	.	.	V .
20.000	0.2603	0.03	Q	.	.	.	V .
20.083	0.2605	0.03	Q	.	.	.	V .
20.167	0.2607	0.03	Q	.	.	.	V .
20.250	0.2609	0.03	Q	.	.	.	V .
20.333	0.2611	0.03	Q	.	.	.	V .
20.417	0.2613	0.03	Q	.	.	.	V .
20.500	0.2615	0.03	Q	.	.	.	V .
20.583	0.2617	0.03	Q	.	.	.	V .
20.667	0.2619	0.03	Q	.	.	.	V .
20.750	0.2621	0.03	Q	.	.	.	V.
20.833	0.2623	0.03	Q	.	.	.	V.
20.917	0.2625	0.03	Q	.	.	.	V.
21.000	0.2627	0.03	Q	.	.	.	V.
21.083	0.2628	0.03	Q	.	.	.	V.
21.167	0.2630	0.03	Q	.	.	.	V.
21.250	0.2632	0.03	Q	.	.	.	V.
21.333	0.2634	0.03	Q	.	.	.	V.
21.417	0.2635	0.03	Q	.	.	.	V.
21.500	0.2637	0.03	Q	.	.	.	V.
21.583	0.2639	0.03	Q	.	.	.	V.
21.667	0.2641	0.03	Q	.	.	.	V.
21.750	0.2642	0.03	Q	.	.	.	V.
21.833	0.2644	0.03	Q	.	.	.	V.
21.917	0.2646	0.03	Q	.	.	.	V.
22.000	0.2648	0.03	Q	.	.	.	V.
22.083	0.2649	0.03	Q	.	.	.	V.
22.167	0.2651	0.03	Q	.	.	.	V.
22.250	0.2653	0.03	Q	.	.	.	V.
22.333	0.2655	0.03	Q	.	.	.	V.
22.417	0.2656	0.03	Q	.	.	.	V.
22.500	0.2658	0.03	Q	.	.	.	V.
22.583	0.2660	0.02	Q	.	.	.	V.
22.667	0.2661	0.02	Q	.	.	.	V.
22.750	0.2663	0.02	Q	.	.	.	V.
22.833	0.2664	0.02	Q	.	.	.	V.
22.917	0.2665	0.02	Q	.	.	.	V.
23.000	0.2667	0.02	Q	.	.	.	V.
23.083	0.2668	0.02	Q	.	.	.	V.

23.166	0.2670	0.02	Q	.	.	.	V.
23.250	0.2671	0.02	Q	.	.	.	V.
23.333	0.2673	0.02	Q	.	.	.	V.
23.416	0.2674	0.02	Q	.	.	.	V.
23.500	0.2675	0.02	Q	.	.	.	V.
23.583	0.2677	0.02	Q	.	.	.	V.
23.666	0.2678	0.02	Q	.	.	.	V.
23.750	0.2680	0.02	Q	.	.	.	V.
23.833	0.2681	0.02	Q	.	.	.	V.
23.916	0.2682	0.02	Q	.	.	.	V.
24.000	0.2684	0.02	Q	.	.	.	V.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
24.083	0.2685	0.01	Q	.	.	.	V.
24.166	0.2685	0.01	Q	.	.	.	V.
24.250	0.2686	0.01	Q	.	.	.	V.
24.333	0.2687	0.00	Q	.	.	.	V.
24.416	0.2687	0.00	Q	.	.	.	V.
24.500	0.2687	0.00	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1470.0
10%	765.0
20%	525.0
30%	435.0
40%	360.0
50%	240.0
60%	210.0
70%	180.0
80%	45.0
90%	30.0

****
FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 1

>>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
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(UNIT-HYDROGRAPH ADDED TO STREAM #1)

WATERSHED AREA = 3.230 ACRES
BASEFLOW = 0.000 CFS/SQUARE-MILE
Warning: Watershed Area is less than 10 acres
*USER ENTERED "LAG" TIME = 0.105 HOURS
CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
VALLEY S-GRAPH SELECTED
UNIFORM MEAN SOIL-LOSS(INCH/HOUR) = 0.050
LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
MINIMUM SOIL-LOSS RATE(INCH/HOUR) = 0.010
USER-ENTERED RAINFALL = 1.70 INCHES
RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 1.0000

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 238.777

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	49.304	6.420
2	90.106	5.313
3	97.423	0.953
4	99.347	0.251
5	99.739	0.051
6	99.935	0.026
7	100.000	0.009

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0034	0.0017	0.0017
2	0.0051	0.0025	0.0025
3	0.0051	0.0025	0.0025

4	0.0068	0.0034	0.0034
5	0.0051	0.0025	0.0025
6	0.0051	0.0025	0.0025
7	0.0051	0.0025	0.0025
8	0.0068	0.0034	0.0034
9	0.0068	0.0034	0.0034
10	0.0068	0.0034	0.0034
11	0.0085	0.0042	0.0042
12	0.0085	0.0042	0.0042
13	0.0085	0.0042	0.0042
14	0.0085	0.0042	0.0042
15	0.0085	0.0042	0.0042
16	0.0102	0.0051	0.0051
17	0.0102	0.0051	0.0051
18	0.0119	0.0059	0.0059
19	0.0119	0.0059	0.0059
20	0.0136	0.0068	0.0068
21	0.0102	0.0051	0.0051
22	0.0119	0.0059	0.0059
23	0.0136	0.0068	0.0068
24	0.0136	0.0068	0.0068
25	0.0153	0.0076	0.0076
26	0.0153	0.0076	0.0076
27	0.0170	0.0085	0.0085
28	0.0170	0.0085	0.0085
29	0.0170	0.0085	0.0085
30	0.0187	0.0093	0.0093
31	0.0204	0.0102	0.0102
32	0.0221	0.0110	0.0110
33	0.0255	0.0127	0.0127
34	0.0255	0.0127	0.0127
35	0.0272	0.0136	0.0136
36	0.0289	0.0144	0.0144
37	0.0323	0.0147	0.0176
38	0.0340	0.0143	0.0197
39	0.0357	0.0140	0.0217
40	0.0374	0.0137	0.0237
41	0.0255	0.0127	0.0127
42	0.0255	0.0127	0.0127
43	0.0340	0.0128	0.0212
44	0.0340	0.0125	0.0215
45	0.0323	0.0122	0.0201
46	0.0323	0.0119	0.0204
47	0.0289	0.0116	0.0173
48	0.0306	0.0114	0.0192
49	0.0425	0.0111	0.0314
50	0.0442	0.0108	0.0334
51	0.0476	0.0105	0.0371

52	0.0493	0.0103	0.0390
53	0.0578	0.0100	0.0478
54	0.0578	0.0097	0.0481
55	0.0391	0.0095	0.0296
56	0.0391	0.0092	0.0299
57	0.0459	0.0089	0.0370
58	0.0442	0.0087	0.0355
59	0.0442	0.0084	0.0358
60	0.0425	0.0082	0.0343
61	0.0408	0.0080	0.0328
62	0.0391	0.0077	0.0314
63	0.0323	0.0075	0.0248
64	0.0323	0.0073	0.0250
65	0.0068	0.0034	0.0034
66	0.0068	0.0034	0.0034
67	0.0051	0.0025	0.0025
68	0.0051	0.0025	0.0025
69	0.0085	0.0042	0.0042
70	0.0085	0.0042	0.0042
71	0.0085	0.0042	0.0042
72	0.0068	0.0034	0.0034
73	0.0068	0.0034	0.0034
74	0.0068	0.0034	0.0034
75	0.0051	0.0025	0.0025
76	0.0034	0.0017	0.0017
77	0.0051	0.0025	0.0025
78	0.0068	0.0034	0.0034
79	0.0051	0.0025	0.0025
80	0.0034	0.0017	0.0017
81	0.0051	0.0025	0.0025
82	0.0051	0.0025	0.0025
83	0.0051	0.0025	0.0025
84	0.0034	0.0017	0.0017
85	0.0051	0.0025	0.0025
86	0.0034	0.0017	0.0017
87	0.0051	0.0025	0.0025
88	0.0034	0.0017	0.0017
89	0.0051	0.0025	0.0025
90	0.0034	0.0017	0.0017
91	0.0034	0.0017	0.0017
92	0.0034	0.0017	0.0017
93	0.0034	0.0017	0.0017
94	0.0034	0.0017	0.0017
95	0.0034	0.0017	0.0017
96	0.0034	0.0017	0.0017

TOTAL STORM RAINFALL(INCHES) = 1.70
TOTAL SOIL-LOSS(INCHES) = 0.61

TOTAL EFFECTIVE RAINFALL(INCHES) = 1.09

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.1642
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.2933

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2 4 - 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

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0002	0.01	Q	.	.	.	.
0.250	0.0002	0.01	Q	.	.	.	.
0.333	0.0004	0.03	Q	.	.	.	.
0.417	0.0006	0.03	Q	.	.	.	.
0.500	0.0008	0.03	Q	.	.	.	.
0.583	0.0010	0.03	Q	.	.	.	.
0.667	0.0012	0.03	Q	.	.	.	.
0.750	0.0014	0.03	Q	.	.	.	.
0.833	0.0017	0.04	Q	.	.	.	.
0.917	0.0019	0.04	Q	.	.	.	.
1.000	0.0022	0.04	Q	.	.	.	.
1.083	0.0025	0.04	Q	.	.	.	.
1.167	0.0027	0.04	Q	.	.	.	.
1.250	0.0030	0.04	Q	.	.	.	.
1.333	0.0032	0.03	Q	.	.	.	.
1.417	0.0034	0.03	Q	.	.	.	.
1.500	0.0037	0.03	Q	.	.	.	.
1.583	0.0039	0.03	Q	.	.	.	.
1.667	0.0041	0.03	Q	.	.	.	.
1.750	0.0044	0.03	Q	.	.	.	.
1.833	0.0046	0.04	Q	.	.	.	.
1.917	0.0049	0.04	Q	.	.	.	.
2.000	0.0052	0.04	Q	.	.	.	.
2.083	0.0055	0.04	Q	.	.	.	.
2.167	0.0058	0.04	Q	.	.	.	.
2.250	0.0061	0.04	Q	.	.	.	.
2.333	0.0064	0.04	Q	.	.	.	.
2.417	0.0067	0.04	Q	.	.	.	.
2.500	0.0070	0.04	Q	.	.	.	.

2.583	0.0073	0.05	Q	.	.	.	.
2.667	0.0076	0.05	QV	.	.	.	.
2.750	0.0080	0.05	QV	.	.	.	.
2.833	0.0084	0.05	QV	.	.	.	.
2.917	0.0087	0.05	QV	.	.	.	.
3.000	0.0091	0.05	QV	.	.	.	.
3.083	0.0095	0.06	QV	.	.	.	.
3.167	0.0099	0.06	QV	.	.	.	.
3.250	0.0102	0.06	QV	.	.	.	.
3.333	0.0106	0.06	QV	.	.	.	.
3.417	0.0110	0.06	QV	.	.	.	.
3.500	0.0114	0.06	QV	.	.	.	.
3.583	0.0118	0.06	QV	.	.	.	.
3.667	0.0121	0.06	QV	.	.	.	.
3.750	0.0125	0.06	QV	.	.	.	.
3.833	0.0129	0.06	QV	.	.	.	.
3.917	0.0134	0.06	QV	.	.	.	.
4.000	0.0138	0.06	QV	.	.	.	.
4.083	0.0142	0.07	QV	.	.	.	.
4.167	0.0147	0.07	Q V	.	.	.	.
4.250	0.0151	0.07	Q V	.	.	.	.
4.333	0.0156	0.07	Q V	.	.	.	.
4.417	0.0161	0.07	Q V	.	.	.	.
4.500	0.0166	0.07	Q V	.	.	.	.
4.583	0.0171	0.08	Q V	.	.	.	.
4.667	0.0177	0.08	Q V	.	.	.	.
4.750	0.0182	0.08	Q V	.	.	.	.
4.833	0.0188	0.08	Q V	.	.	.	.
4.917	0.0193	0.08	Q V	.	.	.	.
5.000	0.0199	0.08	Q V	.	.	.	.
5.083	0.0204	0.08	Q V	.	.	.	.
5.167	0.0210	0.08	Q V	.	.	.	.
5.250	0.0215	0.08	Q V	.	.	.	.
5.333	0.0220	0.07	Q V	.	.	.	.
5.417	0.0225	0.07	Q V	.	.	.	.
5.500	0.0230	0.07	Q V	.	.	.	.
5.583	0.0236	0.08	Q V	.	.	.	.
5.667	0.0241	0.08	Q V	.	.	.	.
5.750	0.0247	0.08	Q V	.	.	.	.
5.833	0.0253	0.09	Q V	.	.	.	.
5.917	0.0259	0.09	Q V	.	.	.	.
6.000	0.0265	0.09	Q V	.	.	.	.
6.083	0.0272	0.09	Q V	.	.	.	.
6.167	0.0278	0.09	Q V	.	.	.	.
6.250	0.0284	0.09	Q V	.	.	.	.
6.333	0.0291	0.10	Q V	.	.	.	.
6.417	0.0298	0.10	Q V	.	.	.	.
6.500	0.0305	0.10	Q V	.	.	.	.

6.583	0.0312	0.10	Q	V	.	.	.	.
6.667	0.0319	0.10	Q	V	.	.	.	.
6.750	0.0326	0.10	Q	V	.	.	.	.
6.833	0.0334	0.11	Q	V	.	.	.	.
6.917	0.0341	0.11	Q	V	.	.	.	.
7.000	0.0349	0.11	Q	V	.	.	.	.
7.083	0.0357	0.11	Q	V	.	.	.	.
7.167	0.0364	0.11	Q	V	.	.	.	.
7.250	0.0372	0.11	Q	V	.	.	.	.
7.333	0.0380	0.12	Q	V	.	.	.	.
7.417	0.0388	0.12	Q	V	.	.	.	.
7.500	0.0396	0.12	Q	V	.	.	.	.
7.583	0.0404	0.13	Q	V	.	.	.	.
7.667	0.0413	0.13	Q	V	.	.	.	.
7.750	0.0422	0.13	Q	V	.	.	.	.
7.833	0.0431	0.14	Q	V	.	.	.	.
7.917	0.0441	0.14	Q	V	.	.	.	.
8.000	0.0450	0.14	Q	V	.	.	.	.
8.083	0.0461	0.15	Q	V	.	.	.	.
8.167	0.0471	0.15	Q	V	.	.	.	.
8.250	0.0482	0.15	Q	V	.	.	.	.
8.333	0.0493	0.16	Q	V	.	.	.	.
8.417	0.0504	0.16	Q	V	.	.	.	.
8.500	0.0516	0.16	Q	V	.	.	.	.
8.583	0.0527	0.17	Q	V	.	.	.	.
8.667	0.0539	0.17	Q	V	.	.	.	.
8.750	0.0551	0.17	Q	V	.	.	.	.
8.833	0.0563	0.18	Q	V	.	.	.	.
8.917	0.0576	0.18	Q	V	.	.	.	.
9.000	0.0588	0.18	Q	V	.	.	.	.
9.083	0.0603	0.21	Q	V	.	.	.	.
9.167	0.0617	0.21	Q	V	.	.	.	.
9.250	0.0631	0.21	Q	V	.	.	.	.
9.333	0.0648	0.24	Q	V	.	.	.	.
9.417	0.0664	0.24	Q	V	.	.	.	.
9.500	0.0680	0.24	Q	V	.	.	.	.
9.583	0.0699	0.27	.Q	V	.	.	.	.
9.667	0.0717	0.27	.Q	V	.	.	.	.
9.750	0.0735	0.27	.Q	V	.	.	.	.
9.833	0.0755	0.29	.Q	V	.	.	.	.
9.917	0.0775	0.29	.Q	V	.	.	.	.
10.000	0.0795	0.29	.Q	V	.	.	.	.
10.083	0.0811	0.23	Q	.V	.	.	.	.
10.167	0.0828	0.23	Q	.V	.	.	.	.
10.250	0.0844	0.23	Q	.V	.	.	.	.
10.333	0.0856	0.18	Q	.V	.	.	.	.
10.417	0.0868	0.18	Q	.V	.	.	.	.
10.500	0.0881	0.18	Q	. V	.	.	.	.

10.583	0.0896	0.22	Q	. V . . .
10.667	0.0912	0.22	Q	. V . . .
10.750	0.0927	0.22	Q	. V . . .
10.833	0.0945	0.27	.Q	. V . . .
10.917	0.0964	0.27	.Q	. V . . .
11.000	0.0982	0.27	.Q	. V . . .
11.083	0.1001	0.27	.Q	. V . . .
11.167	0.1019	0.27	.Q	. V . . .
11.250	0.1038	0.27	.Q	. V . . .
11.333	0.1056	0.26	.Q	. V . . .
11.417	0.1074	0.26	.Q	. V . . .
11.500	0.1092	0.26	.Q	. V . . .

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TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
11.583	0.1109	0.25	Q	. V .	.	.	
11.667	0.1126	0.25	Q	. V .	.	.	
11.750	0.1143	0.25	Q	. V .	.	.	
11.833	0.1160	0.24	Q	. V .	.	.	
11.917	0.1176	0.24	Q	. V .	.	.	
12.000	0.1193	0.24	Q	. V .	.	.	
12.083	0.1215	0.33	.Q	. V .	.	.	
12.167	0.1238	0.33	.Q	. V .	.	.	
12.250	0.1260	0.33	.Q	. V .	.	.	
12.333	0.1288	0.41	.Q	. V .	.	.	
12.417	0.1316	0.41	.Q	. V .	.	.	
12.500	0.1344	0.41	.Q	. V .	.	.	
12.583	0.1375	0.45	.Q	. V .	.	.	
12.667	0.1406	0.45	.Q	. V.	.	.	
12.750	0.1438	0.45	.Q	. V.	.	.	
12.833	0.1471	0.49	.Q	. V	.	.	
12.917	0.1505	0.49	.Q	. V	.	.	
13.000	0.1539	0.49	.Q	. V	.	.	
13.083	0.1577	0.56	. Q	. .V	.	.	
13.167	0.1616	0.56	. Q	. . V	.	.	
13.250	0.1654	0.56	. Q	. . V	.	.	
13.333	0.1697	0.61	. Q	. . V	.	.	
13.417	0.1739	0.61	. Q	. . V	.	.	
13.500	0.1781	0.61	. Q	. . V	.	.	
13.583	0.1816	0.50	. Q	. . V	.	.	
13.667	0.1850	0.50	. Q	. . V	.	.	
13.750	0.1885	0.50	. Q	. . V	.	.	
13.833	0.1913	0.41	.Q	. . V	.	.	
13.917	0.1942	0.41	.Q	. . V	.	.	
14.000	0.1970	0.41	.Q	. . V	.	.	
14.083	0.2000	0.44	.Q	. . V	.	.	
14.167	0.2030	0.44	.Q	. . V	.	.	

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14.250      0.2061      0.44  .Q        .         .       V .          .
14.333      0.2093      0.46  .Q        .         .       V .          .
14.417      0.2125      0.46  .Q        .         .       V .          .
14.500      0.2157      0.46  .Q        .         .        V.          .
14.583      0.2189      0.46  .Q        .         .        V.          .
14.667      0.2221      0.46  .Q        .         .         V          .
14.750      0.2253      0.46  .Q        .         .         V          .
14.833      0.2284      0.46  .Q        .         .         .V         .
14.917      0.2315      0.46  .Q        .         .         .V         .
15.000      0.2347      0.46  .Q        .         .         . V        .
15.083      0.2377      0.44  .Q        .         .         . V        .
15.167      0.2407      0.44  .Q        .         .         . V        .
15.250      0.2437      0.44  .Q        .         .         .  V       .
15.333      0.2466      0.42  .Q        .         .         .  V       .
15.417      0.2495      0.42  .Q        .         .         .   V      .
15.500      0.2524      0.42  .Q        .         .         .   V      .
15.583      0.2550      0.37  .Q        .         .         .   V      .
15.667      0.2575      0.37  .Q        .         .         .    V     .
15.750      0.2600      0.37  .Q        .         .         .    V     .
15.833      0.2623      0.33  .Q        .         .         .    V     .
15.917      0.2646      0.33  .Q        .         .         .     V    .
16.000      0.2669      0.33  .Q        .         .         .     V    .
16.083      0.2682      0.19  Q         .         .         .     V    .
16.167      0.2695      0.19  Q         .         .         .     V    .
16.250      0.2709      0.19  Q         .         .         .     V    .
16.333      0.2714      0.07  Q         .         .         .      V   .
16.417      0.2719      0.07  Q         .         .         .      V   .
16.500      0.2724      0.07  Q         .         .         .      V   .
16.583      0.2727      0.05  Q         .         .         .      V   .
16.667      0.2730      0.05  Q         .         .         .      V   .
16.750      0.2733      0.05  Q         .         .         .      V   .
16.833      0.2736      0.04  Q         .         .         .      V   .
16.917      0.2738      0.04  Q         .         .         .      V   .
17.000      0.2741      0.04  Q         .         .         .      V   .
17.083      0.2744      0.05  Q         .         .         .      V   .
17.167      0.2747      0.05  Q         .         .         .      V   .
17.250      0.2750      0.05  Q         .         .         .      V   .
17.333      0.2754      0.05  Q         .         .         .      V   .
17.417      0.2757      0.05  Q         .         .         .      V   .
17.500      0.2761      0.05  Q         .         .         .      V   .
17.583      0.2765      0.05  Q         .         .         .      V   .
17.667      0.2768      0.05  Q         .         .         .      V   .
17.750      0.2772      0.05  Q         .         .         .      V   .
17.833      0.2776      0.05  Q         .         .         .      V   .
17.917      0.2779      0.05  Q         .         .         .      V   .
18.000      0.2783      0.05  Q         .         .         .      V   .
18.083      0.2786      0.05  Q         .         .         .      V   .
18.167      0.2789      0.05  Q         .         .         .       V  .
```

18.250	0.2792	0.05	Q	.	.	.	V .
18.333	0.2795	0.04	Q	.	.	.	V .
18.417	0.2798	0.04	Q	.	.	.	V .
18.500	0.2801	0.04	Q	.	.	.	V .
18.583	0.2804	0.04	Q	.	.	.	V .
18.667	0.2806	0.04	Q	.	.	.	V .
18.750	0.2809	0.04	Q	.	.	.	V .
18.833	0.2811	0.03	Q	.	.	.	V .
18.917	0.2813	0.03	Q	.	.	.	V .
19.000	0.2815	0.03	Q	.	.	.	V .
19.083	0.2817	0.03	Q	.	.	.	V .
19.167	0.2819	0.03	Q	.	.	.	V .
19.250	0.2821	0.03	Q	.	.	.	V .
19.333	0.2824	0.04	Q	.	.	.	V .
19.417	0.2826	0.04	Q	.	.	.	V .
19.500	0.2829	0.04	Q	.	.	.	V .
19.583	0.2831	0.04	Q	.	.	.	V .
19.667	0.2834	0.04	Q	.	.	.	V .
19.750	0.2837	0.04	Q	.	.	.	V .
19.833	0.2839	0.03	Q	.	.	.	V .
19.917	0.2841	0.03	Q	.	.	.	V .
20.000	0.2843	0.03	Q	.	.	.	V .
20.083	0.2845	0.03	Q	.	.	.	V .
20.167	0.2847	0.03	Q	.	.	.	V .
20.250	0.2849	0.03	Q	.	.	.	V .
20.333	0.2851	0.03	Q	.	.	.	V .
20.417	0.2853	0.03	Q	.	.	.	V .
20.500	0.2855	0.03	Q	.	.	.	V .
20.583	0.2858	0.03	Q	.	.	.	V .
20.667	0.2860	0.03	Q	.	.	.	V.
20.750	0.2862	0.03	Q	.	.	.	V.
20.833	0.2864	0.03	Q	.	.	.	V.
20.917	0.2866	0.03	Q	.	.	.	V.
21.000	0.2868	0.03	Q	.	.	.	V.
21.083	0.2870	0.03	Q	.	.	.	V.
21.167	0.2872	0.03	Q	.	.	.	V.
21.250	0.2874	0.03	Q	.	.	.	V.
21.333	0.2876	0.03	Q	.	.	.	V.
21.417	0.2877	0.03	Q	.	.	.	V.
21.500	0.2879	0.03	Q	.	.	.	V.
21.583	0.2881	0.03	Q	.	.	.	V.
21.667	0.2883	0.03	Q	.	.	.	V.
21.750	0.2885	0.03	Q	.	.	.	V.
21.833	0.2887	0.03	Q	.	.	.	V.
21.917	0.2889	0.03	Q	.	.	.	V.
22.000	0.2891	0.03	Q	.	.	.	V.
22.083	0.2893	0.03	Q	.	.	.	V.
22.167	0.2895	0.03	Q	.	.	.	V.

22.250	0.2897	0.03	Q	.	.	.	V.
22.333	0.2898	0.03	Q	.	.	.	V.
22.417	0.2900	0.03	Q	.	.	.	V.
22.500	0.2902	0.03	Q	.	.	.	V.
22.583	0.2904	0.02	Q	.	.	.	V.
22.667	0.2905	0.02	Q	.	.	.	V.
22.750	0.2907	0.02	Q	.	.	.	V.
22.833	0.2908	0.02	Q	.	.	.	V.
22.917	0.2910	0.02	Q	.	.	.	V.
23.000	0.2912	0.02	Q	.	.	.	V.
23.083	0.2913	0.02	Q	.	.	.	V.
23.166	0.2915	0.02	Q	.	.	.	V.
23.250	0.2916	0.02	Q	.	.	.	V.
23.333	0.2918	0.02	Q	.	.	.	V.
23.416	0.2919	0.02	Q	.	.	.	V.
23.500	0.2921	0.02	Q	.	.	.	V.
23.583	0.2922	0.02	Q	.	.	.	V.
23.666	0.2924	0.02	Q	.	.	.	V.
23.750	0.2925	0.02	Q	.	.	.	V.
23.833	0.2927	0.02	Q	.	.	.	V.
23.916	0.2928	0.02	Q	.	.	.	V.
24.000	0.2930	0.02	Q	.	.	.	V.

↟

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
24.083	0.2931	0.01	Q	.	.	.	V.
24.166	0.2931	0.01	Q	.	.	.	V.
24.250	0.2932	0.01	Q	.	.	.	V.
24.333	0.2932	0.00	Q	.	.	.	V.
24.416	0.2932	0.00	Q	.	.	.	V.
24.500	0.2933	0.00	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1470.0
10%	750.0
20%	525.0
30%	420.0
40%	330.0
50%	240.0
60%	210.0
70%	150.0

80%	45.0
90%	30.0

==========

END OF FLOODSCx ROUTING ANALYSIS

APPENDIX F

Proposed Hydrology Calculations
2 Year Rainfall Frequency

```
**************************************************************************
  INTEGRATED RATIONAL METHOD/UH METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                     (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                     (Rational Tabling Version 18.0)
                  Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                *
* XO 5/16/19                                                             *
* KMV2P.RES                                                              *
 **************************************************************************

  FILE NAME: KMV2P.DAT
  TIME/DATE OF STUDY: 09:52 05/16/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.554
  SLOPE OF INTENSITY DURATION CURVE = 0.5004
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

  UNIT-HYDROGRAPH MODEL SELECTIONS/PARAMETERS:
    WATERSHED LAG = 0.80 * Tc
    VALLEY S-GRAPH USED.
    *24-HOUR (15-MINUTE PERIOD) DESIGN STORM USED.
    UNADJUSTED 24-HOUR RAINFALL DEPTH (INCHES) =   0.67
    USER-SPECIFIED DEPTH-AREA REDUCTION FACTOR:
      FOR 24-HOUR RAINFALL DEPTH =  1.00
    LOW LOSS RATE PERCENTAGE =  0.85
    MINIMUM LOSS RATE PERCENTAGE FOR 24-HOUR STORM =  0.05
  *PRECIPITATION ZONE NUMBER (PZN) = 2.0
  *ANTECEDENT MOISTURE CONDITION (AMC) =  0.00 ASSUMED FOR UNIT HYDROGRAPH METHOD*


****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   324.00
  UPSTREAM ELEVATION(FEET) =     54.30
  DOWNSTREAM ELEVATION(FEET) =     49.80
  ELEVATION DIFFERENCE(FEET) =      4.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.602
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  COMMERCIAL                 D        0.64     0.8805       75    7.20
  SUBAREA RUNOFF(CFS) =      0.90
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      0.90

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    45.70  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =    57.00   MANNING'S N =  0.015
```

```
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.31
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.90
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    7.31
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   412.00
  UPSTREAM ELEVATION(FEET) =     54.30
  DOWNSTREAM ELEVATION(FEET) =     46.80
  ELEVATION DIFFERENCE(FEET) =      7.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.569
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
       LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
  COMMERCIAL                 D        1.41     0.8801       75    7.51
  SUBAREA RUNOFF(CFS) =      1.95
  TOTAL AREA(ACRES) =      1.41   TOTAL RUNOFF(CFS) =      1.95

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.30  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =   423.00   MANNING'S N =  0.015
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.29
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.95
  PIPE TRAVEL TIME(MIN.) =   1.64    Tc(MIN.) =    9.15
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     835.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        1.95     9.15       1.421        1.41
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     835.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        0.90     7.31       1.589        0.64
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     381.00 FEET.

****************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
********************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       2.46       7.31        1.589
     2       2.75       9.15        1.421

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       2.75   Tc(MIN.) =    9.15
 TOTAL AREA(ACRES) =        2.0

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    39.70  DOWNSTREAM(FEET) =    36.50
 FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.015
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.19
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.75
 PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    9.35
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     920.00 FEET.
```

```
**************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
--------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   884.00
 UPSTREAM ELEVATION(FEET) =     50.90
 DOWNSTREAM ELEVATION(FEET) =     44.90
 ELEVATION DIFFERENCE(FEET) =      6.00
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.182
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Runoff      SCS   Tc
      LAND USE            GROUP   (ACRES)   Coefficient    CN  (MIN.)
 APARTMENTS                 D        3.64     0.8508       75   13.21
 SUBAREA RUNOFF(CFS) =      3.66
 TOTAL AREA(ACRES) =      3.64   TOTAL RUNOFF(CFS) =      3.66

**************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
--------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    42.86  DOWNSTREAM(FEET) =    41.60
 FLOW LENGTH(FEET) =   282.00   MANNING'S N =  0.015
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.48
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.66
 PIPE TRAVEL TIME(MIN.) =   1.35    Tc(MIN.) =   14.57
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1166.00 FEET.
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        3.6  TC(MIN.) =     14.57
 PEAK FLOW RATE(CFS)   =       3.66
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2011 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 18.0)
                 Release Date: 05/01/2011  License ID 1499

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* CAR PROS KIA SALES AND SERVICE FACILITY                                *
* XO 5/16/19                                                             *
* KMV2PU.RES                                                             *
 ************************************************************************

  FILE NAME: KMV2PU.DAT
  TIME/DATE OF STUDY: 11:24 05/16/2019
```

```
**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     13.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =       2.050 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
  Warning: Watershed Area is less than 10 acres
         *USER ENTERED "LAG" TIME =    0.125 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.050
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.010
```

KMV2PU.RES

USER-ENTERED RAINFALL = 1.70 INCHES
RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 1.0000

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 200.481

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	43.361	3.583
2	86.804	3.590
3	95.553	0.723
4	98.648	0.256
5	99.513	0.071
6	99.805	0.024
7	99.951	0.012
8	100.000	0.004

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0034	0.0017	0.0017
2	0.0051	0.0025	0.0025
3	0.0051	0.0025	0.0025
4	0.0068	0.0034	0.0034
5	0.0051	0.0025	0.0025
6	0.0051	0.0025	0.0025
7	0.0051	0.0025	0.0025
8	0.0068	0.0034	0.0034
9	0.0068	0.0034	0.0034
10	0.0068	0.0034	0.0034
11	0.0085	0.0042	0.0042
12	0.0085	0.0042	0.0042
13	0.0085	0.0042	0.0042
14	0.0085	0.0042	0.0042
15	0.0085	0.0042	0.0042

16	0.0102	0.0051	0.0051
17	0.0102	0.0051	0.0051
18	0.0119	0.0059	0.0059
19	0.0119	0.0059	0.0059
20	0.0136	0.0068	0.0068
21	0.0102	0.0051	0.0051
22	0.0119	0.0059	0.0059
23	0.0136	0.0068	0.0068
24	0.0136	0.0068	0.0068
25	0.0153	0.0076	0.0076
26	0.0153	0.0076	0.0076
27	0.0170	0.0085	0.0085
28	0.0170	0.0085	0.0085
29	0.0170	0.0085	0.0085
30	0.0187	0.0093	0.0093
31	0.0204	0.0102	0.0102
32	0.0221	0.0110	0.0110
33	0.0255	0.0127	0.0127
34	0.0255	0.0127	0.0127
35	0.0272	0.0136	0.0136
36	0.0289	0.0144	0.0144
37	0.0323	0.0147	0.0176
38	0.0340	0.0143	0.0197
39	0.0357	0.0140	0.0217
40	0.0374	0.0137	0.0237
41	0.0255	0.0127	0.0127
42	0.0255	0.0127	0.0127
43	0.0340	0.0128	0.0212
44	0.0340	0.0125	0.0215
45	0.0323	0.0122	0.0201
46	0.0323	0.0119	0.0204
47	0.0289	0.0116	0.0173
48	0.0306	0.0114	0.0192
49	0.0425	0.0111	0.0314
50	0.0442	0.0108	0.0334
51	0.0476	0.0105	0.0371
52	0.0493	0.0103	0.0390
53	0.0578	0.0100	0.0478
54	0.0578	0.0097	0.0481
55	0.0391	0.0095	0.0296
56	0.0391	0.0092	0.0299
57	0.0459	0.0089	0.0370
58	0.0442	0.0087	0.0355
59	0.0442	0.0084	0.0358
60	0.0425	0.0082	0.0343
61	0.0408	0.0080	0.0328
62	0.0391	0.0077	0.0314
63	0.0323	0.0075	0.0248

64	0.0323	0.0073	0.0250
65	0.0068	0.0034	0.0034
66	0.0068	0.0034	0.0034
67	0.0051	0.0025	0.0025
68	0.0051	0.0025	0.0025
69	0.0085	0.0042	0.0042
70	0.0085	0.0042	0.0042
71	0.0085	0.0042	0.0042
72	0.0068	0.0034	0.0034
73	0.0068	0.0034	0.0034
74	0.0068	0.0034	0.0034
75	0.0051	0.0025	0.0025
76	0.0034	0.0017	0.0017
77	0.0051	0.0025	0.0025
78	0.0068	0.0034	0.0034
79	0.0051	0.0025	0.0025
80	0.0034	0.0017	0.0017
81	0.0051	0.0025	0.0025
82	0.0051	0.0025	0.0025
83	0.0051	0.0025	0.0025
84	0.0034	0.0017	0.0017
85	0.0051	0.0025	0.0025
86	0.0034	0.0017	0.0017
87	0.0051	0.0025	0.0025
88	0.0034	0.0017	0.0017
89	0.0051	0.0025	0.0025
90	0.0034	0.0017	0.0017
91	0.0034	0.0017	0.0017
92	0.0034	0.0017	0.0017
93	0.0034	0.0017	0.0017
94	0.0034	0.0017	0.0017
95	0.0034	0.0017	0.0017
96	0.0034	0.0017	0.0017

TOTAL STORM RAINFALL(INCHES) = 1.70
TOTAL SOIL-LOSS(INCHES) = 0.61
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.09

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.1042
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.1861

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2 4 - 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 FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0000	0.01	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0001	0.01	Q	.	.	.	.
0.333	0.0002	0.02	Q	.	.	.	.
0.417	0.0003	0.02	Q	.	.	.	.
0.500	0.0004	0.02	Q	.	.	.	.
0.583	0.0006	0.02	Q	.	.	.	.
0.667	0.0007	0.02	Q	.	.	.	.
0.750	0.0008	0.02	Q	.	.	.	.
0.833	0.0010	0.02	Q	.	.	.	.
0.917	0.0012	0.02	Q	.	.	.	.
1.000	0.0013	0.02	Q	.	.	.	.
1.083	0.0015	0.02	Q	.	.	.	.
1.167	0.0017	0.02	Q	.	.	.	.
1.250	0.0018	0.02	Q	.	.	.	.
1.333	0.0020	0.02	Q	.	.	.	.
1.417	0.0021	0.02	Q	.	.	.	.
1.500	0.0023	0.02	Q	.	.	.	.
1.583	0.0024	0.02	Q	.	.	.	.
1.667	0.0026	0.02	Q	.	.	.	.
1.750	0.0027	0.02	Q	.	.	.	.
1.833	0.0029	0.02	Q	.	.	.	.
1.917	0.0030	0.02	Q	.	.	.	.
2.000	0.0032	0.02	Q	.	.	.	.
2.083	0.0034	0.03	Q	.	.	.	.
2.167	0.0036	0.03	Q	.	.	.	.
2.250	0.0038	0.03	Q	.	.	.	.
2.333	0.0040	0.03	Q	.	.	.	.
2.417	0.0042	0.03	Q	.	.	.	.
2.500	0.0043	0.03	Q	.	.	.	.
2.583	0.0046	0.03	Q	.	.	.	.
2.667	0.0048	0.03	QV	.	.	.	.
2.750	0.0050	0.03	QV	.	.	.	.
2.833	0.0052	0.03	QV	.	.	.	.
2.917	0.0055	0.03	QV	.	.	.	.
3.000	0.0057	0.03	QV	.	.	.	.
3.083	0.0059	0.03	QV	.	.	.	.
3.167	0.0062	0.03	QV	.	.	.	.
3.250	0.0064	0.03	QV	.	.	.	.
3.333	0.0067	0.04	QV	.	.	.	.
3.417	0.0069	0.04	QV	.	.	.	.
3.500	0.0071	0.04	QV	.	.	.	.

3.583	0.0074	0.04	QV	.	.	.	.
3.667	0.0076	0.04	QV	.	.	.	.
3.750	0.0079	0.04	QV	.	.	.	.
3.833	0.0081	0.04	QV	.	.	.	.
3.917	0.0084	0.04	QV	.	.	.	.
4.000	0.0087	0.04	QV	.	.	.	.
4.083	0.0089	0.04	QV	.	.	.	.
4.167	0.0092	0.04	QV	.	.	.	.
4.250	0.0095	0.04	Q V	.	.	.	.
4.333	0.0098	0.04	Q V	.	.	.	.
4.417	0.0101	0.04	Q V	.	.	.	.
4.500	0.0104	0.04	Q V	.	.	.	.
4.583	0.0108	0.05	Q V	.	.	.	.
4.667	0.0111	0.05	Q V	.	.	.	.
4.750	0.0114	0.05	Q V	.	.	.	.
4.833	0.0118	0.05	Q V	.	.	.	.
4.917	0.0121	0.05	Q V	.	.	.	.
5.000	0.0125	0.05	Q V	.	.	.	.
5.083	0.0128	0.05	Q V	.	.	.	.
5.167	0.0132	0.05	Q V	.	.	.	.
5.250	0.0135	0.05	Q V	.	.	.	.
5.333	0.0138	0.05	Q V	.	.	.	.
5.417	0.0142	0.05	Q V	.	.	.	.
5.500	0.0145	0.05	Q V	.	.	.	.
5.583	0.0148	0.05	Q V	.	.	.	.
5.667	0.0152	0.05	Q V	.	.	.	.
5.750	0.0155	0.05	Q V	.	.	.	.
5.833	0.0159	0.06	Q V	.	.	.	.
5.917	0.0163	0.06	Q V	.	.	.	.
6.000	0.0167	0.06	Q V	.	.	.	.
6.083	0.0171	0.06	Q V	.	.	.	.
6.167	0.0175	0.06	Q V	.	.	.	.
6.250	0.0179	0.06	Q V	.	.	.	.
6.333	0.0183	0.06	Q V	.	.	.	.
6.417	0.0188	0.06	Q V	.	.	.	.
6.500	0.0192	0.06	Q V	.	.	.	.
6.583	0.0196	0.07	Q V	.	.	.	.
6.667	0.0201	0.07	Q V	.	.	.	.
6.750	0.0205	0.07	Q V	.	.	.	.
6.833	0.0210	0.07	Q V	.	.	.	.
6.917	0.0215	0.07	Q V	.	.	.	.
7.000	0.0220	0.07	Q V	.	.	.	.
7.083	0.0225	0.07	Q V	.	.	.	.
7.167	0.0229	0.07	Q V	.	.	.	.
7.250	0.0234	0.07	Q V	.	.	.	.
7.333	0.0239	0.07	Q V	.	.	.	.
7.417	0.0244	0.07	Q V	.	.	.	.
7.500	0.0249	0.07	Q V	.	.	.	.

7.583	0.0255	0.08	Q	V	.	.	.	.
7.667	0.0260	0.08	Q	V	.	.	.	.
7.750	0.0266	0.08	Q	V	.	.	.	.
7.833	0.0272	0.09	Q	V	.	.	.	.
7.917	0.0278	0.09	Q	V	.	.	.	.
8.000	0.0284	0.09	Q	V	.	.	.	.
8.083	0.0290	0.10	Q	V	.	.	.	.
8.167	0.0297	0.10	Q	V	.	.	.	.
8.250	0.0303	0.10	Q	V	.	.	.	.
8.333	0.0310	0.10	Q	V	.	.	.	.
8.417	0.0318	0.10	Q	V	.	.	.	.
8.500	0.0325	0.10	Q	V	.	.	.	.
8.583	0.0332	0.11	Q	V	.	.	.	.
8.667	0.0339	0.11	Q	V	.	.	.	.
8.750	0.0347	0.11	Q	V	.	.	.	.
8.833	0.0355	0.11	Q	V	.	.	.	.
8.917	0.0363	0.11	Q	V	.	.	.	.
9.000	0.0371	0.11	Q	V	.	.	.	.
9.083	0.0379	0.13	Q	V	.	.	.	.
9.167	0.0388	0.13	Q	V	.	.	.	.
9.250	0.0397	0.13	Q	V	.	.	.	.
9.333	0.0408	0.15	Q	V	.	.	.	.
9.417	0.0418	0.15	Q	V	.	.	.	.
9.500	0.0428	0.15	Q	V	.	.	.	.
9.583	0.0440	0.17	Q	V	.	.	.	.
9.667	0.0451	0.17	Q	V	.	.	.	.
9.750	0.0462	0.17	Q	V	.	.	.	.
9.833	0.0475	0.18	Q	V	.	.	.	.
9.917	0.0488	0.18	Q	V	.	.	.	.
10.000	0.0500	0.18	Q	V	.	.	.	.
10.083	0.0511	0.15	Q	V	.	.	.	.
10.167	0.0521	0.15	Q	V	.	.	.	.
10.250	0.0532	0.15	Q	V	.	.	.	.
10.333	0.0540	0.12	Q	V	.	.	.	.
10.417	0.0548	0.12	Q	V	.	.	.	.
10.500	0.0556	0.12	Q	V	.	.	.	.
10.583	0.0565	0.14	Q	V	.	.	.	.
10.667	0.0575	0.14	Q	V	.	.	.	.
10.750	0.0585	0.14	Q	V	.	.	.	.
10.833	0.0596	0.17	Q	V	.	.	.	.
10.917	0.0608	0.17	Q	V	.	.	.	.
11.000	0.0619	0.17	Q	V	.	.	.	.
11.083	0.0631	0.17	Q	V	.	.	.	.
11.167	0.0643	0.17	Q	V	.	.	.	.
11.250	0.0654	0.17	Q	V	.	.	.	.
11.333	0.0666	0.17	Q	V	.	.	.	.
11.417	0.0677	0.17	Q	V	.	.	.	.
11.500	0.0689	0.17	Q	V	.	.	.	.

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TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
11.583	0.0700	0.16	Q	.	V .	.	.
11.667	0.0711	0.16	Q	.	V .	.	.
11.750	0.0721	0.16	Q	.	V .	.	.
11.833	0.0732	0.15	Q	.	V .	.	.
11.917	0.0743	0.15	Q	.	V .	.	.
12.000	0.0753	0.15	Q	.	V .	.	.
12.083	0.0767	0.20	Q	.	V .	.	.
12.167	0.0781	0.20	Q	.	V .	.	.
12.250	0.0795	0.20	Q	.	V .	.	.
12.333	0.0812	0.25	.Q	.	V .	.	.
12.417	0.0830	0.25	.Q	.	V .	.	.
12.500	0.0847	0.25	.Q	.	V .	.	.
12.583	0.0866	0.28	.Q	.	V .	.	.
12.667	0.0886	0.28	.Q	.	V.	.	.
12.750	0.0905	0.28	.Q	.	V.	.	.
12.833	0.0927	0.31	.Q	.	V.	.	.
12.917	0.0948	0.31	.Q	.	V	.	.
13.000	0.0969	0.31	.Q	.	V	.	.
13.083	0.0993	0.35	.Q	.	.V	.	.
13.167	0.1017	0.35	.Q	.	.V	.	.
13.250	0.1041	0.35	.Q	.	. V	.	.
13.333	0.1068	0.39	.Q	.	. V	.	.
13.417	0.1094	0.39	.Q	.	. V	.	.
13.500	0.1121	0.39	.Q	.	. V	.	.
13.583	0.1143	0.33	.Q	.	. V	.	.
13.667	0.1166	0.33	.Q	.	. V	.	.
13.750	0.1188	0.33	.Q	.	. V	.	.
13.833	0.1207	0.26	.Q	.	. V	.	.
13.917	0.1225	0.26	.Q	.	. V	.	.
14.000	0.1243	0.26	.Q	.	. V	.	.
14.083	0.1262	0.28	.Q	.	. V	.	.
14.167	0.1281	0.28	.Q	.	. V	.	.
14.250	0.1301	0.28	.Q	.	. V	.	.
14.333	0.1321	0.29	.Q	.	. V	.	.
14.417	0.1341	0.29	.Q	.	. V	.	.
14.500	0.1361	0.29	.Q	.	. V.	.	.
14.583	0.1382	0.29	.Q	.	. V.	.	.
14.667	0.1402	0.29	.Q	.	. V	.	.
14.750	0.1422	0.29	.Q	.	. V	.	.
14.833	0.1442	0.29	.Q	.	. V	.	.
14.917	0.1462	0.29	.Q	.	. V	.	.
15.000	0.1482	0.29	.Q	.	. V	.	.
15.083	0.1501	0.28	.Q	.	. V	.	.
15.167	0.1521	0.28	.Q	.	. V	.	.

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15.250      0.1540      0.28  .Q        .         .         .  V       .
15.333      0.1558      0.27  .Q        .         .         .  V       .
15.417      0.1577      0.27  .Q        .         .         .  V       .
15.500      0.1595      0.27  .Q        .         .         .   V      .
15.583      0.1612      0.24  Q         .         .         .   V      .
15.667      0.1628      0.24  Q         .         .         .   V      .
15.750      0.1644      0.24  Q         .         .         .    V     .
15.833      0.1659      0.21  Q         .         .         .    V     .
15.917      0.1674      0.21  Q         .         .         .    V     .
16.000      0.1689      0.21  Q         .         .         .     V    .
16.083      0.1698      0.13  Q         .         .         .     V    .
16.167      0.1707      0.13  Q         .         .         .     V    .
16.250      0.1716      0.13  Q         .         .         .     V    .
16.333      0.1719      0.05  Q         .         .         .     V    .
16.417      0.1723      0.05  Q         .         .         .      V   .
16.500      0.1727      0.05  Q         .         .         .      V   .
16.583      0.1729      0.03  Q         .         .         .      V   .
16.667      0.1731      0.03  Q         .         .         .      V   .
16.750      0.1734      0.03  Q         .         .         .      V   .
16.833      0.1735      0.02  Q         .         .         .      V   .
16.917      0.1737      0.02  Q         .         .         .      V   .
17.000      0.1739      0.02  Q         .         .         .      V   .
17.083      0.1741      0.03  Q         .         .         .      V   .
17.167      0.1743      0.03  Q         .         .         .      V   .
17.250      0.1745      0.03  Q         .         .         .      V   .
17.333      0.1747      0.03  Q         .         .         .      V   .
17.417      0.1749      0.03  Q         .         .         .      V   .
17.500      0.1751      0.03  Q         .         .         .      V   .
17.583      0.1754      0.03  Q         .         .         .      V   .
17.667      0.1756      0.03  Q         .         .         .      V   .
17.750      0.1759      0.03  Q         .         .         .      V   .
17.833      0.1761      0.03  Q         .         .         .      V   .
17.917      0.1763      0.03  Q         .         .         .      V   .
18.000      0.1765      0.03  Q         .         .         .      V   .
18.083      0.1767      0.03  Q         .         .         .      V   .
18.167      0.1769      0.03  Q         .         .         .       V  .
18.250      0.1771      0.03  Q         .         .         .       V  .
18.333      0.1773      0.03  Q         .         .         .       V  .
18.417      0.1775      0.03  Q         .         .         .       V  .
18.500      0.1777      0.03  Q         .         .         .       V  .
18.583      0.1779      0.03  Q         .         .         .       V  .
18.667      0.1781      0.03  Q         .         .         .       V  .
18.750      0.1782      0.03  Q         .         .         .       V  .
18.833      0.1784      0.02  Q         .         .         .       V  .
18.917      0.1785      0.02  Q         .         .         .       V  .
19.000      0.1786      0.02  Q         .         .         .       V  .
19.083      0.1787      0.02  Q         .         .         .       V  .
19.167      0.1789      0.02  Q         .         .         .       V  .
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19.250	0.1790	0.02	Q	.	.	.	V .
19.333	0.1792	0.02	Q	.	.	.	V .
19.417	0.1793	0.02	Q	.	.	.	V .
19.500	0.1795	0.02	Q	.	.	.	V .
19.583	0.1796	0.02	Q	.	.	.	V .
19.667	0.1798	0.02	Q	.	.	.	V .
19.750	0.1800	0.02	Q	.	.	.	V .
19.833	0.1801	0.02	Q	.	.	.	V .
19.917	0.1802	0.02	Q	.	.	.	V .
20.000	0.1804	0.02	Q	.	.	.	V .
20.083	0.1805	0.02	Q	.	.	.	V .
20.167	0.1806	0.02	Q	.	.	.	V .
20.250	0.1807	0.02	Q	.	.	.	V .
20.333	0.1809	0.02	Q	.	.	.	V .
20.417	0.1810	0.02	Q	.	.	.	V .
20.500	0.1812	0.02	Q	.	.	.	V .
20.583	0.1813	0.02	Q	.	.	.	V .
20.667	0.1815	0.02	Q	.	.	.	V .
20.750	0.1816	0.02	Q	.	.	.	V.
20.833	0.1817	0.02	Q	.	.	.	V.
20.917	0.1818	0.02	Q	.	.	.	V.
21.000	0.1820	0.02	Q	.	.	.	V.
21.083	0.1821	0.02	Q	.	.	.	V.
21.167	0.1822	0.02	Q	.	.	.	V.
21.250	0.1823	0.02	Q	.	.	.	V.
21.333	0.1825	0.02	Q	.	.	.	V.
21.417	0.1826	0.02	Q	.	.	.	V.
21.500	0.1827	0.02	Q	.	.	.	V.
21.583	0.1828	0.02	Q	.	.	.	V.
21.667	0.1829	0.02	Q	.	.	.	V.
21.750	0.1831	0.02	Q	.	.	.	V.
21.833	0.1832	0.02	Q	.	.	.	V.
21.917	0.1833	0.02	Q	.	.	.	V.
22.000	0.1834	0.02	Q	.	.	.	V.
22.083	0.1835	0.02	Q	.	.	.	V.
22.167	0.1837	0.02	Q	.	.	.	V.
22.250	0.1838	0.02	Q	.	.	.	V.
22.333	0.1839	0.02	Q	.	.	.	V.
22.417	0.1840	0.02	Q	.	.	.	V.
22.500	0.1842	0.02	Q	.	.	.	V.
22.583	0.1843	0.01	Q	.	.	.	V.
22.667	0.1844	0.01	Q	.	.	.	V.
22.750	0.1845	0.01	Q	.	.	.	V.
22.833	0.1846	0.01	Q	.	.	.	V.
22.917	0.1847	0.01	Q	.	.	.	V.
23.000	0.1847	0.01	Q	.	.	.	V.
23.083	0.1848	0.01	Q	.	.	.	V.
23.166	0.1849	0.01	Q	.	.	.	V.

23.250	0.1850	0.01	Q	.	.	.	V.
23.333	0.1851	0.01	Q	.	.	.	V.
23.416	0.1852	0.01	Q	.	.	.	V.
23.500	0.1853	0.01	Q	.	.	.	V.
23.583	0.1854	0.01	Q	.	.	.	V.
23.666	0.1855	0.01	Q	.	.	.	V.
23.750	0.1856	0.01	Q	.	.	.	V.
23.833	0.1857	0.01	Q	.	.	.	V.
23.916	0.1858	0.01	Q	.	.	.	V.
24.000	0.1859	0.01	Q	.	.	.	V.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
24.083	0.1860	0.01	Q	.	.	.	V.
24.166	0.1860	0.01	Q	.	.	.	V.
24.250	0.1861	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1455.0
10%	750.0
20%	525.0
30%	435.0
40%	330.0
50%	240.0
60%	210.0
70%	150.0
80%	45.0
90%	30.0

FLOW PROCESS FROM NODE 30.00 TO NODE 32.00 IS CODE = 1

>>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<

(UNIT-HYDROGRAPH ADDED TO STREAM #1)

WATERSHED AREA = 3.640 ACRES
BASEFLOW = 0.000 CFS/SQUARE-MILE

Warning: Watershed Area is less than 10 acres
*USER ENTERED "LAG" TIME = 0.194 HOURS
CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
VALLEY S-GRAPH SELECTED
UNIFORM MEAN SOIL-LOSS(INCH/HOUR) = 0.050
LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.500
MINIMUM SOIL-LOSS RATE(INCH/HOUR) = 0.010
USER-ENTERED RAINFALL = 1.70 INCHES
RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 1.0000

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 128.667

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	27.527	4.039
2	75.994	7.112
3	88.565	1.845
4	94.216	0.829
5	97.329	0.457
6	98.694	0.200
7	99.441	0.110
8	99.777	0.049
9	99.944	0.025
10	100.000	0.008

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0034	0.0017	0.0017
2	0.0051	0.0025	0.0025
3	0.0051	0.0025	0.0025
4	0.0068	0.0034	0.0034

5	0.0051	0.0025	0.0025
6	0.0051	0.0025	0.0025
7	0.0051	0.0025	0.0025
8	0.0068	0.0034	0.0034
9	0.0068	0.0034	0.0034
10	0.0068	0.0034	0.0034
11	0.0085	0.0042	0.0042
12	0.0085	0.0042	0.0042
13	0.0085	0.0042	0.0042
14	0.0085	0.0042	0.0042
15	0.0085	0.0042	0.0042
16	0.0102	0.0051	0.0051
17	0.0102	0.0051	0.0051
18	0.0119	0.0059	0.0059
19	0.0119	0.0059	0.0059
20	0.0136	0.0068	0.0068
21	0.0102	0.0051	0.0051
22	0.0119	0.0059	0.0059
23	0.0136	0.0068	0.0068
24	0.0136	0.0068	0.0068
25	0.0153	0.0076	0.0076
26	0.0153	0.0076	0.0076
27	0.0170	0.0085	0.0085
28	0.0170	0.0085	0.0085
29	0.0170	0.0085	0.0085
30	0.0187	0.0093	0.0093
31	0.0204	0.0102	0.0102
32	0.0221	0.0110	0.0110
33	0.0255	0.0127	0.0127
34	0.0255	0.0127	0.0127
35	0.0272	0.0136	0.0136
36	0.0289	0.0144	0.0144
37	0.0323	0.0147	0.0176
38	0.0340	0.0143	0.0197
39	0.0357	0.0140	0.0217
40	0.0374	0.0137	0.0237
41	0.0255	0.0127	0.0127
42	0.0255	0.0127	0.0127
43	0.0340	0.0128	0.0212
44	0.0340	0.0125	0.0215
45	0.0323	0.0122	0.0201
46	0.0323	0.0119	0.0204
47	0.0289	0.0116	0.0173
48	0.0306	0.0114	0.0192
49	0.0425	0.0111	0.0314
50	0.0442	0.0108	0.0334
51	0.0476	0.0105	0.0371
52	0.0493	0.0103	0.0390

53	0.0578	0.0100	0.0478
54	0.0578	0.0097	0.0481
55	0.0391	0.0095	0.0296
56	0.0391	0.0092	0.0299
57	0.0459	0.0089	0.0370
58	0.0442	0.0087	0.0355
59	0.0442	0.0084	0.0358
60	0.0425	0.0082	0.0343
61	0.0408	0.0080	0.0328
62	0.0391	0.0077	0.0314
63	0.0323	0.0075	0.0248
64	0.0323	0.0073	0.0250
65	0.0068	0.0034	0.0034
66	0.0068	0.0034	0.0034
67	0.0051	0.0025	0.0025
68	0.0051	0.0025	0.0025
69	0.0085	0.0042	0.0042
70	0.0085	0.0042	0.0042
71	0.0085	0.0042	0.0042
72	0.0068	0.0034	0.0034
73	0.0068	0.0034	0.0034
74	0.0068	0.0034	0.0034
75	0.0051	0.0025	0.0025
76	0.0034	0.0017	0.0017
77	0.0051	0.0025	0.0025
78	0.0068	0.0034	0.0034
79	0.0051	0.0025	0.0025
80	0.0034	0.0017	0.0017
81	0.0051	0.0025	0.0025
82	0.0051	0.0025	0.0025
83	0.0051	0.0025	0.0025
84	0.0034	0.0017	0.0017
85	0.0051	0.0025	0.0025
86	0.0034	0.0017	0.0017
87	0.0051	0.0025	0.0025
88	0.0034	0.0017	0.0017
89	0.0051	0.0025	0.0025
90	0.0034	0.0017	0.0017
91	0.0034	0.0017	0.0017
92	0.0034	0.0017	0.0017
93	0.0034	0.0017	0.0017
94	0.0034	0.0017	0.0017
95	0.0034	0.0017	0.0017
96	0.0034	0.0017	0.0017

TOTAL STORM RAINFALL(INCHES) = 1.70
TOTAL SOIL-LOSS(INCHES) = 0.61
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.09

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.1850
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.3305

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2 4 - 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

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0000	0.01	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0001	0.01	Q	.	.	.	.
0.333	0.0003	0.02	Q	.	.	.	.
0.417	0.0005	0.02	Q	.	.	.	.
0.500	0.0006	0.02	Q	.	.	.	.
0.583	0.0008	0.03	Q	.	.	.	.
0.667	0.0010	0.03	Q	.	.	.	.
0.750	0.0013	0.03	Q	.	.	.	.
0.833	0.0015	0.04	Q	.	.	.	.
0.917	0.0018	0.04	Q	.	.	.	.
1.000	0.0020	0.04	Q	.	.	.	.
1.083	0.0023	0.04	Q	.	.	.	.
1.167	0.0026	0.04	Q	.	.	.	.
1.250	0.0029	0.04	Q	.	.	.	.
1.333	0.0032	0.04	Q	.	.	.	.
1.417	0.0034	0.04	Q	.	.	.	.
1.500	0.0037	0.04	Q	.	.	.	.
1.583	0.0040	0.04	Q	.	.	.	.
1.667	0.0042	0.04	Q	.	.	.	.
1.750	0.0045	0.04	Q	.	.	.	.
1.833	0.0048	0.04	Q	.	.	.	.
1.917	0.0051	0.04	Q	.	.	.	.
2.000	0.0053	0.04	Q	.	.	.	.
2.083	0.0057	0.05	Q	.	.	.	.
2.167	0.0060	0.05	Q	.	.	.	.
2.250	0.0063	0.05	Q	.	.	.	.
2.333	0.0066	0.05	Q	.	.	.	.
2.417	0.0070	0.05	Q	.	.	.	.
2.500	0.0073	0.05	Q	.	.	.	.
2.583	0.0077	0.05	Q	.	.	.	.

2.667	0.0080	0.05	Q	.	.	.	.
2.750	0.0084	0.05	QV	.	.	.	.
2.833	0.0088	0.06	QV	.	.	.	.
2.917	0.0092	0.06	QV	.	.	.	.
3.000	0.0096	0.06	QV	.	.	.	.
3.083	0.0100	0.06	QV	.	.	.	.
3.167	0.0105	0.06	QV	.	.	.	.
3.250	0.0109	0.06	QV	.	.	.	.
3.333	0.0113	0.06	QV	.	.	.	.
3.417	0.0117	0.06	QV	.	.	.	.
3.500	0.0121	0.06	QV	.	.	.	.
3.583	0.0126	0.06	QV	.	.	.	.
3.667	0.0130	0.06	QV	.	.	.	.
3.750	0.0134	0.06	QV	.	.	.	.
3.833	0.0139	0.07	QV	.	.	.	.
3.917	0.0143	0.07	QV	.	.	.	.
4.000	0.0148	0.07	QV	.	.	.	.
4.083	0.0153	0.07	QV	.	.	.	.
4.167	0.0158	0.07	QV	.	.	.	.
4.250	0.0163	0.07	QV	.	.	.	.
4.333	0.0168	0.08	Q V	.	.	.	.
4.417	0.0173	0.08	Q V	.	.	.	.
4.500	0.0179	0.08	Q V	.	.	.	.
4.583	0.0184	0.08	Q V	.	.	.	.
4.667	0.0190	0.08	Q V	.	.	.	.
4.750	0.0196	0.08	Q V	.	.	.	.
4.833	0.0202	0.09	Q V	.	.	.	.
4.917	0.0208	0.09	Q V	.	.	.	.
5.000	0.0214	0.09	Q V	.	.	.	.
5.083	0.0220	0.09	Q V	.	.	.	.
5.167	0.0226	0.09	Q V	.	.	.	.
5.250	0.0233	0.09	Q V	.	.	.	.
5.333	0.0238	0.08	Q V	.	.	.	.
5.417	0.0244	0.08	Q V	.	.	.	.
5.500	0.0250	0.08	Q V	.	.	.	.
5.583	0.0256	0.09	Q V	.	.	.	.
5.667	0.0262	0.09	Q V	.	.	.	.
5.750	0.0268	0.09	Q V	.	.	.	.
5.833	0.0275	0.10	Q V	.	.	.	.
5.917	0.0281	0.10	Q V	.	.	.	.
6.000	0.0288	0.10	Q V	.	.	.	.
6.083	0.0295	0.10	Q V	.	.	.	.
6.167	0.0302	0.10	Q V	.	.	.	.
6.250	0.0309	0.10	Q V	.	.	.	.
6.333	0.0316	0.11	Q V	.	.	.	.
6.417	0.0324	0.11	Q V	.	.	.	.
6.500	0.0331	0.11	Q V	.	.	.	.
6.583	0.0339	0.11	Q V	.	.	.	.

6.667	0.0347	0.11	Q	V	.	.	.	.
6.750	0.0355	0.11	Q	V	.	.	.	.
6.833	0.0363	0.12	Q	V	.	.	.	.
6.917	0.0372	0.12	Q	V	.	.	.	.
7.000	0.0380	0.12	Q	V	.	.	.	.
7.083	0.0388	0.12	Q	V	.	.	.	.
7.167	0.0397	0.12	Q	V	.	.	.	.
7.250	0.0405	0.12	Q	V	.	.	.	.
7.333	0.0414	0.13	Q	V	.	.	.	.
7.417	0.0423	0.13	Q	V	.	.	.	.
7.500	0.0432	0.13	Q	V	.	.	.	.
7.583	0.0441	0.14	Q	V	.	.	.	.
7.667	0.0450	0.14	Q	V	.	.	.	.
7.750	0.0460	0.14	Q	V	.	.	.	.
7.833	0.0470	0.15	Q	V	.	.	.	.
7.917	0.0480	0.15	Q	V	.	.	.	.
8.000	0.0491	0.15	Q	V	.	.	.	.
8.083	0.0502	0.16	Q	V	.	.	.	.
8.167	0.0513	0.16	Q	V	.	.	.	.
8.250	0.0524	0.16	Q	V	.	.	.	.
8.333	0.0537	0.18	Q	V	.	.	.	.
8.417	0.0549	0.18	Q	V	.	.	.	.
8.500	0.0561	0.18	Q	V	.	.	.	.
8.583	0.0574	0.19	Q	V	.	.	.	.
8.667	0.0587	0.19	Q	V	.	.	.	.
8.750	0.0600	0.19	Q	V	.	.	.	.
8.833	0.0614	0.20	Q	V	.	.	.	.
8.917	0.0627	0.20	Q	V	.	.	.	.
9.000	0.0641	0.20	Q	V	.	.	.	.
9.083	0.0656	0.22	Q	V	.	.	.	.
9.167	0.0671	0.22	Q	V	.	.	.	.
9.250	0.0686	0.22	Q	V	.	.	.	.
9.333	0.0704	0.25	.Q	V	.	.	.	.
9.417	0.0721	0.25	.Q	V	.	.	.	.
9.500	0.0738	0.25	.Q	V	.	.	.	.
9.583	0.0758	0.28	.Q	V	.	.	.	.
9.667	0.0777	0.28	.Q	V	.	.	.	.
9.750	0.0797	0.28	.Q	V	.	.	.	.
9.833	0.0818	0.31	.Q	V	.	.	.	.
9.917	0.0840	0.31	.Q	V	.	.	.	.
10.000	0.0861	0.31	.Q	V	.	.	.	.
10.083	0.0881	0.29	.Q	V	.	.	.	.
10.167	0.0901	0.29	.Q	V	.	.	.	.
10.250	0.0921	0.29	.Q	V	.	.	.	.
10.333	0.0936	0.22	Q	.V	.	.	.	.
10.417	0.0951	0.22	Q	.V	.	.	.	.
10.500	0.0967	0.22	Q	.V	.	.	.	.
10.583	0.0983	0.24	Q	.V	.	.	.	.

10.667	0.0999	0.24	Q	. V . . .
10.750	0.1015	0.24	Q	. V . . .
10.833	0.1035	0.29	.Q	. V . . .
10.917	0.1055	0.29	.Q	. V . . .
11.000	0.1075	0.29	.Q	. V . . .
11.083	0.1096	0.30	.Q	. V . . .
11.167	0.1116	0.30	.Q	. V . . .
11.250	0.1137	0.30	.Q	. V . . .
11.333	0.1157	0.29	.Q	. V . . .
11.417	0.1178	0.29	.Q	. V . . .
11.500	0.1198	0.29	.Q	. V . . .

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
11.583	0.1217	0.28	.Q	. V .	.	.	
11.667	0.1237	0.28	.Q	. V .	.	.	
11.750	0.1257	0.28	.Q	. V .	.	.	
11.833	0.1275	0.27	.Q	. V .	.	.	
11.917	0.1294	0.27	.Q	. V .	.	.	
12.000	0.1313	0.27	.Q	. V .	.	.	
12.083	0.1335	0.33	.Q	. V .	.	.	
12.167	0.1358	0.33	.Q	. V .	.	.	
12.250	0.1381	0.33	.Q	. V .	.	.	
12.333	0.1410	0.43	.Q	. V .	.	.	
12.417	0.1439	0.43	.Q	. V .	.	.	
12.500	0.1469	0.43	.Q	. V .	.	.	
12.583	0.1502	0.48	.Q	. V .	.	.	
12.667	0.1534	0.48	.Q	. V .	.	.	
12.750	0.1567	0.48	.Q	. V .	.	.	
12.833	0.1603	0.53	. Q	. V.	.	.	
12.917	0.1640	0.53	. Q	. V.	.	.	
13.000	0.1676	0.53	. Q	. V	.	.	
13.083	0.1716	0.59	. Q	. V	.	.	
13.167	0.1757	0.59	. Q	. V	.	.	
13.250	0.1797	0.59	. Q	. V	.	.	
13.333	0.1843	0.66	. Q	. . V	.	.	
13.417	0.1889	0.66	. Q	. . V	.	.	
13.500	0.1934	0.66	. Q	. . V	.	.	
13.583	0.1976	0.61	. Q	. . V	.	.	
13.667	0.2018	0.61	. Q	. . V	.	.	
13.750	0.2061	0.61	. Q	. . V	.	.	
13.833	0.2094	0.49	.Q	. . V	.	.	
13.917	0.2128	0.49	.Q	. . V	.	.	
14.000	0.2162	0.49	.Q	. . V	.	.	
14.083	0.2196	0.49	.Q	. . V	.	.	
14.167	0.2230	0.49	.Q	. . V	.	.	
14.250	0.2264	0.49	.Q	. . V	.	.	

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14.333      0.2300      0.52  . Q       .         .      V  .          .
14.417      0.2336      0.52  . Q       .         .       V .          .
14.500      0.2372      0.52  . Q       .         .       V .          .
14.583      0.2408      0.52  . Q       .         .        V.          .
14.667      0.2444      0.52  . Q       .         .        V.          .
14.750      0.2480      0.52  . Q       .         .         V          .
14.833      0.2516      0.52  . Q       .         .         V          .
14.917      0.2551      0.52  . Q       .         .         V          .
15.000      0.2587      0.52  . Q       .         .          V         .
15.083      0.2621      0.50  . Q       .         .         .V         .
15.167      0.2656      0.50  . Q       .         .          . V       .
15.250      0.2691      0.50  . Q       .         .          . V       .
15.333      0.2724      0.48  .Q        .         .          . V       .
15.417      0.2757      0.48  .Q        .         .          .  V      .
15.500      0.2790      0.48  .Q        .         .          .  V      .
15.583      0.2821      0.44  .Q        .         .          .   V     .
15.667      0.2851      0.44  .Q        .         .          .   V     .
15.750      0.2882      0.44  .Q        .         .          .   V     .
15.833      0.2909      0.39  .Q        .         .          .    V    .
15.917      0.2936      0.39  .Q        .         .          .    V    .
16.000      0.2963      0.39  .Q        .         .          .    V    .
16.083      0.2983      0.29  .Q        .         .          .     V   .
16.167      0.3003      0.29  .Q        .         .          .     V   .
16.250      0.3023      0.29  .Q        .         .          .     V   .
16.333      0.3032      0.13  Q         .         .          .     V   .
16.417      0.3041      0.13  Q         .         .          .     V   .
16.500      0.3051      0.13  Q         .         .          .     V   .
16.583      0.3056      0.09  Q         .         .          .     V   .
16.667      0.3062      0.09  Q         .         .          .      V  .
16.750      0.3068      0.09  Q         .         .          .      V  .
16.833      0.3072      0.06  Q         .         .          .      V  .
16.917      0.3077      0.06  Q         .         .          .      V  .
17.000      0.3081      0.06  Q         .         .          .      V  .
17.083      0.3084      0.05  Q         .         .          .      V  .
17.167      0.3088      0.05  Q         .         .          .      V  .
17.250      0.3092      0.05  Q         .         .          .      V  .
17.333      0.3096      0.06  Q         .         .          .      V  .
17.417      0.3100      0.06  Q         .         .          .      V  .
17.500      0.3105      0.06  Q         .         .          .      V  .
17.583      0.3109      0.06  Q         .         .          .      V  .
17.667      0.3113      0.06  Q         .         .          .      V  .
17.750      0.3117      0.06  Q         .         .          .      V  .
17.833      0.3121      0.06  Q         .         .          .      V  .
17.917      0.3125      0.06  Q         .         .          .      V  .
18.000      0.3129      0.06  Q         .         .          .      V  .
18.083      0.3133      0.05  Q         .         .          .      V  .
18.167      0.3137      0.05  Q         .         .          .      V  .
18.250      0.3140      0.05  Q         .         .          .       V .
```

18.333	0.3144	0.05	Q	.	.	.	V .
18.417	0.3147	0.05	Q	.	.	.	V .
18.500	0.3151	0.05	Q	.	.	.	V .
18.583	0.3154	0.05	Q	.	.	.	V .
18.667	0.3157	0.05	Q	.	.	.	V .
18.750	0.3161	0.05	Q	.	.	.	V .
18.833	0.3163	0.04	Q	.	.	.	V .
18.917	0.3166	0.04	Q	.	.	.	V .
19.000	0.3168	0.04	Q	.	.	.	V .
19.083	0.3171	0.03	Q	.	.	.	V .
19.167	0.3173	0.03	Q	.	.	.	V .
19.250	0.3175	0.03	Q	.	.	.	V .
19.333	0.3178	0.04	Q	.	.	.	V .
19.417	0.3181	0.04	Q	.	.	.	V .
19.500	0.3183	0.04	Q	.	.	.	V .
19.583	0.3186	0.04	Q	.	.	.	V .
19.667	0.3189	0.04	Q	.	.	.	V .
19.750	0.3192	0.04	Q	.	.	.	V .
19.833	0.3195	0.04	Q	.	.	.	V .
19.917	0.3197	0.04	Q	.	.	.	V .
20.000	0.3200	0.04	Q	.	.	.	V .
20.083	0.3202	0.03	Q	.	.	.	V .
20.167	0.3204	0.03	Q	.	.	.	V .
20.250	0.3206	0.03	Q	.	.	.	V .
20.333	0.3209	0.04	Q	.	.	.	V .
20.417	0.3211	0.04	Q	.	.	.	V .
20.500	0.3214	0.04	Q	.	.	.	V .
20.583	0.3216	0.04	Q	.	.	.	V .
20.667	0.3219	0.04	Q	.	.	.	V .
20.750	0.3221	0.04	Q	.	.	.	V .
20.833	0.3224	0.03	Q	.	.	.	V.
20.917	0.3226	0.03	Q	.	.	.	V.
21.000	0.3228	0.03	Q	.	.	.	V.
21.083	0.3230	0.03	Q	.	.	.	V.
21.167	0.3232	0.03	Q	.	.	.	V.
21.250	0.3235	0.03	Q	.	.	.	V.
21.333	0.3237	0.03	Q	.	.	.	V.
21.417	0.3239	0.03	Q	.	.	.	V.
21.500	0.3241	0.03	Q	.	.	.	V.
21.583	0.3243	0.03	Q	.	.	.	V.
21.667	0.3246	0.03	Q	.	.	.	V.
21.750	0.3248	0.03	Q	.	.	.	V.
21.833	0.3250	0.03	Q	.	.	.	V.
21.917	0.3252	0.03	Q	.	.	.	V.
22.000	0.3254	0.03	Q	.	.	.	V.
22.083	0.3256	0.03	Q	.	.	.	V.
22.167	0.3258	0.03	Q	.	.	.	V.
22.250	0.3261	0.03	Q	.	.	.	V.

22.333	0.3263	0.03	Q	.	.	.	V.
22.417	0.3265	0.03	Q	.	.	.	V.
22.500	0.3267	0.03	Q	.	.	.	V.
22.583	0.3269	0.03	Q	.	.	.	V.
22.667	0.3271	0.03	Q	.	.	.	V.
22.750	0.3273	0.03	Q	.	.	.	V.
22.833	0.3275	0.03	Q	.	.	.	V.
22.917	0.3276	0.03	Q	.	.	.	V.
23.000	0.3278	0.03	Q	.	.	.	V.
23.083	0.3280	0.03	Q	.	.	.	V.
23.166	0.3282	0.03	Q	.	.	.	V.
23.250	0.3283	0.03	Q	.	.	.	V.
23.333	0.3285	0.03	Q	.	.	.	V.
23.416	0.3287	0.03	Q	.	.	.	V.
23.500	0.3289	0.03	Q	.	.	.	V.
23.583	0.3290	0.03	Q	.	.	.	V.
23.666	0.3292	0.03	Q	.	.	.	V.
23.750	0.3294	0.03	Q	.	.	.	V.
23.833	0.3295	0.02	Q	.	.	.	V.
23.916	0.3297	0.02	Q	.	.	.	V.
24.000	0.3299	0.02	Q	.	.	.	V.

↑

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
24.083	0.3300	0.02	Q	.	.	.	V.
24.166	0.3301	0.02	Q	.	.	.	V.
24.250	0.3303	0.02	Q	.	.	.	V.
24.333	0.3303	0.01	Q	.	.	.	V.
24.416	0.3303	0.01	Q	.	.	.	V.
24.500	0.3304	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1470.0
10%	765.0
20%	525.0
30%	435.0
40%	375.0
50%	225.0
60%	210.0
70%	180.0
80%	45.0

90% 30.0

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END OF FLOODSCx ROUTING ANALYSIS

APPENDIX G

Geotechnical Investigation and Percolation Test Results

GEOTECHNICAL INVESTIGATION AND PERCOLATION TEST RESULTS

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE AND AUTO MALL WAY
MORENO VALLEY, CALIFORNIA

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

CAR PROS AUTOMOTIVE GROUP
FEDERAL WAY, WASHINGTON

JANUARY 18, 2019
PROJECT NO. T2844-22-01

Project No. T2844-22-01
January 18, 2019

Cars Pros Automotive Group
181 S 333rd Street, Building C, Suite 210
Federal Way, Washington 98002

Attention: Mr. Ken Phillips

Subject: GEOTECHNICAL INVESTIGATION
AND PERCOLATION TEST RESULTS
KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

Dear Mr. Phillips:

In accordance with your authorization of Proposal No. IE-2287, Geocon West Inc. (Geocon) herein submits the results of our geotechnical investigation and percolation test results for the subject site. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed automotive sales lot. The site is considered suitable for development provided the recommendations of this report are followed.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON WEST, INC.

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PDT:CER:LAB:hd

(e-mail) Addressee

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GEOTECHNICAL INVESTIGATION
AND PERCOLATION TEST RESULTS

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation and percolation tests for the planned automotive sales development located east of the intersection of Moreno Beach Drive and Auto Mall Drive, in the city of Moreno Valley, California (see *Vicinity Map*, Figure 1). The purpose of the geotechnical investigation is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may affect development of the property. Percolation testing was performed to provide information for site storm water infiltration design. This investigation also included a review of readily available published and unpublished geologic literature (see *List of References*).

The scope of this investigation included performing a site reconnaissance, field exploration, engineering analyses, and preparing this report. We performed our field investigation on December 17 and 18, 2018 by drilling ten small-diameter borings to a maximum depth of 51½ feet below the existing ground surface. Four of the borings were used to perform percolation testing. The *Geologic Map*, Figure 2, presents the approximate locations of the borings. *Appendix A* provides a detailed discussion of the field investigation including logs of the borings and percolation test results. Details of the laboratory tests and a summary of the test results are presented in *Appendix B* and on the boring logs in *Appendix A*.

Recommendations presented herein are based on analyses of data obtained from our site investigation and our understanding of proposed site development. References reviewed to prepare this report are provided in the *List of References*. If project details vary significantly from those described herein, Geocon should be contacted to evaluate the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located southeast of the intersection of Moreno Beach Drive and Auto Mall Drive in the city of Moreno Valley, California. The site is bounded on the west by Auto Mall Drive, the north by Petit Street, the south by Moreno Beach Drive, and on the east by a parcel line. The site is currently vacant and appears to be periodically disked for weed abatement. Periodic use of the site as a parking lot was observed during our site exploration. Access to the property is from Petit Street. The existing grades range from approximate elevation 1,750 feet above Mean Sea Level (MSL) in the north to 1,755 feet above MSL in the south. A stockpile is located in the southern portion of the site, as shown on Figure 2. The maximum height of the stockpile is approximately 5 feet. The site is at latitude 33.93375 and longitude -117.17466.

Based on the *Site Plan,* prepared by Carlile Coatsworth Architects, Inc., we understand that the proposed construction consists of a 24,661-square-foot sales and service facility, car wash, several vehicle display areas, with associated parking and infrastructure. A grading plan has not been provided for our review; however, based on current site conditions, cuts and fills of less than 10 feet are expected at the site.

Based on the preliminary plans, we understand that the proposed building will be constructed of concrete masonry unit (CMU) walls and concrete cast-in-place or tilt-up walls and supported on conventional spread footing foundations with a concrete slab-on-grade floor. We expect column loads will be up to 100 kips and wall loads will be up to 10 kips per linear foot. Preliminary geotechnical recommendations for design of the structure are based on these assumptions and provided herein.

The site descriptions and proposed development are based on a site reconnaissance, review of published geologic literature, our field investigation, a review of the conceptual plans, and discussions with you. If development plans differ from those described herein, Geocon should be contacted for review of the plans and possible revisions to this report.

3. GEOLOGIC SETTING

The site is located within the Perris block of the northern Peninsular Ranges Geomorphic Province (Province), defined as a relatively stable area between the Elsinore and San Jacinto fault zones. In the vicinity of the site, the geomorphology consists of older alluvial fan deposits. The Peninsular Ranges are bounded by the Transverse Ranges (San Gabriel and San Bernardino Mountains) to the north and the Colorado Desert Geomorphic Province to the east. The Peninsular Ranges Geomorphic Province extends westward into the Pacific Ocean and southward to the tip of Baja California. Overall, the Province is characterized by Cretaceous-age granitic rock and a lesser amount of Mesozoic-age metamorphic rock overlain by terrestrial and marine sediments. Faulting within the Province is typically northwest trending and includes the San Andreas, San Jacinto, Elsinore, and Newport-Inglewood faults.

The San Jacinto fault zones is located approximately 1.8 miles to the northeast. Geologic units within the site consist of very old alluvial fan deposits and a stockpile of undocumented fill.

4. SOIL AND GEOLOGIC CONDITIONS

We observed very old alluvial fan deposits with a thin mantle of overlying undocumented fill during our field investigation. The occurrence, distribution and description of the geologic units encountered are shown on the *Geologic Map*, Figure 2 and the boring logs in *Appendix A*. The surficial soils and geologic units are described herein in order of increasing age.

4.1 Undocumented Fill (afu)

Undocumented fill was observed throughout the site in the top 1 to 4 feet of the borings during our geotechnical investigation. The stockpile of undocumented fill in the south-central portion of the site was observed to be approximately 5 feet thick. As observed the undocumented fill consists of loose to medium dense, dry to damp, reddish brown silty sand. A minor amount of clayey sand was also encountered.

4.2 Very Old Alluvial Fan Deposits (Qvof)

Very old alluvium was observed underlying the undocumented fill through the site. As observed, the older alluvium consists predominately of damp to moist, medium dense to very dense silty sand. Lesser amounts of clayey sand, sandy silt, and sandy clay was also encountered.

5. GROUNDWATER

We did not encounter groundwater or seepage during the site investigation. According to the California Department of Water Resources, several wells in the area indicated a depth to groundwater in excess of 190 feet below the existing ground surface. It is not uncommon for seepage conditions to develop where none previously existed. Groundwater and seepage are dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Faulting

The numerous faults in southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (Bryant and Hart, 2007). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years) but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not within a currently established State of California Alquist-Priolo Earthquake Fault Zone or a Riverside County Fault Hazard Zone for surface fault rupture hazards. No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site.

According to the *Fault Activity Map of California* (2010), 18 known active faults are located within a search radius of 50 miles from the property. The nearest known active fault is the Claremont fault segment of the San Jacinto fault zone, located approximately 2 miles west of the site, and is the dominant source of potential ground motion. Earthquakes that might occur on these fault zones or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. Table 6.1.1 lists the estimated maximum earthquake magnitude for the most dominant faults in relationship to the site location.

TABLE 6.1.1
KNOWN ACTIVE FAULTS WITHIN 50 MILES OF THE SITE

Fault Name	Maximum Earthquake Magnitude (Mw)	Distance from Site (miles)	Direction from Site
San Jacinto (Claremont)	6.7	2	NE
San Jacinto (Casa Loma)	6.9	2.8	E
San Gorgonio Pass	7.6	8	E
Banning	7.2	10	SE
San Andreas (San Bernardino)	8.2	12	NE
San Jacinto	7.8	13	N
San Jacinto (Glen Helen)	6.7	13	N
Elsinore (Main Street)	6.7	21	W
Chino	6.7	22	W
Elsinore (Glen Ivy North)	6.8	23	WSW
Elsinore (Whittier)	6.9	24	W
Morongo Valley	7.2	28	E
Pinto Mountain	7.3	35	E
San Andreas Fault (South Branch)	8.2	40	SE
Burt Mountain	6.8	41	ENE
San Jacinto (Clark)	6.8	43	N
San Andreas Fault (North Branch)	8.2	47	N
Newport-Inglewood	7.5	50	SW

Historic earthquakes in southern California of magnitude 6.0 and greater, their magnitude, distance, and direction from the site are listed in Table 6.1.2.

TABLE 6.1.2
HISTORIC EARTHQUAKE EVENTS WITH REPECT TO THE SITE

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Jacinto	December 25, 1899	6.7	16	SE
San Jacinto	April 21, 1918	6.8	16	SE
Loma Linda Area	July 22, 1923	6.3	6	NW
Long Beach	March 10, 1933	6.4	50	WSW
Buck Ridge	March 25, 1937	6.0	64	ESE
Imperial Valley	May 18, 1940	6.9	51	E
Desert Hot Springs	December 4, 1948	6.0	45	E
Arroyo Salada	March 19, 1954	6.4	77	E
Borrego Mountain	April 8, 1968	6.5	84	SE
San Fernando	February 9, 1971	6.6	84	WNW
Joshua Tree	April 22, 1992	6.1	54	E
Landers	June 28, 1992	7.3	50	ENE
Big Bear	June 28, 1992	6.4	29	NE
Northridge	January 17, 1994	6.7	88	WNW
Hector Mine	October 16, 1999	7.1	73	NE

6.2 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects the earth surface. The potential for ground rupture is considered to be very low due to the absence of active or potentially active faults at the subject site.

6.3 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface, and soil has a relative density less than about 70 percent. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. Due to the lack of a permanent, near-surface groundwater table and the dense to very dense nature of the old alluvial fan deposits, liquefaction potential for the site is negligible and not a design consideration.

6.4 Expansive Soil

The older alluvium generally consists of silty or clayey sands with lesser amounts of sandy silts and sandy clays. Laboratory testing results indicate samples of the near surface soils exhibits a “very low” expansion potential (expansion index [EI] of 20 or less) with test results showing expansion index of 3.

6.5 Hydrocompression

Hydrocompression is the tendency of unsaturated soil structure to collapse upon wetting resulting in the overall settlement of the affected soil and overlying foundations or improvements supported thereon. Potentially compressible soils underlying the site are typically removed and recompacted during remedial site grading. However, if compressible soil is left in-place, a potential for settlement due to hydrocompression of the soil exists.

Soils obtained during our investigation were tested for hydrocompression and exhibited a collapse potential up to 2.2 percent when loaded to the expected post-grading pressures. The test results indicate that the soils are classified as having a "slight" (0.1 to 2.0 percent) to "moderate" (2.1 to 6.0) degree of specimen collapse in accordance with ASTM D5333.

6.6 Seiches and Tsunamis

Seiches are caused by the movement of an inland body of water due to the movement from seismic forces. The site is located approximately 5.1 miles north of Lake Perris. In the unlikely event of a seiche, water is anticipated to be confined to the young alluvial valley channel south of the site.

A tsunami is a series of long-period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The site is located approximately 36 miles from the Pacific Ocean at an elevation greater than 1,500 feet MSL. Therefore, the risk of tsunamis affecting the site is negligible and not a design consideration.

6.7 Inundation

According to the State of California, Department of Water Resources, *Inundation Map for Perris Dam*, dated April 29, 1975, the site is not within an inundation zone due to dam failure. Therefore, inundation due to dam failure is not a design consideration.

6.8 Landslides

Landslides are not mapped on or near the site. Due to the relatively level topography at the site, the potential for landslides at the property or at a location that could impact the site is negligible and not a design consideration.

6.9 Rock Fall Hazards

Rock falls are not a design consideration due to the lack of natural bedrock slopes above and adjacent to the site.

6.10 Slope Stability

Based on the preliminary site plans and relatively level topography at the site, cut and fill slopes are anticipated to be less than 5 feet in height at inclinations no steeper than 2:1 (h:v). In general, permanent, cut slopes and graded fill slopes constructed with on-site soils inclined no steeper than 2:1 (h:v) with vertical heights of 5 feet or less are anticipated to have adequate factors of safety. Fill keys should be constructed in accordance with the standard grading specifications in *Appendix C*. Grading of fill slopes should be designed in accordance with the requirements of Moreno Valley and the 2016 California Building Code (CBC).

7. SITE INFILTRATION

Percolation testing was performed in accordance with the procedures in *Riverside County Flood Control and Water Conservation District LID BMP, Appendix A.* The percolation test locations are depicted on the *Geologic Map* (see Figures 2 and 3).

A 3-inch diameter perforated PVC pipe in silt filter sock was placed in each percolation test hole and approximately 2 inches of gravel was placed at the bottom of the PVC pipe. The test locations were pre-saturated prior to testing. Percolation testing was begun within 24 hours after the holes were presaturated. Percolation data sheets are presented in *Appendix A* of this report. Calculations to convert the percolation test rate to infiltration test rates are presented in Table 7.0 below. Note that the Handbook requires a factor of safety of 3 be applied to the values below based on the test method used.

TABLE 7.0
INFILTRATION TEST RATES FOR PERCOLATION AREAS

Parameter	P-1	P-2	P-3	P-4
Depth (inches)	91.2	79.0	117.4	120.0
Test Type	Normal	Normal	Normal	Normal
Change in head over time: ΔH (inches)	0.1	1.1	0.1	0.5
Average head: Havg (inches)	41.6	11.9	41.0	24.6
Time Interval (minutes): Δt (minutes)	30	30	30	30
Radius of test hole: r (inches)	4	4	4	4
Tested Infiltration Rate: It (inches/hour)	0.01	0.31	0.01	0.07

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 From a geotechnical engineering standpoint, the site is suitable for construction of the proposed auto facility development provided the recommendations presented herein are implemented in design and construction of the project.

8.1.2 Potential geologic hazards at the site include seismic shaking and hydrocompression.

8.1.3 The site is located approximately 2 miles from the nearest active fault. Based on our background research and previous investigation, it is our opinion active, potentially active, or inactive faults do not extend across the site. Risks associated with seismic activity consist of the potential for moderate to strong seismic shaking.

8.1.4 Our field investigation indicates the site is blanketed by undocumented fill over very old alluvium. The undocumented fill and upper portion of the very old alluvium are not considered suitable for the support of compacted fill and settlement-sensitive structures. Remedial grading of the surficial soil will be required as discussed herein. The existing site soils are suitable for re-use as engineered fill provided the recommendations in the *Grading* section of this report are followed.

8.1.5 Soil samples tested for hydrocompression exhibit a collapse potential of up to 2.2 percent for the site. The test results indicate that the degree of specimen collapse would be classified as "moderate" (2.1 to 6.0 percent), in accordance with ASTM D 5333. Remedial grading will assist in reducing the collapse potential of the near-surface soils. However, precautionary measures will be needed to mitigate the potential for hydrocompression of deeper soils. Proper site drainage should be maintained. Landscape planters that saturate the subsurface or storm water infiltration structures should not be used within 20 feet of the proposed building or other on grade improvements. Localized surface settlement should be expected in the vicinity of the storm water infiltration structures or other areas where water is allowed to infiltrate to the subsurface.

8.1.6 Moisture contents in the borings varied and the upper portions were below optimum moisture content. Moisture conditioning of the soils should be expected during construction. Special handling of the soil should be anticipated, particularly if grading occurs during the rainy season.

8.1.7 Although the majority of on-site soils consist of silty and clayey sands, some granular material, having little to no cohesion and subject to caving in unshored excavations, should be expected at the site. It is the responsibility of the contractor to ensure that excavations and trenches are properly shored and maintained in accordance with OSHA rules and regulations to maintain the stability of adjacent existing improvements.

8.1.8 The laboratory tests indicate that the site soils are non-expansive and have a "very low" expansion potential. If medium to highly expansive soils are encountered at the site, they should be exported from the site or selectively graded and placed in the deeper fill areas to allow for the placement of low expansion material at the finish pad grade.

8.1.9 Grading plans were not available for our review, however, cuts and fill of less than 10 feet are anticipated to achieve planned finish grades.

8.1.10 Although not encountered in our exploration, cobbles may be encountered during site grading and may present difficulty for site excavations. The contractor should be prepared to perform site excavations in these conditions.

8.1.11 We did not encounter groundwater during our investigation and do not expect groundwater would impact site improvements. However, wet conditions and seepage could affect proposed construction if grading and improvement operations occur during or shortly after a rain event.

8.1.12 Proper drainage should be maintained in order to preserve the design properties of the fill in the sheet-graded pad and slope areas.

8.1.13 The planned structures can be supported on a shallow foundation system with a slab-on-grade floor system.

8.1.14 Changes in the design, location or elevation of improvements, as outlined in this report, should be reviewed by this office. Once final grading plans become available, they should be reviewed by this office to evaluate the necessity for review and possible revision of this report.

8.1.15 Recommended grading specifications are provided in *Appendix C*.

8.2 Excavation and Soil Characteristics

8.2.1 Excavation of the very old alluvium should be possible with moderate to heavy effort using conventional heavy-duty equipment.

8.2.2 The soil encountered in the field investigation is considered to be "non-expansive" (expansion index [EI] of less than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 8.2.2 presents soil classifications based on the expansion index. Based on the laboratory test results, we expect a majority of the soil encountered will possess a "very low" expansion potential (EI between 0 and 20). Medium to highly expansive soils may be encountered at the site and should not be placed within 4 feet of the proposed foundations, flatwork or paving improvements. Additional testing for expansion potential should be performed during grading and once final grades are achieved.

TABLE 8.2.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	**Very Low**	**Non-Expansive**
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

8.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. *Appendix B* presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the location tested possess a sulfate content of 0.001 percent (10 parts per million [ppm]) equating to an exposure class of "S0" as defined by 2016 CBC Section 1904.3 and ACI 318. Table 8.2.3 presents a summary of concrete requirements set forth by 2016 CBC Section 1904.3 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 8.2.3
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0	**SO_4<0.10**	**No Type Restriction**	**n/a**	**2,500**
S1	0.10≤SO_4<0.20	II	0.50	4,000
S2	0.20≤SO_4≤2.00	V	0.45	4,500
S3	SO_4>2.00	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

8.2.4 Laboratory testing indicates the site soils have a minimum electrical resistivity of 4,600 ohm-cm, possess 98 ppm chloride, 10 ppm sulfate, and a pH of 8.3. As shown in Table 8.2.4 below, the site would not be classified as "corrosive" to buried improvements, in accordance with the Caltrans Corrosion Guidelines (Caltrans, 2018).

TABLE 8.2.4
CALTRANS CORROSION GUIDELINES

Corrosion Exposure	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)	pH
Corrosive	<1,100	500 or greater	1,500 or greater	5.5 or less

8.2.5 Geocon does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

8.3 Seismic Design Criteria

8.3.1 We used the computer program *U.S. Seismic Design Maps*, provided by the California Office of Statewide Health Planning and Development (OSHPD) to evaluate the seismic design criteria. Table 8.3.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements as currently proposed should be designed using a Site Class D in accordance with ASCE 7-10 Section 20.3.1. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10 using blow count data presented on the boring logs in *Appendix A*. The values presented in Table 8.3.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 8.3.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	2.146g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.971g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.00	Table 1613.3.3(1)
Site Coefficient, F_V	1.50	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	2.146g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	1.457g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.431g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.971g	Section 1613.3.4 (Eqn 16-40)

8.3.2 Table 8.3.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 8.3.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Site Class	D	Section 1613.3.2
Mapped MCE_G Peak Ground Acceleration, PGA	0.83g	Figures 2 through 42-7
Site Coefficient, F_{PGA}	1.00	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.83g	Section 11.8.3 (Eqn 11.8-1)

8.3.3 Conformance to the criteria in Tables 8.3.1 and 8.3.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

8.4 Temporary Excavations

8.4.1 The recommendations included herein are provided for temporary excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

8.4.2 Excavations on the order of 5 to 15 feet in vertical height are expected during grading operations and utility installation. The contractor's competent person should evaluate the necessity for lay back of vertical cut areas. Vertical excavations up to 5 feet may be attempted where loose soils or caving sands are not present, and where not surcharged by existing structures or vehicle/construction equipment loads.

8.4.3 Vertical excavations greater than 5 feet will require sloping measures in order to provide a stable excavation. We expect that sufficient space is available to complete the majority of the required earthwork for this project using sloping measures. If necessary, compound excavation, slot-cutting, and or shoring recommendations will be provided in an addendum.

8.4.4 Where sufficient space is available, temporary unsurcharged embankments may be sloped back at a uniform 1.5:1 (h:v) slope gradient or flatter. A uniform slope does not have a vertical portion.

8.4.5 Where sloped embankments are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. The contractor's personnel should inspect the soil exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. Excavations should be stabilized within 30 days of initial excavation.

8.5 Grading

8.5.1 Grading should be performed in accordance with the recommendations provided in this report, the *Recommended Grading Specifications* contained in *Appendix C* and Moreno Valley Standards.

8.5.2 Prior to commencing grading, a pre-construction conference should be held at the site with the owner/developer, city inspector, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling requirements can be discussed at that time.

8.5.3 Site preparation should begin with the removal of deleterious material, debris, buried trash, and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

8.5.4 Undocumented fill and the upper portion of the very old alluvium in the building areas should be removed to expose competent older alluvium. Based on our findings, we expect the existing soils within approximately 5 feet of the existing ground surface will require remedial excavation and proper compaction. Areas of loose, dry, or compressible soils will require additional excavation and processing prior to fill placement. Removals should extend at least 3 feet below the bottom of the planned foundations, and the excavations should be extended laterally a minimum distance of 5 feet beyond the building footprint or for a distance equal to the depth of removal, whichever is greater. Where the lateral over-excavation is not possible, structural setbacks or deepened footings may be required.

8.5.5 Removals in pavement and walkway areas should extend at least 2 feet beneath the pavement or flatwork subgrade elevation.

8.5.6 The actual depth of removal should be evaluated by the engineering geologist during grading operations. Deeper excavations may be required if dry, loose, soft, or porous materials are present at the base of the removals. The bottom of the excavations should be scarified to a depth of at least 1 foot, moisture conditioned as necessary, and properly compacted.

8.5.7 The site should then be brought to final subgrade elevations with fill compacted in layers. In general, soil native to the site is suitable for use as fill if free from vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content, as determined in accordance with ASTM D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content shortly before paving operations.

8.5.8 Import fill soil (if necessary) should consist of granular materials with a “very low” expansion potential (EI of less than 20), free of deleterious material and rock fragments larger than 6 inches and should be compacted as recommended herein. Geocon should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

8.5.9 Foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer, prior to placing fill, steel, gravel or concrete.

8.6 Utility Trench Backfill

8.6.1 Utility trenches should be properly backfilled in accordance with the requirements of Moreno Valley and the latest edition of the *Standard Specifications for Public Works Construction* (Greenbook). The pipes should be bedded with well graded crushed rock or clean sands (Sand Equivalent greater than 30) to a depth of at least one foot over the pipe. The bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of well graded crushed rock is only acceptable if used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. Backfill of utility trenches should not contain rocks greater than 3 inches in diameter. The use of 2-sack slurry and controlled low strength material (CLSM) are also acceptable as backfill. However, consideration should be given to the possibility of differential settlement where the slurry ends and earthen backfill begins. These transitions should be minimized and additional stabilization should be considered at these transitions.

8.6.2 Trench excavation bottoms must be observed and approved in writing by the Geotechnical Engineer, prior to placing bedding materials, fill, gravel, or concrete.

8.7 Earthwork Grading Factors

8.7.1 Estimates of shrinkage factors are based on empirical judgments comparing the material in its existing or natural state as encountered in the exploratory excavations to a compacted state. Variations in natural soil density and in compacted fill density render shrinkage value estimates very approximate. As an example, the contractor can compact the fill to a dry density of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has an approximately 10 percent range of control over the fill volume. Based on our experience and the densities measured during our investigation, the shrinkage of undocumented fill and older alluvium soil is expected to be on the order of 0 to 10 percent when compacted to at least 90 percent of the laboratory maximum dry density. This estimate is for preliminary quantity estimates only. Due to the variations in the actual shrinkage/bulking factors, a balance area should be provided to accommodate variations

8.8 Foundation and Concrete Slab-On-Grade Recommendations

8.8.1 The foundation recommendations presented herein are for the proposed buildings subsequent to the recommended grading assuming that the buildings are founded in soils with a low expansion potential. If soils with a medium or high expansion potential are placed within 4 feet of finish grade, then Geocon should be contacted for additional recommendations. The proposed structure can be supported on a shallow foundation system bearing in newly placed compacted fill.

8.8.2 Foundations for the structure should consist of either continuous strip footings and/or isolated spread footings. Continuous footings should be at least 18 inches wide and extend at least 18 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 24 inches and should also extend at least 18 inches below lowest adjacent pad grade. A wall/column footing dimension detail depicting footing embedment is provided on Figure 3.

8.8.3 From a geotechnical engineering standpoint, concrete slabs-on-grade for the structure should be at least 4 inches thick and be reinforced with at least No. 3 steel reinforcing bars placed 24 inches on center in both directions. The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slab for supporting equipment and storage loads. A thicker concrete slab may be required for heavier loading conditions. To reduce the effects of differential settlement on the foundation system, thickened slabs and/or an increase in steel reinforcement can provide a benefit to reduce concrete cracking.

8.8.4 Steel reinforcement for continuous footings should consist of at least two No. 4 steel reinforcing bars placed horizontally in the footings, one near the top and one near the bottom. Steel reinforcement for the spread footings should be designed by the project structural engineer.

8.8.5 The recommendations presented herein are based on soil characteristics only (EI of 20 or less) and are not intended to replace steel reinforcement required for structural considerations.

8.8.6 Foundations may be designed for an allowable soil bearing pressure of 3,500 pounds per square foot (psf) (dead plus live load). The value presented herein is for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

8.8.7 The maximum expected static settlement for the planned structures supported on conventional foundation systems with the above allowable bearing pressure and deriving support in engineered fill is estimated to be 1 inch and to occur below the heaviest loaded structural element. Differential settlement is estimated to be on the order of ½ inch over a horizontal distance of 40 feet. Once the design and foundation loading configuration proceeds to a more finalized plan, the estimated settlements within this report should be reviewed and revised, if necessary

8.8.8 Once the design and foundation loading configuration proceeds to a more finalized plan, the estimated settlements within this report should be reviewed and revised, if necessary.

8.8.9 Slabs-on-grade that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) and should be installed in general conformance with ASTM E1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, the concrete slab-on-grade may be underlain by a vapor retarder over 4 inches of clean sand (sand equivalent greater than 30), since the sand will serve as a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

8.8.10 The bedding sand thickness should be evaluated by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 4 inches. Placement of 3 inches and 4 inches of sand is common practice in southern California for 5-inch and 4-inch thick slabs, respectively. The foundation engineer should provide appropriate concrete mix design criteria and curing measures that may be utilized to assure proper curing of the slab to reduce the potential for rapid moisture loss and subsequent cracking and/or slab curl.

8.8.11 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

8.8.12 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil, or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

8.8.13 Geocon should be consulted to provide additional design parameters as required by the structural engineer.

8.9 Concrete Flatwork

8.9.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with No. 3 reinforcing bars spaced 24 inches on center in each direction to reduce the potential for wide cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete.

8.9.2 Even with the incorporation of the recommendations within this report, the exterior concrete flatwork has a likelihood of experiencing some movement due to swelling or settlement; therefore, the steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

8.9.3 Where exterior flatwork abuts structures at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

8.9.4 The recommendations presented herein are intended to reduce the potential for cracking as a result of differential movement. However, even with the incorporation of the recommendations presented herein, concrete will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

8.10 Conventional Retaining Walls

8.10.1 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 10 feet. In the event that walls higher than 10 feet or other types of walls are planned, Geocon should be consulted for additional recommendations.

8.10.2 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal to vertical), an active soil pressure of 60 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an EI of 50 or less. For walls where backfill materials do not conform to the criteria herein, Geocon should be consulted for additional recommendations.

8.10.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls with a level backfill surface should be designed for a soil pressure equivalent to the pressure exerted by a fluid density of 55 pcf.

8.10.4 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, proposed retaining walls in excess of 6 feet in height should be designed with seismic lateral pressure (Section 1803.5.12 of the 2016 CBC).

8.10.5 A seismic load of 10 pcf should be used for design of walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is applied as an equivalent fluid pressure along the height of the wall and the calculated loads result in a maximum load exerted at the base of the wall and zero at the top of the wall. This seismic load should be applied in addition to the active earth pressure. The earth pressure is based on half of two-thirds of PGA_M calculated from ASCE 7-10 Section 11.8.3.

8.10.6 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

8.10.7 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The soil immediately adjacent to the backfilled retaining wall should be composed of free draining material completely wrapped in Mirafi 140N (or equivalent) filter fabric for a lateral distance of 1 foot for the bottom two-thirds of the height of the retaining wall. The upper one-third should be backfilled with less permeable compacted fill to reduce water infiltration. Alternatively, a drainage panel, such as a Miradrain 6000 or equivalent, can be placed along the back of the wall. A typical drain detail for each option is shown on Figure 4. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted backfill (EI of 50 or less) with no hydrostatic forces or imposed surcharge load. If conditions different than those described are expected or if specific drainage details are desired, Geocon should be contacted for additional recommendations.

8.10.8 Wall foundations should be designed in accordance with the above foundation recommendations.

8.11 Lateral Loading

8.11.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid density of 350 pounds per cubic foot (pcf) should be used for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

8.11.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.40 should be used for design. The friction coefficient may be reduced depending on the vapor barrier or waterproofing material used for construction in accordance with the manufacturer's recommendations.

8.11.3 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

8.12 Preliminary Pavement Recommendations

8.12.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) and Moreno Valley specifications using a range of Traffic Indices. The project civil engineer and owner should evaluate the final Traffic Index for the pavements and review the pavement designations to determine appropriate locations for pavement thickness. Based on our laboratory testing we have used a preliminary R-value of 30 for the subgrade soils for the purposes of this analysis. The final pavement sections should be based on the R-value of the subgrade soil encountered at final subgrade elevation. Table 8.12.1 presents the preliminary flexible pavement sections.

TABLE 8.12.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Driveways for automobiles and light-duty vehicles	5.5	30	3.0	7.0
Medium truck traffic areas	6.0	30	3.5	8.0
Driveways for heavy truck and fire truck traffic	7.0	30	4.0	10.0
Collector Roadways	8.0	30	5.0	11.0

8.12.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

8.12.3 Base materials should conform to Section 26 of the *Standard Specifications for The State of California Department of Transportation (Caltrans)*. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*.

8.12.4 A rigid Portland cement concrete (PCC) pavement section should be placed in heavy truck areas, driveway aprons, and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R *Guide for Design and Construction of Concrete Parking Lots* using the parameters presented in Table 8.12.4.

TABLE 8.12.4
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	150 pci
Modulus of rupture for concrete, M_R	500 psi
Traffic Category, TC	C and D
Average daily truck traffic, ADTT	100 and 700

8.12.5 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 8.12.5.

TABLE 8.12.5
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Automobile Parking Stalls (TC=C)	6.5
Heavy Truck and Fire Lane Areas (TC=D)	7.5

8.12.6 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch).

8.12.7 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., 6-inch and 7.5-inch-thick slabs would have an 8- and 9.5-inch-thick edge, respectively). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

8.12.8 In order to control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab in accordance with the referenced ACI report.

8.12.9 The performance of pavements is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement surfaces will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

8.13 Temporary Excavations

8.13.1 Excavations on the order of 5 to 15 feet below the existing ground surface are expected for construction of the proposed utility improvements; and we expect that the proposed utilities will be installed with conventional cut-and-cover methods.

8.13.2 The excavations will expose fill and very old alluvial soils which are suitable for vertical excavations up to 5 feet where loose soils or caving sands are not present and where not surcharged by adjacent traffic or structures.

8.13.3 Vertical excavations greater than 5 feet will require sloping measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments should be designed by the contractor's competent person in accordance with OSHA regulations.

8.13.4 Where there is insufficient space for sloped excavations, shoring or trench shields should be used to support excavations. Shoring may also be necessary where sloped excavation could remove vertical or lateral support of existing improvements, including existing utilities and adjacent structures. Recommendations for temporary shoring can be provided in an addendum if needed.

8.13.5 Where sloped embankments are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. The contractor's competent person should inspect the soils exposed in the cut slopes during excavation in accordance with OSHA regulations so that modifications of the slopes can be made if variations in the soil conditions occur.

8.14 Site Drainage and Moisture Protection

8.14.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

8.14.2 Landscape planters that saturate the subsurface should not be used within 20 feet of the proposed structure or other settlement sensitive on grade improvements. Localized surface settlement should be anticipated in areas where water is allowed to infiltrate into the subsurface.

8.14.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

8.14.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

8.14.5 If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to infiltration areas. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeology study at the site. Down-gradient and adjacent structures may be subjected to seeps, movement of foundations and slabs, or other impacts as a result of water infiltration.

8.15 Grading and Foundation Plan Review

8.15.1 Geocon should review the project grading and foundation plans prior to final design submittal to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations, if necessary.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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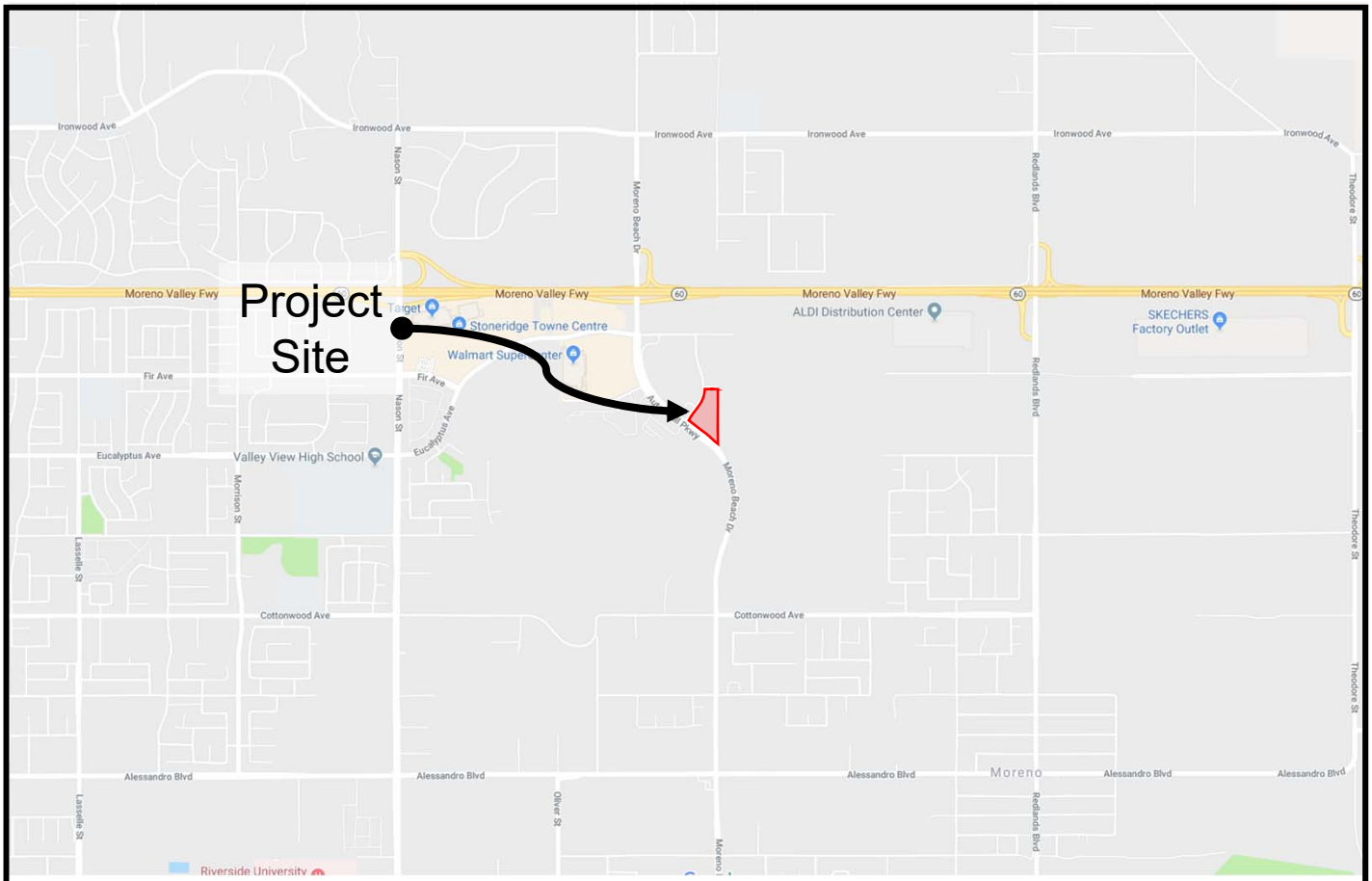

N

1000 ft

SOURCE: Google Maps, 2019

VICINITY MAP

GEOCON
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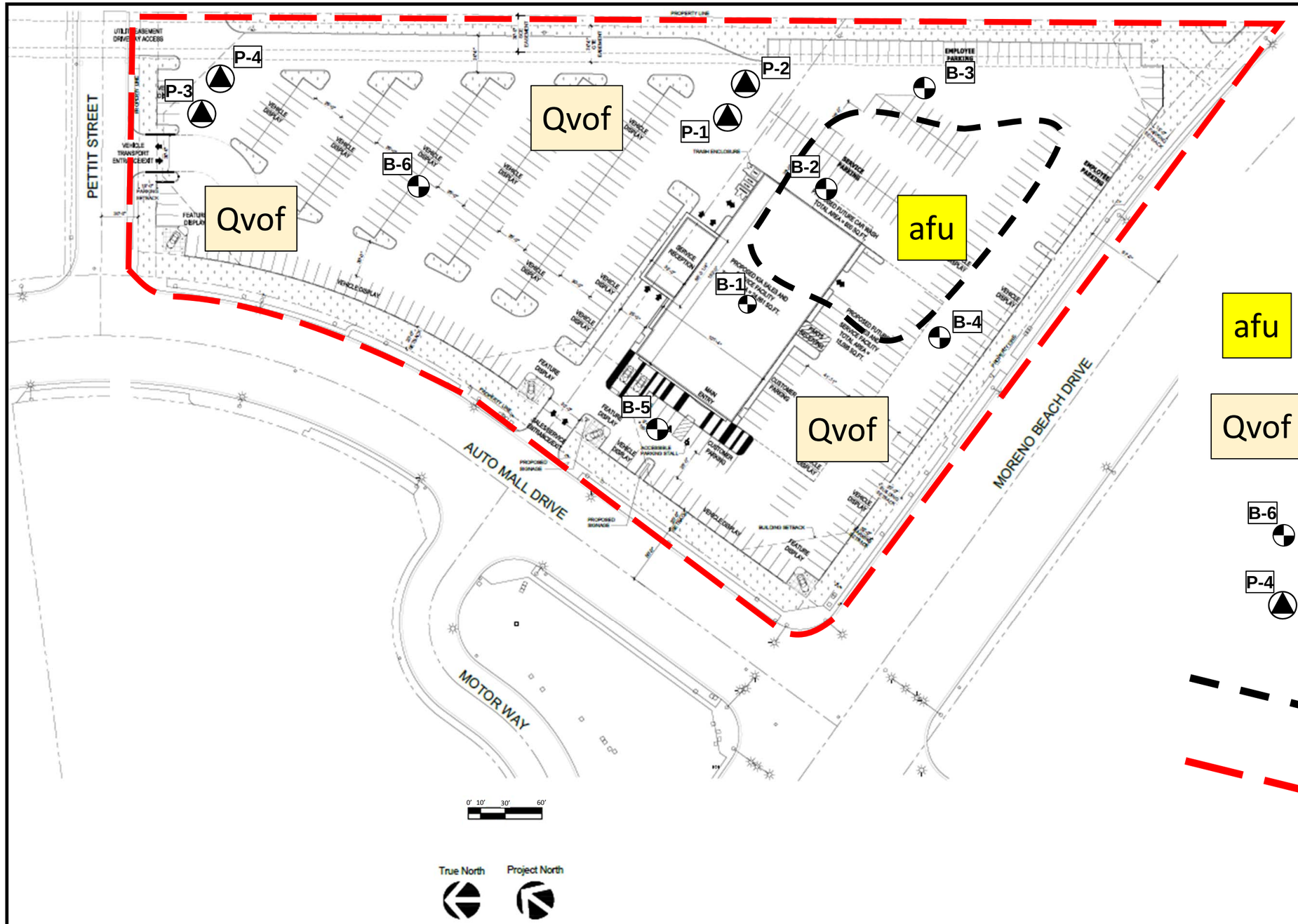
PHONE 951-304-2300 FAX 951-304-2392

PDT		

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019	PROJECT NO. T2844-22-01	FIG. 1



GEOCON LEGEND

Locations are approximate

afu ..... UNDOCUMENTED FILL

Qvof ..... VERY OLD ALLUVIAL FAN DEPOSITS

B-6 ..... BORING LOCATION

P-4 ..... PERCOLATION TEST LOCATION

..... GEOLOGIC CONTACT

..... LIMITS OF THIS REPORT

Source: Carlile Coatsworth Architects, Inc., dated January 17, 2019

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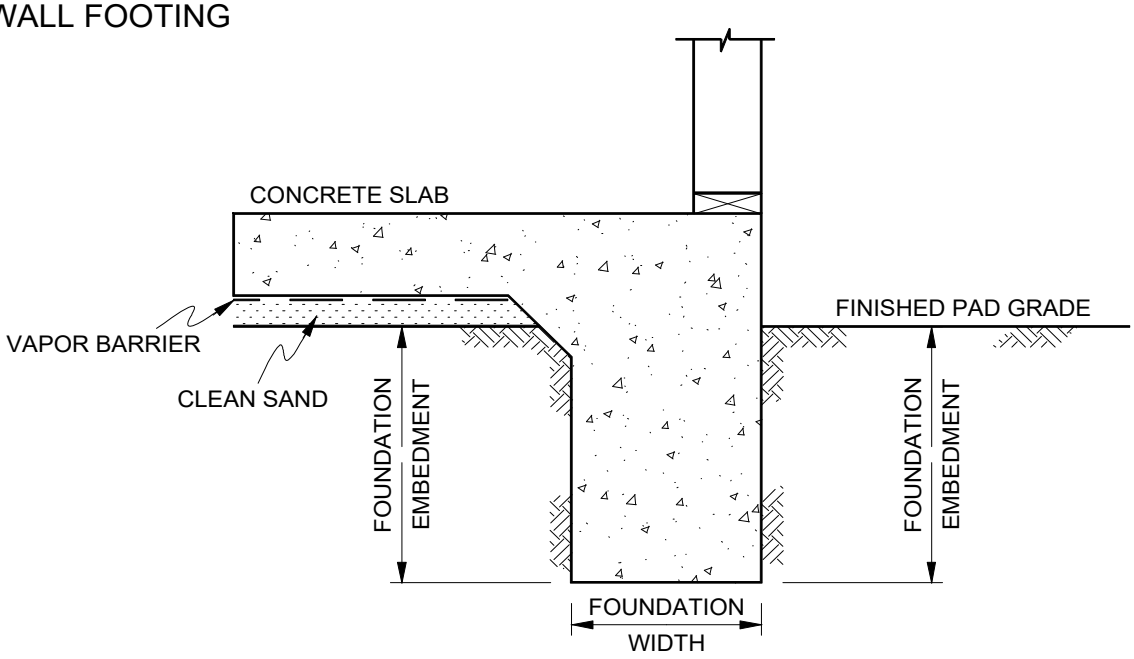
GEOLOGIC MAP

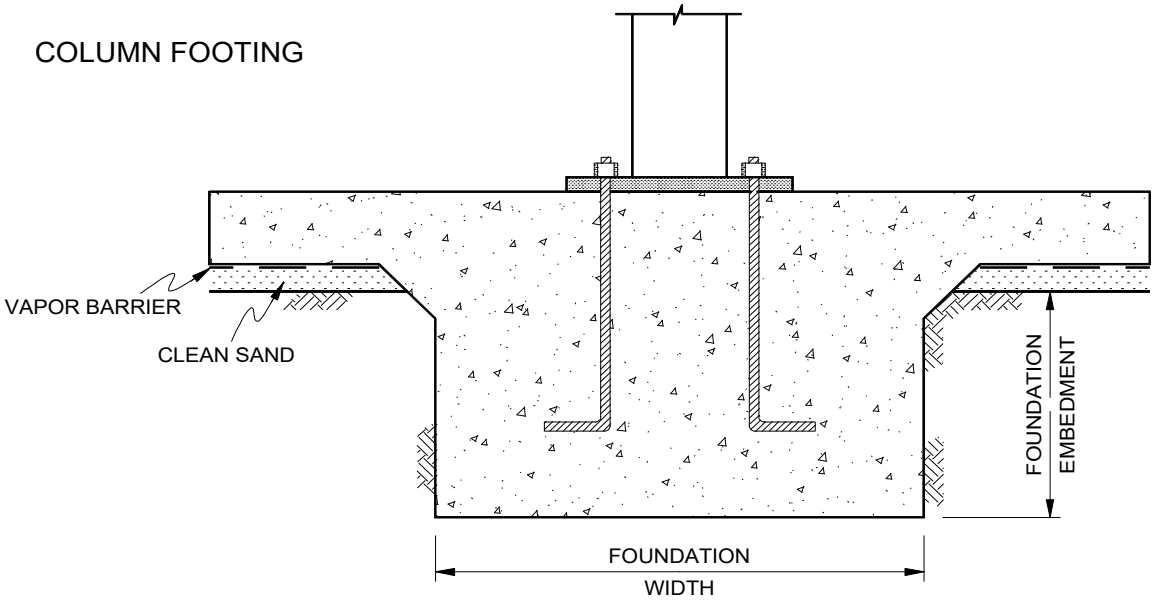
KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019 | PROJECT NO. T2844-22-01 | FIG. 2

WALL FOOTING



COLUMN FOOTING



NOTE: SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

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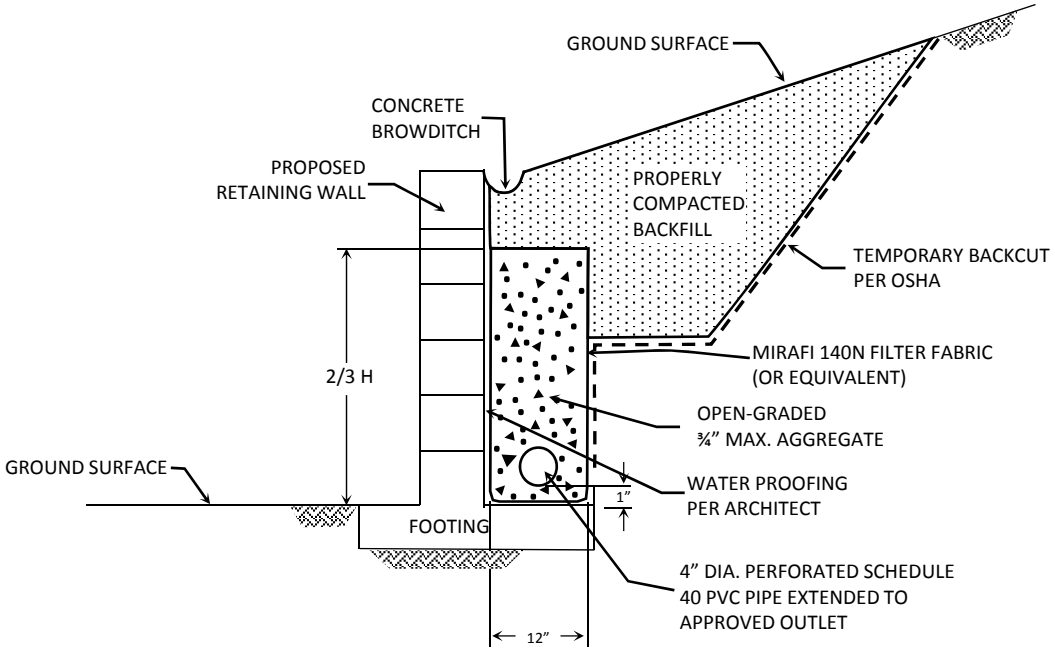
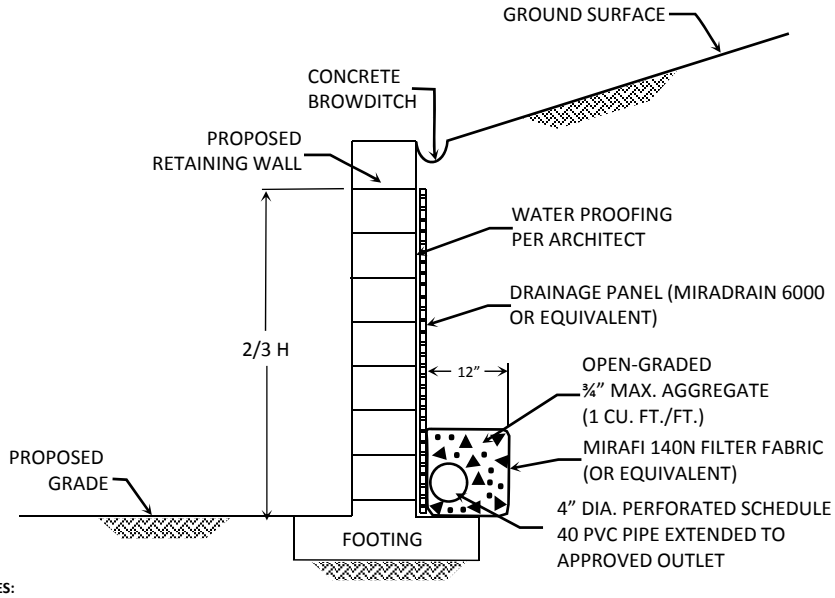
WALL / COLUMN FOOTING DETAIL

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019	PROJECT NO. T2844-22-01	FIG. 3





NOTES:

DRAIN SHOULD BE UNFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPIMG

CONCRETE BROW DITCH RECOMMENDED FOR SLOPE HEIGHTS
GREATER THAN 6 FEET

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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PDT		

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019	PROJECT NO. T2367-22-02	FIG. 4

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

Field work for our investigation included a subsurface exploration, soil sampling, and percolation testing. The *Geologic Map*, Figure 2 presents the locations of the exploratory borings. Boring logs and an explanation of the geologic units encountered are presented in figures following the text in this appendix. We located the borings in the field using existing reference points. Therefore, actual boring locations may deviate slightly. We performed a field investigation on December 17, 2018 which consisted of drilling 10 exploratory borings to a maximum depth of approximately 51½ feet below existing grade with a CME 75 drill rig equipped with 8-inch-diameter hollow-stem auger.

We collected bulk and relatively undisturbed samples from the borings by driving a 3-inch O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a 140-pound hammer falling 30 inches on an auto hammer. The California Modified Sampler was equipped with 1-inch high by 2$^{3}/_{8}$-inch inside diameter brass sampler rings to facilitate removal and testing. Relatively undisturbed samples and bulk samples of disturbed soils were transported to our laboratory for testing. The type of sample is noted on the exploratory boring logs.

The samplers were driven 18 inches into the bottom of the excavations. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler if driven 18 inches. If the sampler was not driven for 18 inches, an approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values, adjustments have not been applied. We estimated elevations shown on the boring logs from a topographic map.

We visually examined the soil conditions encountered within the borings, classified, and logged in general accordance with the Unified Soil Classification System (USCS). Logs of the borings are presented on Figures A-1 through A-10. The logs depict the general soil and geologic conditions encountered and the depth at which we obtained the samples.

Percolation testing was performed on December 18, 2018 in accordance with *Riverside County Flood Control and Water Conservation District, LID BMP Manual, Appendix A.* The percolation tests were run in accordance with *Section 2.3., Shallow Percolation Test*. The percolation test data is presented on Figures A-11 and A-14.

PROJECT NO. T2844-22-01

BORING B-1

ELEV. (MSL.) **1756** DATE COMPLETED **12/17/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PDT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B-1@0-5'			SM	**UNDOCUMENTED FILL (afu)** Silty SAND, loose, dry, reddish brown; fine to medium sand; some gravel and cobble; some concrete chunks			
2								
	B-1@2.5'			SM	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Silty SAND, very dense, damp, light brown; fine to coarse sand	85	124.6	4.6
4								
	B-1@5'				-Becomes dark reddish brown; damp; trace coarse sand; trace gravel; trace carbonate stringers	80	130.4	5.3
6								
8	B-1@7.5				-Becomes dense, moist; fine sand; some mica	56	125.4	7.8
10	B-1@10'				-Some medium sand	69	132.9	7.9
				ML	Sandy SILT, hard, moist, dark gray; fine sand; trace medium sand			
12								
14					-Becomes dark brown; some clay			
	B-1@15'			SM	Silty SAND, dense, moist, reddish brown; fine to medium sand; trace mica	60		
16								
18								
20	B-1@20				-Becomes very dense	80	126.0	10.8
22								
24								
	B-1@25'				-Becomes medium dense	44		
26								
28								

Figure A-1,
Log of Boring B-1, Page 1 of 2

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2844-22-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING B-1** ELEV. (MSL.) **1756** DATE COMPLETED **12/17/2018** EQUIPMENT **HOLLOW STEM AUGER** BY: **PDT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B-1@30'			SM	Silty SAND, medium dense, moist, reddish brown; trace coarse sand; trace gravel; increase in silt	12		
32								
34								
36	B-1@35'				-Becomes brownish red; fine sand; trace medium sand	44		
38								
40	B-1@40'				-Some carbonate stringers	23		
42								
44								
46	B-1@45'				-Becomes dense; strong brown; fine to mediun sand; carbonate stringers; micaceous	62		
48								
50	B-1@50					34		
					Total depth 51.5 feet Groundwater not encountered Penetration resistance for 140-lb hammer falling 30" by auto-hammer Backfilled with cuttings 4/9/2018			

Figure A-1,
Log of Boring B-1, Page 2 of 2

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2844-22-01

BORING B-2

ELEV. (MSL.) **1753** DATE COMPLETED **12/17/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PDT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND, medium dense, dry, reddish brown; fine to medium sand			
2	B-2@2.5'					50/6"	117.3	6.2
4				ML	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Sandy SILT, stiff, damp, light brown; fine sand			
6	B-2@5-10 B-2@5'					33	96.7	9.6
8	B-2@7.5'				-Becomes moist moist, dark brown; micaceous	21	106.1	11.5
10	B-2@10'					24	102.9	10.3
12								
14				SM	Silty SAND, medium dense, moist, strong brown; fine sand			
16	B-2@15'					40		
18								
20	B-2@20'					42	128.0	4.5
22								
24								
26	B-2@25'				-Becomes dense	63		
					Total depth 26.5 feet Groundwater not encountered Penetration resistance for 140-lb hammer falling 30" by auto-hammer Backfilled with cuttings 4/9/2018			

Figure A-2,
Log of Boring B-2, Page 1 of 1

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2844-22-01

BORING B-3

ELEV. (MSL.) **1751** DATE COMPLETED **12/17/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PDT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND, loose, dry, reddish brown; fine to medium sand; some gravel and cobble			
2				SM	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Silty SAND, very dense, damp, brownish red; fine to medium sand; carbonate stringers			
	B-3@2.5'					50/6"		
4								
	B-3@5-10'				-Becomes moist; strong brown	50/6"	127.9	7.5
6	B-3@5'							
	B-3@7.5'				-Trace carbonate stringers; micaceous	50/6"		
8				ML	Sandy SILT, hard, moist, dark brown; fine sand			
10	B-3@10'					44		
12								
				CL	Sandy CLAY, stiff, moist, dark brown; fine sand			
14								
	B-3@15'					14	117.1	11.1
16								
				SC	Clayey SAND, medium dense, moist, reddish brown, fine to coarse sand; trace carbonate stringers			
18								
20	B-3@20'					44		
					Total depth 21.5 feet Groundwater not encountered Penetration resistance for 140-lb hammer falling 30" by auto-hammer Backfilled with cuttings 12/17/2018			

T2843-22-01 BORING LOGS.GPJ

Figure A-3,
Log of Boring B-3, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2844-22-01

BORING B-4

ELEV. (MSL.) **1756** DATE COMPLETED **12/17/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **ATS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND, dense, damp, brown; fine sand; some coarse sand; trace gravel			
2								
4	B-4@2.5' B-4@2.5-7.5'			SM	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Silty SAND, very dense, damp, light brown; fine sand; some medium and coarse sand; trace mica; root hairs	50/5"		
6	B-4@5'				-Becomes dense, strong brown; trace pinhole porosity; micaceous	63		
8	B-4@7.5'				-Becomes very dense; moist	85	130.9	7.0
10	B-4@10'				-Becomes dense; dark gray; fine sand	53		
12								
14								
16	B-4@15'				-Becomes very dense; brownish gray; some medium and coarse sand	50/5"		
18								
20	B-4@20'			SC	Clayaey SAND, medium dense, damp, reddish brown; fine sand; some coarse sand	42	135.2	6.1
					Total depth 21.5 feet Groundwater not encountered Penetration resistance for 140-lb hammer falling 30" by auto-hammer Backfilled with cuttings 12/17/2018			

Figure A-4,
Log of Boring B-4, Page 1 of 1

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2844-22-01

BORING B-5

ELEV. (MSL.) **1755** DATE COMPLETED **12/17/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **ATS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B-5@0-5'			SM	**UNDOCUMENTED FILL (afu)** Silty SAND, dense, damp, brown; fine sand; some coarse sand; trace gravel			
2								
	B-5@2.5'			SM	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Silty SAND, very dense, moist, light brown; fine sand; some medium and coarse sand; trace mica; root hairs	66	116.6	6.5
4								
	B-5@5'				-Becomes very dense, moist, strong brown; pinhole porosity; micaceous	50/4"	134.1	7.6
6								
8	B-5@7.5'			SC	Clayey SAND, very dense, moist, dark brown; fine sand; trace medium and coarse sand; trace gravel; pinhole porosity; trace mica	50/6"	130.7	7.8
10	B-5@10'				-Becomes dense; reddish brown	50		
12								
14								
	B-5@15'				-Becomes brown	57	132.4	6.1
16								
18								
20	B-5@20'			SM	Silty SAND, medium dense, moist, light brown; fine sand; some medium and coarse sand; pinhole porosity	32		
					Total depth 21.5 feet Groundwater not encountered Penetration resistance for 140-lb hammer falling 30" by auto-hammer Backfilled with cuttings 12/17/2018			

Figure A-5,
Log of Boring B-5, Page 1 of 1

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. T2844-22-01

BORING B-6

ELEV. (MSL.) **1752** DATE COMPLETED **12/17/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **ATS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B-6@0-5'			SM	**UNDOCUMENTED FILL (afu)** Silty SAND, dense, damp, brown; fine sand; trace gravel; root hairs			
2								
	B-6@2.5'			SP	Poorly Graded SAND, very dense, moist, light yellowish brown; fine sand; some medium and coarse sand; trace mica	50/5"	129.6	6.0
4								
	B-6@5'			SC	Clayey SAND, very dense, moist, light reddish brown; fine sand; pinhole porosity	50/6"		
6								
	B-6@7.5'			SM	Silty SAND, very dense, moist, grayish brown; fine sane; pinhole porosity	50/6"	131.5	6.0
8								
10	B-6@10'					50/6"		
12								
14								
	B-6@15'			SC	Clayey SAND, dense, moist, gray, fine sand	72		
16								
					Total depth 16.5 feet Groundwater not encountered Penetration resistance for 140-lb hammer falling 30" by auto-hammer Backfilled with cuttings 12/17/2018			

Figure A-6,
Log of Boring B-6, Page 1 of 1

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. T2844-22-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING P-1** ELEV. (MSL.) **1751** DATE COMPLETED **12/17/2018** EQUIPMENT **HOLLOW STEM AUGER** BY: **ATS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND, medium dense, dry, medium brown; fine sand; some medium and coarse sand			
2				SM	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Silty SAND, dense, damp, brown; fine to medium sand; some coarse sand; trace gravel			
4								
6								
	P-1@7-8'							
8					Total depth 8 feet Groundwater not encountered Set as Percolation Test P-1 Backfilled with cuttings 12/18/2018			

Figure A-7,
Log of Boring P-1, Page 1 of 1

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. T2844-22-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING P-2** ELEV. (MSL.) **1751** DATE COMPLETED **12/17/2018** EQUIPMENT **HOLLOW STEM AUGER** BY: **ATS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND, medium dense, dry, medium brown; fine sand; some medium and coarse sand			
2				SM	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Silty SAND, dense, damp, brown; fine to medium sand; some coarse sand; trace gravel			
4								
6	P-2@6-7"							
					Total depth 7 feet Groundwater not encountered Set as Percolation Test P-2 Backfilled with cuttings 12/18/2018			

Figure A-8,
Log of Boring P-2, Page 1 of 1

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. T2844-22-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING P-3** ELEV. (MSL.) **1751** DATE COMPLETED **12/17/2018** EQUIPMENT **HOLLOW STEM AUGER** BY: **ATS**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**UNDOCUMENTED FILL (afu)** Clayey SAND, medium dense, damp, medium brown; fine sand; some coarse sand			
2				SC	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Clayey SAND, dense, damp, light olive brown; fine sand; some coarse sand			
4								
6				SM	Silty SAND, dense, damp, medium brown; fine sand			
8								
	P-3@9-10			ML	Sandy SILT, stiff, moist, dark yellowish brown; fine to medium sand; trace coarse sand			
10					Total depth 10 feet Groundwater not encountered Set as Percolation Test P-3 Backfilled with cuttings 12/18/2018			

Figure A-9,
Log of Boring P-3, Page 1 of 1

T2843-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. T2844-22-01

BORING P-4

ELEV. (MSL.) **1752** DATE COMPLETED **12/17/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **ATS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**UNDOCUMENTED FILL (afu)** Clayey SAND, medium dense, damp, medium brown; fine sand; some coarse sand			
2				SC	**VERY OLD ALLUVIAL FAN DEPOSITS (Qvof)** Clayey SAND, dense, damp, light olive brown; fine sand; some coarse sand			
4								
6				SM	Silty SAND, dense, damp, medium brown; fine sand			
8								
10	P-4@9-10			ML	Sandy SILT, stiff, moist, dark yellowish brown; fine to medium sand; trace coarse sand			

Total depth 10 feet
Groundwater not encountered
Set as Percolation Test P-4
Backfilled with cuttings 11/27/2018

T2843-22-01 BORING LOGS.GPJ

Figure A-10,
Log of Boring P-4, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PERCOLATION TEST REPORT

Project Name:		KIA Moreno Valley			**Project No.:**		T2844-22-01
Test Hole No.:		P-1			**Date Excavated:**		12/17/2018
Length of Test Pipe:			108.0	inches	**Soil Classification:**		SM
Height of Pipe above Ground:			16.8	inches	**Presoak Date:**		12/17/2018
Depth of Test Hole:			91.2	inches	**Perc Test Date:**		12/18/2018
Check for Sandy Soil Criteria Tested by:				SP	**Percolation Tested by:**		SP
Water level measured from bottom of hole							

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Level (in)	Final Water Level (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	8:52 AM 9:17 AM	25	25	43.2	43.1	0.1	208
2	9:17 AM 9:42 AM	25	50	43.1	43.0	0.1	208
			Soil Criteria: Normal				

Percolation Test

Reading No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Head (in)	Final Water Head (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	9:42 AM 10:12 AM	30	30	43.1	43.0	0.1	250
2	10:12 AM 10:42 AM	30	60	43.0	42.8	0.1	250
3	10:42 AM 11:12 AM	30	90	42.8	42.6	0.2	125
4	11:12 AM 11:42 AM	30	120	42.6	42.5	0.1	250
5	11:42 AM 12:12 PM	30	150	42.5	42.4	0.1	250
6	12:12 PM 12:42 PM	30	180	42.4	42.2	0.1	250
7	12:42 PM 1:12 PM	30	210	42.2	42.1	0.1	250
8	1:12 PM 1:42 PM	30	240	42.1	42.0	0.1	250
9	1:42 PM 2:12 PM	30	270	42.0	41.9	0.1	250
10	2:12 PM 2:42 PM	30	300	41.9	41.8	0.1	250
11	2:42 PM 3:12 PM	30	330	41.8	41.6	0.1	250
12	3:12 PM 3:42 PM	30	360	41.6	41.5	0.1	250

Infiltration Rate (in/hr):			0.01				
Radius of test hole (in):			4				**Figure A-11**
Average Head (in):			41.6				

PERCOLATION TEST REPORT

Project Name:		KIA Moreno Valley			**Project No.:**		T2844-22-01
Test Hole No.:		P-2			**Date Excavated:**		12/17/2018
Length of Test Pipe:			95.8	inches	**Soil Classification:**		SM
Height of Pipe above Ground:			16.8	inches	**Presoak Date:**		12/17/2018
Depth of Test Hole:			79.0	inches	**Perc Test Date:**		12/18/2018
Check for Sandy Soil Criteria Tested by:				SP	**Percolation Tested by:**		SP
Water level measured from bottom of hole							

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Level (in)	Final Water Level (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	8:56 AM 9:21 AM	25	25	23.4	23.0	0.4	69
2	9:21 AM 9:46 AM	25	50	23.0	22.9	0.1	208
			Soil Criteria: Normal				

Percolation Test

Reading No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Head (in)	Final Water Head (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	9:46 AM 10:16 AM	30	30	22.9	22.6	0.4	83
2	10:16 AM 10:46 AM	30	60	22.6	22.2	0.4	83
3	10:46 AM 11:16 AM	30	90	22.2	21.4	0.8	36
4	11:16 AM 11:46 AM	30	120	21.4	20.2	1.2	25
5	11:46 AM 12:16 PM	30	150	20.2	19.1	1.1	28
6	12:16 PM 12:46 PM	30	180	19.1	18.0	1.1	28
7	12:46 PM 1:16 PM	30	210	18.0	16.8	1.2	25
8	1:16 PM 1:46 PM	30	240	16.8	15.7	1.1	28
9	1:46 PM 2:16 PM	30	270	15.7	14.6	1.1	28
10	2:16 PM 2:46 PM	30	300	14.6	13.6	1.1	28
11	2:46 PM 3:16 PM	30	330	13.6	12.5	1.1	28
12	3:16 PM 3:46 PM	30	360	12.5	11.4	1.1	28

Infiltration Rate (in/hr):			0.31				
Radius of test hole (in):			4				**Figure A-12**
Average Head (in):			11.9				

PERCOLATION TEST REPORT

Project Name:		KIA Moreno Valley			**Project No.:**		T2844-22-01
Test Hole No.:		P-3			**Date Excavated:**		12/17/2018
Length of Test Pipe:			119.8	inches	**Soil Classification:**		ML
Height of Pipe above Ground:			2.4	inches	**Presoak Date:**		12/17/2018
Depth of Test Hole:			117.4	inches	**Perc Test Date:**		12/18/2018
Check for Sandy Soil Criteria Tested by:				SP	**Percolation Tested by:**		SP
Water level measured from bottom of hole							

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Level (in)	Final Water Level (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	9:03 AM 9:28 AM	25	25	42.6	42.5	0.1	208
2	9:28 AM 9:53 AM	25	50	42.5	42.4	0.1	208
			Soil Criteria: Normal				

Percolation Test

Reading No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Head (in)	Final Water Head (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	9:53 AM 10:23 AM	30	30	42.4	42.2	0.1	250
2	10:23 AM 10:53 AM	30	60	42.2	42.1	0.1	250
3	10:53 AM 11:23 AM	30	90	42.1	42.0	0.1	250
4	11:23 AM 11:53 AM	30	120	42.0	41.9	0.1	250
5	11:53 AM 12:23 PM	30	150	41.9	41.8	0.1	250
6	12:23 PM 12:53 PM	30	180	41.8	41.6	0.1	250
7	12:53 PM 1:23 PM	30	210	41.6	41.5	0.1	250
8	1:23 PM 1:53 PM	30	240	41.5	41.4	0.1	250
9	1:53 PM 2:23 PM	30	270	41.4	41.3	0.1	250
10	2:23 PM 2:53 PM	30	300	41.3	41.2	0.1	250
11	2:53 PM 3:23 PM	30	330	41.2	41.0	0.1	250
12	3:23 PM 3:53 PM	30	360	41.0	40.9	0.1	250

Infiltration Rate (in/hr):			0.01				
Radius of test hole (in):			4				**Figure A-13**
Average Head (in):			41.0				

PERCOLATION TEST REPORT

Project Name:		KIA Moreno Valley			**Project No.:**		T2844-22-01
Test Hole No.:		P-4			**Date Excavated:**		12/17/2018
Length of Test Pipe:			120.0	inches	**Soil Classification:**		ML
Height of Pipe above Ground:			0.0	inches	**Presoak Date:**		12/17/2018
Depth of Test Hole:			120.0	inches	**Perc Test Date:**		12/18/2018
Check for Sandy Soil Criteria Tested by:				SP	**Percolation Tested by:**		SP
Water level measured from bottom of hole							

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Level (in)	Final Water Level (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	9:06 AM 9:31 AM	25	25	31.3	31.2	0.1	208
2	9:31 AM 9:56 AM	25	50	31.2	30.6	0.6	42
			Soil Criteria: Normal				

Percolation Test

Reading No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Head (in)	Final Water Head (in)	Δ in Water Level (inches)	Percolation Rate (min/inch)
1	9:56 AM 10:26 AM	30	30	30.6	30.5	0.1	250
2	10:26 AM 10:56 AM	30	60	30.5	29.9	0.6	50
3	10:56 AM 11:26 AM	30	90	29.9	29.3	0.6	50
4	11:26 AM 11:56 AM	30	120	29.3	28.7	0.6	50
5	11:56 AM 12:26 PM	30	150	28.7	28.1	0.6	50
6	12:26 PM 12:56 PM	30	180	28.1	27.5	0.6	50
7	12:56 PM 1:26 PM	30	210	27.5	26.9	0.6	50
8	1:26 PM 1:56 PM	30	240	26.9	26.4	0.5	63
9	1:56 PM 2:26 PM	30	270	26.4	25.9	0.5	63
10	2:26 PM 2:56 PM	30	300	25.9	25.3	0.6	50
11	2:56 PM 3:26 PM	30	330	25.3	24.8	0.5	63
12	3:26 PM 3:56 PM	30	360	24.8	24.4	0.5	63

Infiltration Rate (in/hr):			0.07				
Radius of test hole (in):			4				**Figure A-14**
Average Head (in):			24.6				

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with current, generally accepted test methods of ASTM International (ASTM) or other suggested procedures. We analyzed selected soil samples for *in-situ* density and moisture content, maximum dry density and optimum moisture content, expansion index, corrosivity, grain size distribution, consolidation characteristics, R-value and direct shear strength. The results of the laboratory tests are presented on Figures B-1 through B-5. The in-place dry density and moisture content of the samples tested are presented on the boring logs in *Appendix A*.

SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% of dry wt.)
B-1 @ 0-5’	Silty SAND (SM), reddish brown to light brown	135.2	6.7

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS ASTM D4829

Sample No.	Moisture Content		After Test Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
B-5 @ 0-5’	7.6	12.5	120.0	3

SUMMARY OF CORROSIVITY TEST RESULTS

Sample No.	Chloride Content (ppm)	Sulfate Content (%)	pH	Resistivity (ohm-centimeter)
B-1 @ 0-5’	98	0.001	8.3	4,600

Chloride content determined by California Test 422.
Water-soluble sulfate determined by California Test 417.
Resistivity and pH determined by Caltrans Test 643.

SUMMARY OF LABORATORY R-VALUE TEST RESULTS ASTM D2844

Sample No.	R-Value
B-6 @ 0-5”	33

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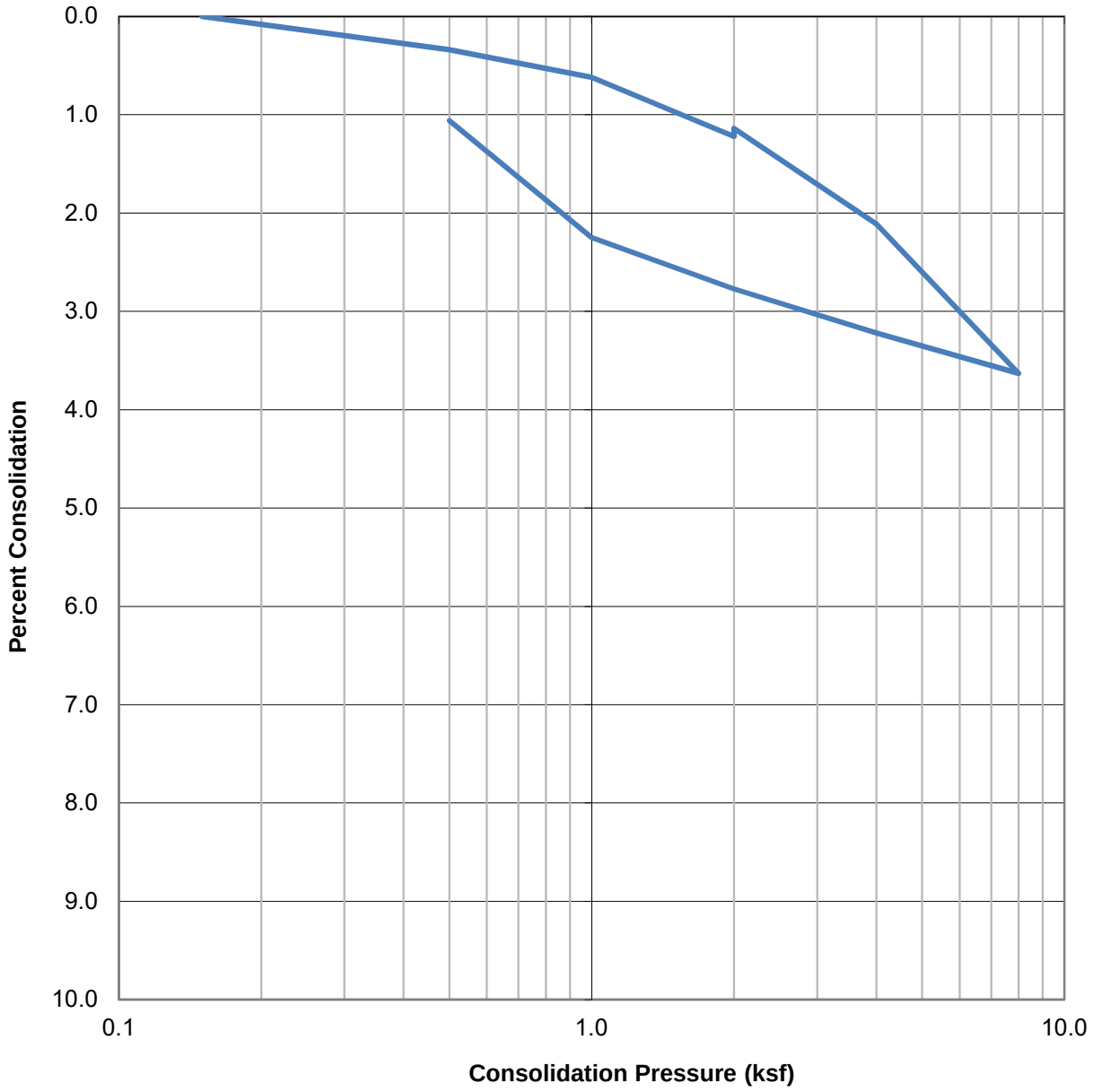
PDT

LABORATORY TEST RESULTS

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019 | PROJECT NO. T2844-22-01 | FIG B-1

WATER ADDED AT 2 KSF



SAMPLE ID	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B-2 @ 7.5'	ML	106.1	11.5	22.1

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GEOTECHNICAL ENVIRONMENTAL MATERIALS
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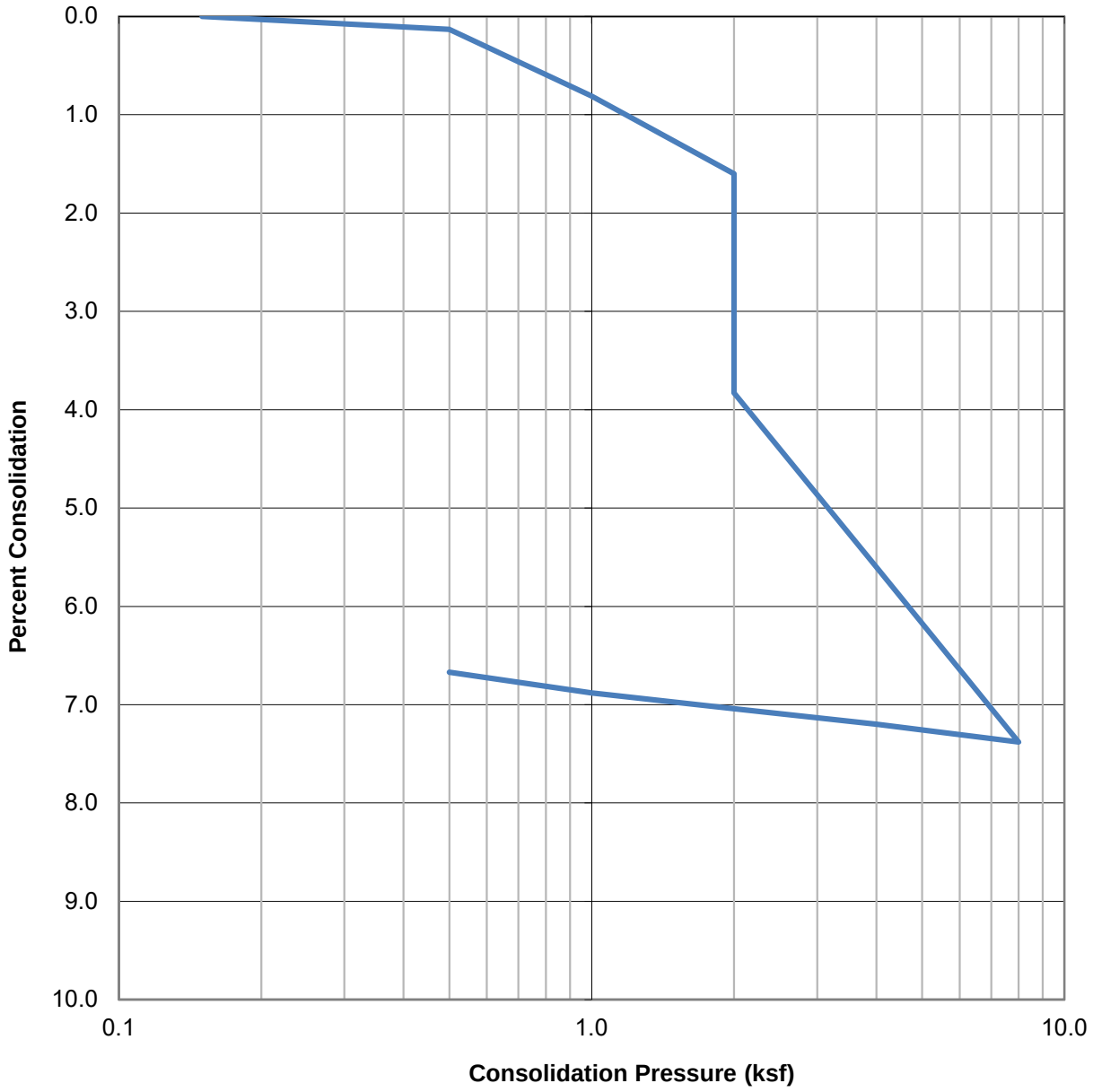
PDT

CONSOLIDATION TEST RESULTS

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019 | PROJECT NO. T2844-22-01 | FIG B-2

WATER ADDED AT 2 KSF



SAMPLE ID	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B-5 @ 2.5'	SM	116.6	6.5	13.1

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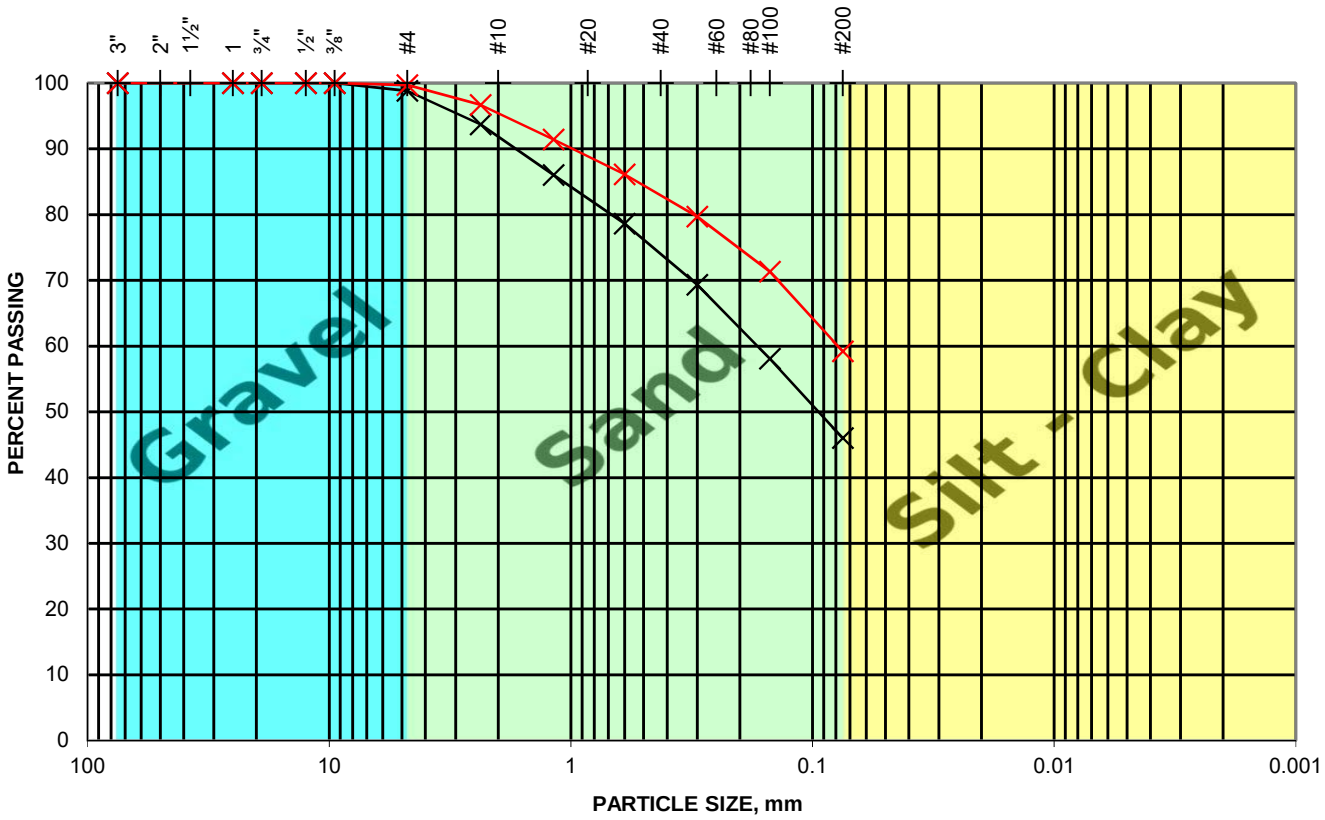
CONSOLIDATION TEST RESULTS

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019 | PROJECT NO. T2844-22-01 | FIG B-3



SAMPLE ID	SAMPLE DESCRIPTION
P-1/P-2 Blend	SM - Silty Sand, trace gravel
P-3/P-4 Blend	ML - Sandy SILT

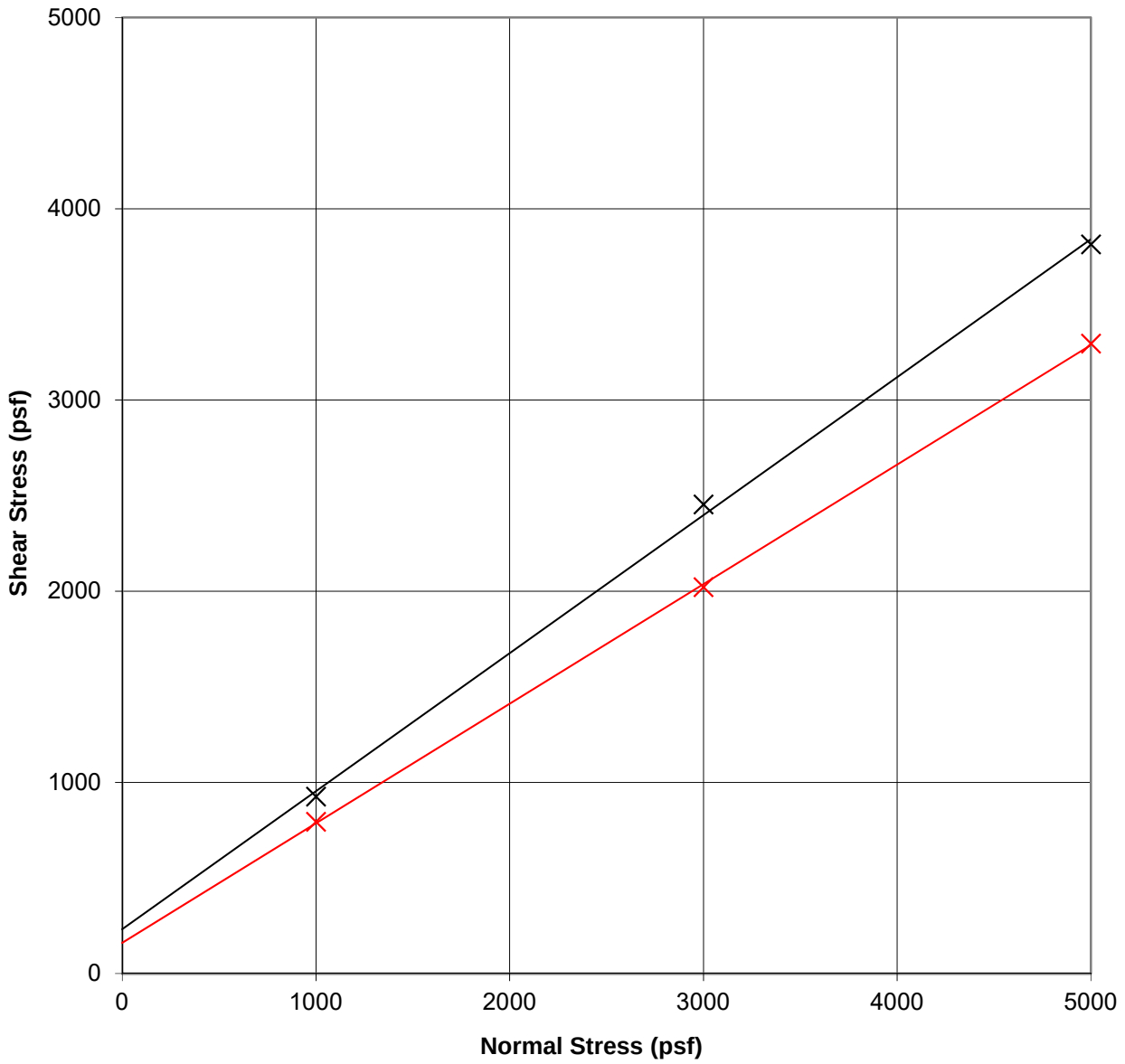
GEOCON
WEST, INC.
GEOTECHNICAL ENVIRONMENTAL MATERIALS
41571 CORNING PLACE, SUITE 101, MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

PDT

GRAIN SIZE DISTRIBUTION

KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019 | PROJECT NO. T2844-22-01 | FIG B-4



SAMPLE ID	SOIL TYPE	INITIAL DRY DENSITY (pcf)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)	C (psf)	ϕ (deg)
*B-1 @ 0-5'	SM	121.7	6.7	11.3	230	36
B-2 @ 5'	ML	96.7	9.6	23.3	160	32

*Sample remolded to approximately 90% of the test maximum dry density at optimum moisture content.

GEOCON
W E S T, I N C.
GEOTECHNICAL ENVIRONMENTAL MATERIALS
41571 CORNING PLACE, SUITE 101, MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

PDT

DIRECT SHEAR TEST RESULTS
KIA MORENO VALLEY
EAST OF MORENO BEACH DRIVE
AND AUTO MALL DRIVE
MORENO VALLEY, CALIFORNIA

JANUARY, 2019 | PROJECT NO. T2844-22-01 | FIG B-5

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

KIA MORENO VALLEY
SOUTHEAST OF MORENO BEACH DRIVE
AND AUTO MALL WAY
MORENO VALLEY, CALIFORNIA

PROJECT NO. T2844-22-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

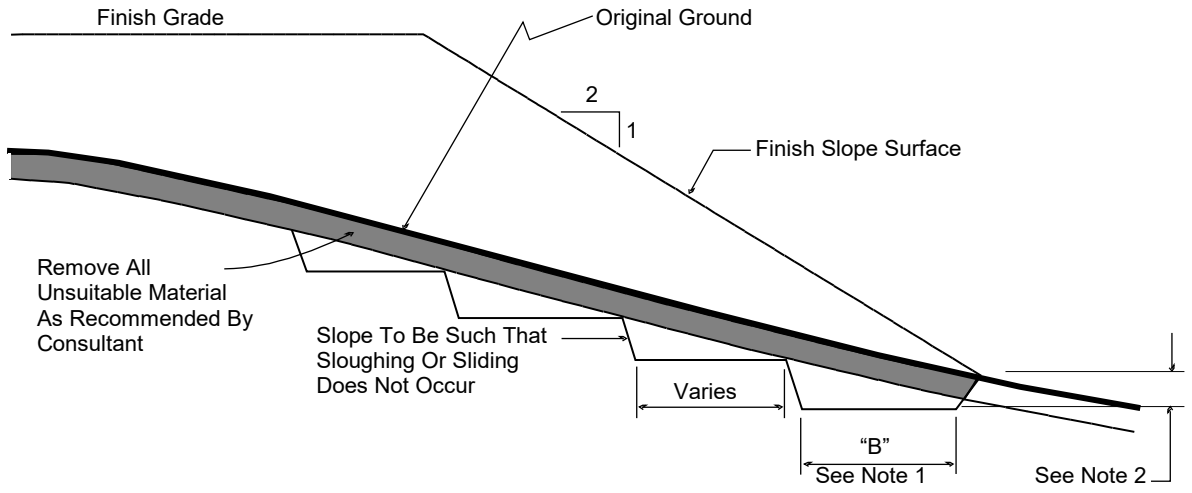
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection

variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

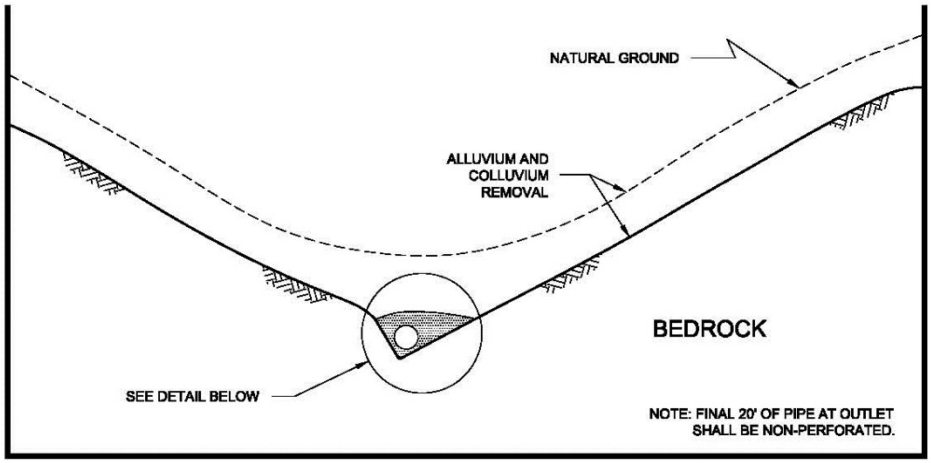
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

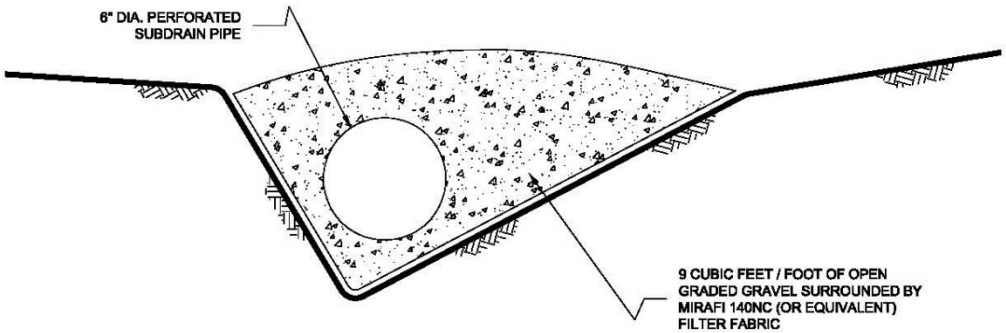
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

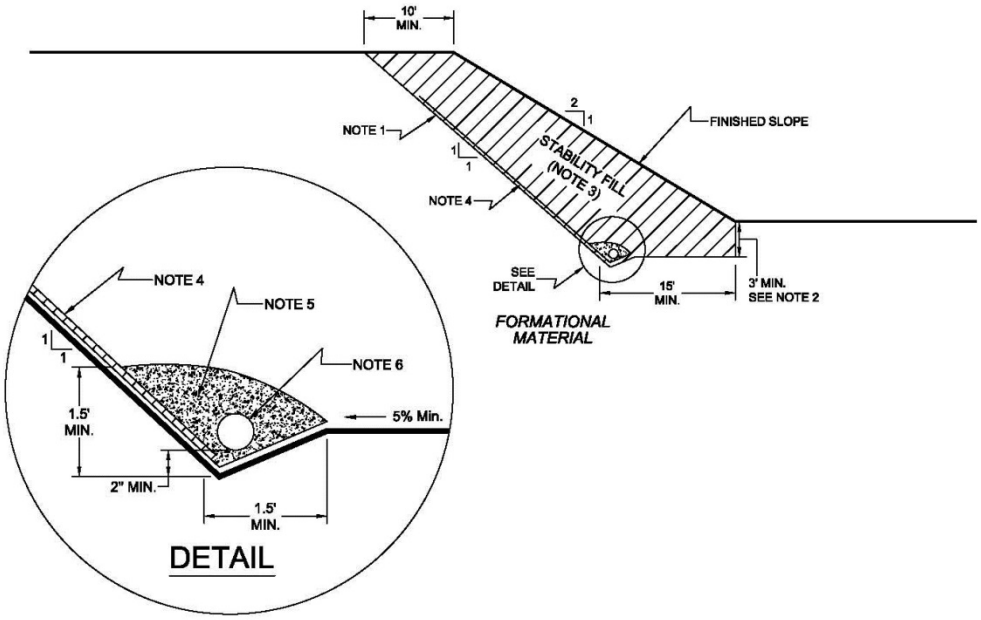
1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or larger) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

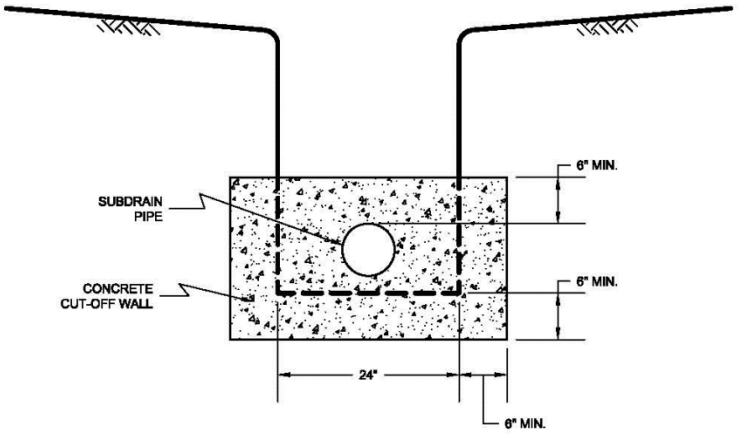
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

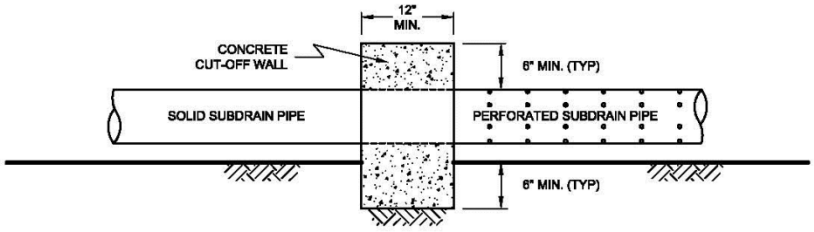
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

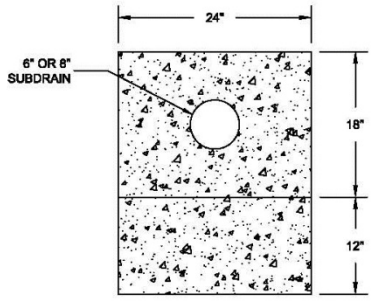


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

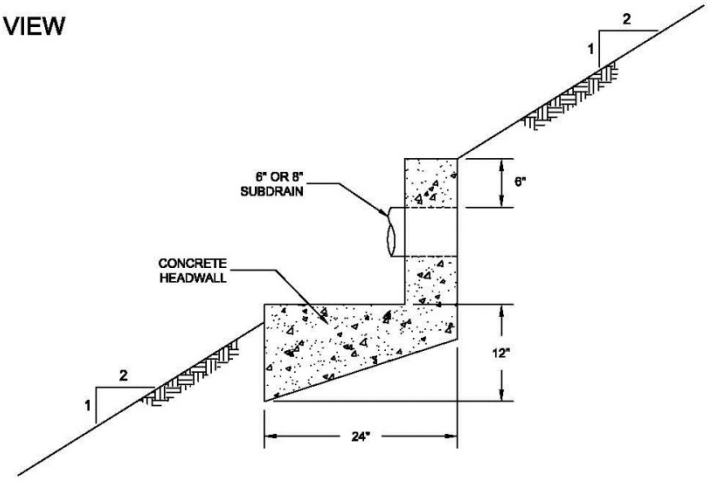
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

APPENDIX F

Riverside County Hydrology Reference Material

- **USDA Soils Map and Description**
- **RCRC&WCD Runoff Index Numbers (Plate D-4.1)**

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

January 30, 2019

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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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 Scale: 1:1,610 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

MAP LEGEND

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

Soils
- Soil 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 11, Sep 12, 2018

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

Date(s) aerial images were photographed: Jan 14, 2015—Jan 21, 2015

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
GkD	Gorgonio loamy sand, channeled, 2 to 15 percent slopes	0.8	13.6%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	1.3	21.7%
HcD2	Hanford coarse sandy loam, 8 to 15 percent slopes, eroded	0.1	2.0%
PaC2	Pachappa fine sandy loam, 2 to 8 percent slopes, eroded	3.8	62.7%
Totals for Area of Interest		**6.1**	**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

GkD—Gorgonio loamy sand, channeled, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcvd
Elevation: 20 to 3,000 feet
Mean annual precipitation: 8 to 25 inches
Mean annual air temperature: 46 to 63 degrees F
Frost-free period: 110 to 310 days
Farmland classification: Not prime farmland

Map Unit Composition

Gorgonio and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gorgonio

Setting

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

Typical profile

H1 - 0 to 15 inches: loamy sand
H2 - 15 to 60 inches: stratified gravelly loamy sand to gravelly loamy fine sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: SANDY ALLUVIAL (1975) (R019XD069CA)
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Drainageways
Hydric soil rating: Yes

Riverwash
Percent of map unit: 4 percent
Landform: Channels
Hydric soil rating: Yes

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

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

GyC2—Greenfield sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcvw
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

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

Description of Greenfield

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

Typical profile
H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Hanford

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

Pachappa

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

Arlington

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

Ramona

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

Unnamed

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

HcD2—Hanford coarse sandy loam, 8 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcw3
Elevation: 150 to 900 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 to 64 degrees F
Frost-free period: 250 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Hanford

Setting

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

Typical profile

H1 - 0 to 8 inches: coarse sandy loam
H2 - 8 to 40 inches: fine sandy loam
H3 - 40 to 60 inches: stratified loamy sand to coarse sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: SANDY (R020XD012CA)
Hydric soil rating: No

Minor Components

Tujunga

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

Greenfield

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

Ramona

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

PaC2—Pachappa fine sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcxp

Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pachappa

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 20 inches: fine sandy loam
H2 - 20 to 40 inches: loam
H3 - 40 to 63 inches: fine sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

San emigdio

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

Hanford

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

Greenfield

Percent of map unit: 5 percent

Hydric soil rating: No

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APPENDIX H

Hydrology Reference Material

- **USDA Soils Map and Description**
- **RCRC&WCD Runoff Index Numbers (Plate D-4.1)**
- **Selected Pages from Moreno Master Drainage Plan**
- **Moreno Master Drainage Plan Hydrology Map**
- **Parcel Map 23244 Storm Drain Improvement Plans**
- **Line "G" Moreno A.D.P. Stage I Dwg. No. 4-526 Plans**

RAINFALL INTENSITY—INCHES PER HOUR

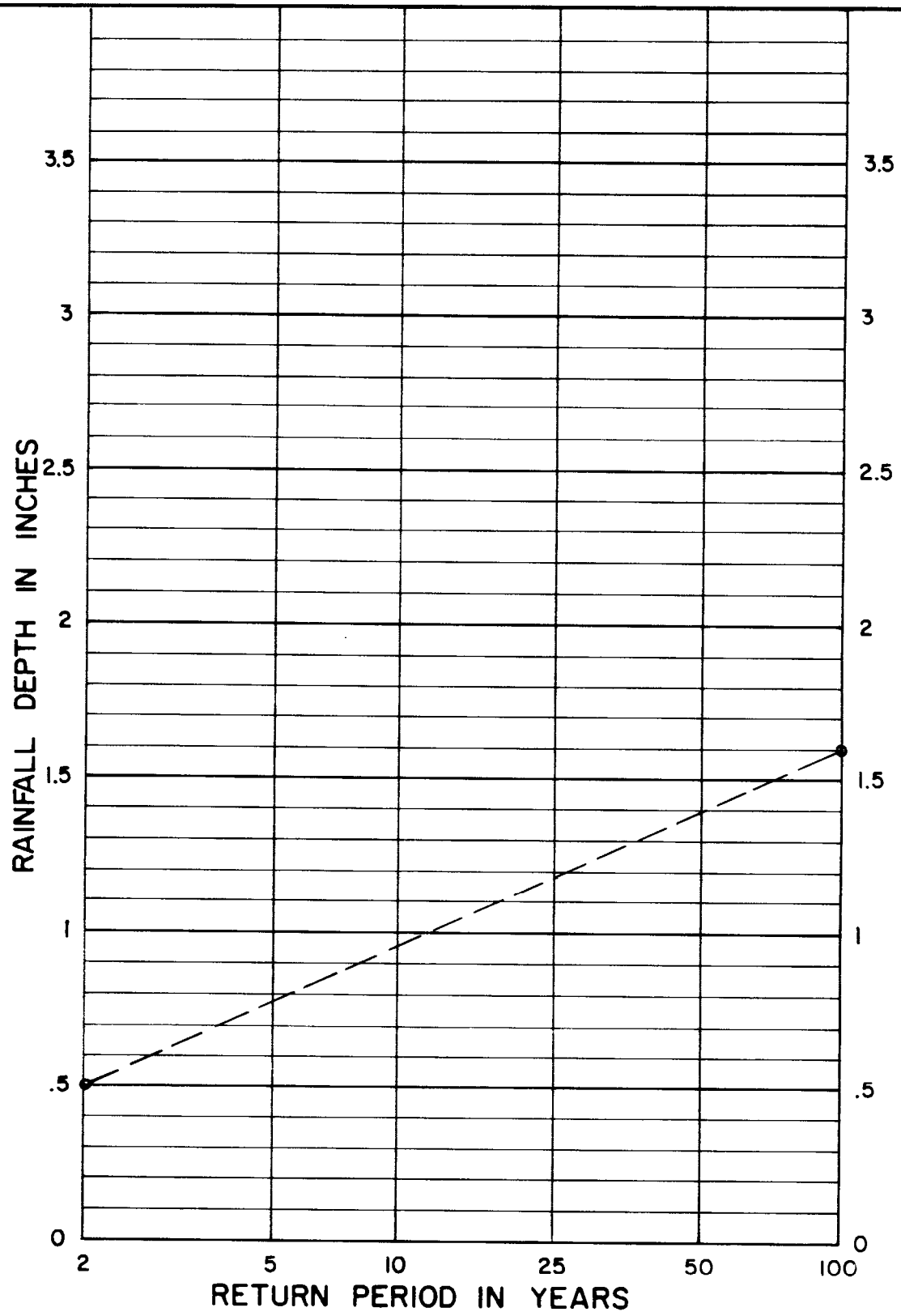
SUNNYMEAD – MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	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		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY – DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



NOTE:

1. For intermediate return periods plot 2-year and 100-year one hour values from maps, then connect points and read value for desired return period. For example given 2-year one hour = .50" and 100-year one hour = 1.60", 25-year one hour = 1.18"

Reference: NOAA Atlas 2, Volume XI - California, 1973.

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL DEPTH VERSUS RETURN PERIOD FOR PARTIAL DURATION SERIES

PLATE D-4.5

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

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

PLATE D-5.5 (1 of 2)

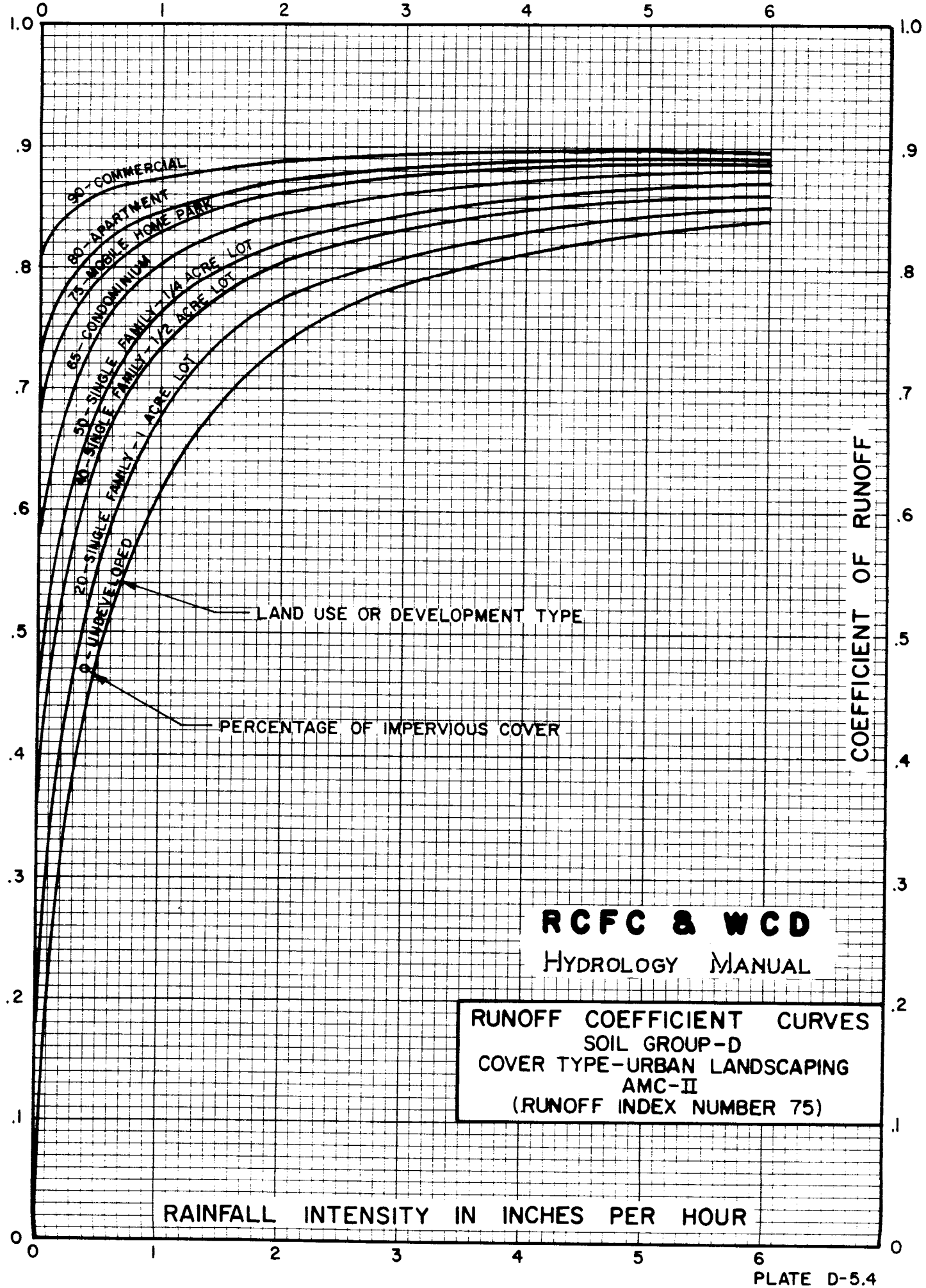
RUNOFF COEFFICIENT CURVE DATA

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	--

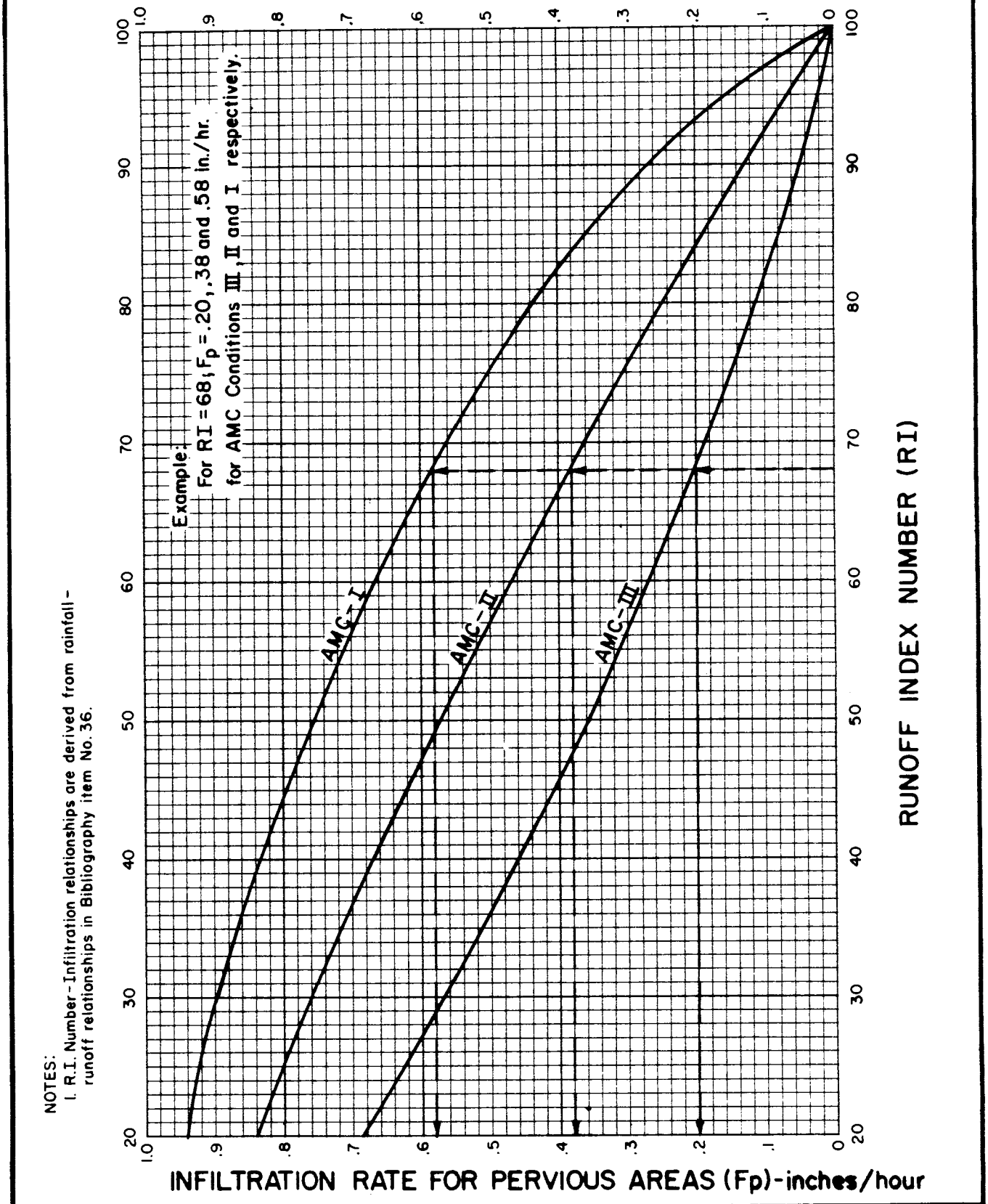


RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-D
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 75)

PLATE D-5.4



NOTES:
1. R.I. Number-Infiltration relationships are derived from rainfall-runoff relationships in Bibliography item No. 36.

RCFC & WCD

HYDROLOGY MANUAL

INFILTRATION RATE FOR PERVIOUS AREAS VERSUS RUNOFF INDEX NUMBERS

PLATE E-6.2

RIVERSIDE COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT
Riverside, California

MORENO

MASTER DRAINAGE PLAN

ZONE FOUR

Original Plan – September 1980
Revision No. 2 – April 2015

WARREN D. WILLIAMS
General Manager-Chief Engineer

MORENO
MASTER DRAINAGE PLAN
(Revision No. 2)

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MAP

Master Drainage Plan ..... INSIDE BACK COVER

SECTION I - PURPOSE

The purpose of this report is to identify the network of drainage facilities needed to alleviate currently known and anticipated drainage problems within the eastern portion of the City of Moreno Valley. A Master Drainage Plan (MDP) was originally adopted for the Moreno watershed in 1980 and was later revised in 1991 due to the development of the watershed at a higher density than anticipated. Since the 1991 revision, the City of Moreno Valley has updated its general plan, approved zone changes, and continued to grow significantly; prompting the District to once again revise the Moreno MDP to address these changes. In addition, this new revision seeks to address changes in regulation that favor the incorporation of flood control facilities which encourage infiltration.

Readers should bear in mind that the drainage network presented herein is conceptual in nature. Simply stated, the MDP provides a conceptual solution that addresses the known and anticipated drainage problems in the Moreno area based on various engineering, environmental, and economic considerations. By no means does the proposed MDP represent the only feasible solution.

The alignment and location of the facilities proposed in this MDP are approximate. Precise locations will be dictated by site specific conditions and other factors existing at the time of detailed design. Similarly, the facility sizing information shown on the enclosed map is preliminary. More detailed analysis performed at the facility design stage will determine the final facility sizing.

SECTION II - SCOPE

Tasks involved in the development of this master plan include:

1. Determination of the points of concentration and quantity of storm water runoff produced at various locations.

2. Determination of the quantity of debris produced by major canyons in the watershed.

3. Determination of the location and size of the proposed drainage facilities.

4. Investigation of alternative routes and conveyance methods as a basis for selecting the most economical, environmental, and soundly engineered plan.

5. Preparation of a drainage facility map.

6. Preparation of preliminary plan and profile sheets.

7. Preparation of individual facility cost estimates.

SECTION III – GENERAL DISCUSSION

The Moreno MDP encompasses a portion of the City of Moreno Valley and surrounding Riverside County lands. The watershed is generally bounded by Lasselle Street on the west, Theodore Street on the east, the Badlands on the north, and the city boundary on the south.

The proposed drainage plan involves the construction of detention basins, debris basins, open channels, and a network of underground storm drains. The drainage system will collect local urban runoff and transport the flows through this developing community to an outlet at the upper terminus of the Kitching Street Channel.

The revision presented here is a re-evaluation and expansion of the 1991 Moreno MDP Revision (Adopted MDP). The proposed plan shall supersede all past plans and reports. The plan presented herein will provide flood protection from the 100-year flood to the community when implemented, serve as a guide for the long term construction scheduling of the primary drainage facilities, and serve the basis for revising the existing Moreno Area Drainage Plan (ADP). The plan will also act as a planning guide for the location and sizing of local drainage facilities to be constructed by developers and others within the area.

SECTION IV – MASTER DRAINAGE PLAN OBJECTIVES

The following objectives were established for the Moreno Master Drainage Plan Revision:

1. Revise the Moreno MDP to provide a drainage plan which supports the existing and proposed land use as set forth in the "Riverside County General Plan" updated in 2008, "City of Moreno Valley General Plan" updated in July 2006, and any proposed amendments thereto.

2. The fully implemented plan should, in conjunction with ultimate street improvements for the area within the boundaries of the Moreno MDP, contain the 100-year frequency flows and alleviate the primary sources of flooding.

3. Identify preferred facility alignments, sizing, and right-of-way required for the future construction of MDP facilities to protect existing and future development.

4. Identify the most economical combination of facilities considering right-of-way acquisition, construction, and maintenance costs.

5. Develop a plan which, when implemented, will result in the elimination of FEMA designated Special Flood Hazard Areas within the boundaries of the Moreno MDP.

6. Revise the Moreno MDP to minimize major diversions and perpetuate the natural drainage pattern of the area to the maximum extent practicable.

7. Where feasible, incorporate facilities which encourage infiltration.

8. Minimize environmental impacts to the maximum extent practicable.

SECTION V – HYDROLOGY

Revision Studies:

This section outlines methodology, assumptions, and rainfall values used for new studies within the drainage area boundary for this MDP revision. The areas restudied were those tributary to Line F north of Cactus Avenue, areas tributary to Quincy Channel (Line G), and areas north of California State Route 60 (SR 60) not tributary to Nason Basin. New studies for the western portion of the plan (west of the Line G system) were not performed during the revision since many of the facilities here have already been constructed and were designed based on the Adopted MDP flow rates and alignments (see Previous Studies section below for additional information).

Two methods were used to develop the hydrology for this MDP revision: the Rational Method and the Synthetic Unit Hydrograph Method. The Rational Method was used to determine the peak discharges (cubic feet per second) generated from smaller watersheds less than 300 to 500 acres in size. For watersheds larger than 500 acres, the Synthetic Unit Hydrograph Method was used. To account for the attenuating effects of channel and basin storage, the Convex Routing Method and Modified Puls Methods were used, respectively. Methodology and supportive data for both the Rational and Synthetic Unit Hydrograph Methods may be found in the *Riverside County Flood Control and Water Conservation District Hydrology Manual*, dated April 1978 (District Hydrology Manual).

Future land use assumptions were based on the following:

- "The City of Moreno Valley General Plan," updated July 2006
- "The Riverside County General Plan," updated December 2008
- Potential changes to areas currently zoned under the "Moreno Highlands Specific Plan," adopted in 1992.

NOAA Atlas 14 Version 4 rainfall values were used in the hydrology calculations performed for this MDP revision. The rainfall frequencies examined were the 2-year (50% annual chance) and the 100-year (1% annual chance) recurrence intervals with 1, 3, 6 and 24 hour durations. The calculated slope of the intensity-duration curve is 0.577. Table 1 highlights the NOAA Atlas 14 Version 4 area weighted point rainfall values used to develop the revision studies:

TABLE 1 – NOAA Atlas 14 Point Rainfall Values

Storm Frequency and Duration	Area Weighted Point Rainfall (Inches)
2 Year – 1 Hour	0.52
2 Year – 3 Hour	0.90
2 Year – 6 Hour	1.29
2 Year – 24 Hour	2.29
100 Year – 1 Hour	1.57
100 Year – 3 Hour	2.42
100 Year – 6 Hour	3.38
100 Year – 24 Hour	6.43

Previous Studies:

Line K System – The flow rates for the Line K system have remained the same as in the Adopted Plan. No changes were proposed to the alignment and no major changes in land use have occurred. Hydrology backup calculations for this line are from studies performed for the Adopted MDP. Line K was sized in these studies using NOAA Atlas 2 rainfall values.

Line H System – Hydrology for this system comes from the approved hydrology study for Tract 31128 and 31129 performed by PHB & Associates, Inc. This study reflects changes to the Adopted MDP alignment. This study uses NOAA Atlas 2 rainfall values.

SECTION VI – EXISTING FACILITIES

In preparing this master drainage plan revision an inventory of known existing facilities was made and is summarized in Table 2. Those facilities serving as part of revised Moreno MDP drainage system are shown on the updated Moreno MDP map.

TABLE 2 – Existing Facilities

Facility	Drawing Number	Maintenance
Line A	4-473	RCFC
Line D	4-1007	RCFC
Line D-5	4-1007	RCFC
Line D-6	4-1007	RCFC
Line F	4-502,4-5271 4-1007, 4-912(Future RCFC)	RCFC
Line F-2	4-491,4-847	RCFC
Line F-3	4-501, 4-506	RCFC
Line F-4	4-501	RCFC
Line F-5	4-570	RCFC
Line F-6	4-528	RCFC
Line F-7	4-501	RCFC
Line F-8	4-509	RCFC
Line F-9	-	MV
Line F-9	4-1007	RCFC
Line F-11	4-847	RCFC
Line F-12	4-847	RCFC
Line F-14	4-719	RCFC
Line G	4-526, 4-886	RCFC
Line G-5 (Auto Mall Dr Lateral)	4-526	MV
Line G-7	4-879	RCFC
Line H-1	4-885	RCFC
Line H-2	4-875	RCFC
Line H-3	-	MV

Facility	Drawing Number	Maintenance
Line H-6	4-875	RCFC
Line H-7	4-867	RCFC
Line H-8	4-875	RCFC
Line H-9	4-834	RCFC
Line I	4-583, 4-647, 4-738, 7-405, 4-904, 4-905	RCFC
Line J	4-858, (4-955 Future RCFC)	RCFC
Line J-2	4-858	RCFC
Line J-3	4-858	RCFC
Line J-4	4-858	RCFC
Line J-5	4-858	MV
Line J-6	4-858	RCFC
Line J-9	4-1027	(Future RCFC)
Line J-10	4-646, 4-647	RCFC
Line K-1	-	MV
Line K-3	-	MV
Moreno Cold Creek SD - Line A	4-929	RCFC

SECTION VII – FACILITY SIZING CRITERIA

Underground Storm Drains

The underground facilities proposed in this MDP are located within existing or assumed future right-of-way, whenever possible, and consists of reinforced concrete pipe (RCP) ranging in size from 27 inches to 108 inches in diameter and reinforced concrete boxes (RCB) ranging in dimensions from 7'W x 7'D to 10'W x 8'D. Underground storm drain facilities were sized based on their full flow capacity.

Open Channels

The open channel facilities proposed are generally located along existing drainage ditches, washes, and where the proposed construction of the channel would have minimal impacts on adjacent properties. The open channels serve as flow conveyors and provide outlets for underground facilities proposed in the plan. Two types of open channels are proposed in this MDP, concrete lined channels and earthen bottomed channels with rock lined side slopes (unlined). The hydraulic sizing of open channels is based on normal depth calculations. The right-of-way requirements for both lined and unlined facilities include the full channel width, maintenance access roads, as well as a 5 foot buffer on either side for anticipated cut and fill. Channels with top widths of less than 20 feet require one 15 foot maintenance access road; where the top width exceeds 20 feet, two maintenance access roads are necessary.

Detention Basins

The detention basins proposed in this MDP are located upstream existing facilities with limited hydraulic capacity (e.g. freeway culverts, Line F). The purpose of the detention basin is to attenuate peak flow rates to match the capacity of downstream existing facilities through the use of temporary detention storage. It should be noted that the detention basins proposed in this plan are sized for the 1% annual chance ("100-year" storm) event. Flows exceeding the design capacity of the basin would pass over an emergency spillway in flow patterns approximating present conditions.

Debris Basins

Debris basins are proposed in watersheds where significant amount of debris would be expected and are generally located upstream of the proposed facilities to capture the debris before it enters the downstream conveyance system. The proposed debris basins were sized using the Tatum Method by the U.S. Army Corps of Engineers Los Angeles District, dated 1963.

SECTION VIII – PROPOSED IMPROVEMENTS

The improvements proposed in this MDP are shown on the enclosed map found at the back of this report. Supporting data for proposed facilities is available at the Riverside County Flood Control and Water Conservation District's Office.

The design engineer should be aware that a detailed utility search was not completed. This means that, while the major known facilities were considered during the development of this MDP, a more thorough search may reveal additional or newly placed utilities that may necessitate minor alignment and size changes, or utility relocations during final design.

Line A – Line A begins approximately 300 feet west of the intersection of Locust Avenue and Quincy Street as a 4.5 foot deep concrete lined trapezoidal channel with side slopes of 1.5:1 and a base width of 6 feet. The channel extends southerly and connects to an existing section of Line A which continues southerly and southeasterly to a confluence point with the proposed Line A-1 just south of Kalmia Street. At the confluence point Line A transitions into a 8'W x 7'D RCB and continues southerly. The RCB then transitions into a 9'W x 7'D and continues southerly to an outlet into the proposed Sinclair Basin just north of California State Route 60 (SR 60).

Line A-1 – Line A-1 begins at a point approximately 1,315 feet north and 235 feet east of the intersection of Locust Avenue and Quincy Street as a 72-inch RCP. The 72-inch RCP extends westerly to Quincy Street and southerly in Quincy Street. At Kalmia Avenue, the 72-inch RCP transitions into a 78-inch RCP until the confluence with Line A.

Line A-2 – Line A-2 begins approximately 650 feet east of the intersection of Locust Avenue and Quincy Street as a 42-inch RCP. The 42-inch RCP extends westerly until the confluence with the proposed Line A-1.

Line A-3 – Line A-3 begins at the intersection of Edmonson Avenue and Kalmia Avenue as a 42-inch RCP. The 42-inch RCP extends easterly in Kalmia Avenue until the confluence with an existing portion of Line A.

Line A-6 – Line A-6 begins at a point approximately 1,300 feet west and 1,300 feet north of the intersection of Quincy Street and Ironwood Avenue as a 36-inch RCP. The 36-inch RCP extends southerly and transitions into a 42-inch and then a 48-inch RCP. At Hemlock Avenue the 48-inch RCP continues easterly and transitions into a 78-inch RCP, then into a 84-inch RCP, and finally into a 7'W x 7'D RCB until the confluence with Line A.

Line A-7 – The upstream origin of Line A-7 begins approximately 850 feet east of the intersection of Petit Street and Ironwood Avenue as a 42-inch RCP. The 42-inch RCP extends to the westerly until the confluence with line A-6.

Line A-8 – Line A-8 begins approximately at the intersection of Hinson Street and Hemlock Avenue as a 42-inch RCP. The 42-inch RCP extends easterly and transitions into a 54-inch RCP until the confluence with Line A-6.

Line F-2 – Line F-2 begins at the intersection of Ironwood Ave. and Redlands Boulevard as a 54-inch RCP and connects to Line F-15. The 54-inch RCP extends southerly to an existing 60-inch Caltrans culvert which extends the pipe to the south side of the State Route 60 Redlands Boulevard off ramp. Line F-2 resumes from the downstream terminus of the existing culvert as a 66-inch RCP which continues southerly transitioning to a 72-inch RCP, to a 78-inch RCP, to a 84-inch RCP, to a 90-inch RCP, to a 96-inch RCP, and finally into a 108-inch RCP until an outlet into the proposed Cactus Basin.

Line F-5 – Line F-5 begins approximately 100 feet south of the intersection of Oliver Street and John F. Kennedy Drive at the downstream terminus of an existing portion of Line F-5 as a double 8'W x 4'D RCB. The RCB extends westerly for 700 feet to the confluence with existing Line F.

Line F-13 – Line F-13 begins at a point approximately 1,330 feet north of the intersection of Moreno Beach Drive and Cactus Boulevard as a 33-inch RCP. The 33-inch RCP extends southerly and transitions into a 39-inch RCP until the confluence with existing Line F-4.

Line F-15 – Line F-15 begins at a point approximately 1,310 feet south and 1,750 feet west of the intersection of Redlands Boulevard and Ironwood Avenue as a 36-inch RCP. The 36-inch RCP extends easterly and transitions into a 48-inch RCP and then to a 54-inch RCP until the confluence with Line F-2 at Redlands Boulevard.

Line F-16 – Line F-16 begins at a point approximately 1,350 feet south of SR 60 and 2,250 feet west of the Redlands Boulevard as a 42-inich RCP. The 42-inch RCP extends easterly and transitions into a 48-inch RCP, to a 54-inch RCP and finally to a 72-inch RCP until the confluence with Line F-2.

Line F-17 – Line F-17 begins at a point approximately 2,630 feet south of SR 60 and 2,250 feet west of the Redlands Boulevard as a 42-inch RCP. From there the 42-inch RCP extends easterly and transitions into a 48-inch RCP, to a 54-inch RCP, and finally to a 60-inch RCP until the confluence with Line F-2.

Line F-18 – Line F-18 begins at a point approximately 1,000 feet east of the intersection of Redlands Boulevard and Alessandro Boulevard as a 48-inch RCP. The 48-inch RCP extends westerly and transitions into a 60-inch RCP until the confluence with Line F-2.

Line F-19 – Line F-19 begins at a point approximately 500 feet east of the intersection of Redlands Boulevard and Brodiaea Avenue as a 60-inch RCP. The 60-inch RCP extends westerly until the confluence with Line F-2.

Line G – Line G begins approximately 850 feet south and 450 feet east of the intersection of Eucalyptus Avenue and Auto Mall Drive as an earthen bottom trapezoidal channel with rock-lined side slopes. The earthen channel runs southeasterly until a confluence with proposed Line G-7, approximately 400 feet north of the intersection of Cottonwood Avenue and Quincy Street. Line G continues southerly, parallel to Quincy Street, until an outlet into existing Line F. Typical channel sections in this reach have depths of 6 to 8 feet, base widths of 6 to 16 feet, and side slopes of 2:1.

Line G-1 – Line G-1 begins at a point approximately 1,200 feet north of SR 60 and 250 feet east of the Moreno Beach Drive as a 42-inch RCP. The 42-inch RCP extends easterly until the confluence with Line G-4.

Line G-2 – Line G-2 begins at the intersection of Hemlock Avenue and Petit Street as a 42-inch RCP. The 42-inch RCP extends westerly and transitions into a 54-inch RCP until the confluence with Line G-4.

NODE	FLOW D/S	NODE	FLOW D/S	NODE	FLOW D/S	NODE	FLOW D/S
99	315 cfs (3hr)	184	425 cfs (3hr)	359	330 cfs (3hr)		
100	315 cfs (3hr)	209	505 cfs (3hr)	360	1395 cfs (3hr)		
109	490 cfs (3hr)	210	505 cfs (3hr)	369	535 cfs (3hr)		
110	795 cfs (3hr)	219	125 cfs (3hr)	370	3755 cfs (6hr)		
119	410 cfs (3hr)	220 (inflow)	3025 cfs (3hr)				
120	1165 cfs (3hr)	220 (outflow)	2110 cfs (6hr)				
129	540 cfs (3hr)	308	910 cfs (3hr)				
130	540 cfs (3hr)	309	375 cfs (3hr)				
135	1660 (3hr)	310	1260 cfs (3hr)				
140 (inflow)	2525 cfs (3hr)	320 (inflow)	1555 cfs (3hr)				
140 (outflow)	635 cfs (6hr)	320 (outflow)	280 cfs (24hr)				
149	635 cfs (3hr)	339	300 cfs (3hr)				
160	1020 cfs (3hr)	340	300 cfs (3hr)				
170	1605 cfs (3hr)	350	1140 cfs (3hr)				DJC 6/26/2014

308 2552

"LineA310node" A - 14 678.8 ac

L=14325' Lca=6870' n=0.026

309 2304

99 2404

109 2512

129 2536

A - 2 322.9 ac "LineB110node"

"LineC130node" A - 4 355.1 ac

L=7600' Lca=5200' n=0.035

RECHE CYN. RD.

CITY LIMITS

RECHE CANYON DEBRIS BASIN

APPROXIMATE R/W = 5.5 ac.

b=10' d=7' ss=1.5:1 Q=1560

14'X7' RCB

LOCUST AVE.

K-4

42" Q=40

42" Q=125

42" Q=135

51" Q=200

9.0'x7' RCB Q=1780

KALMIA AVE.

QUINCY ST.

"LineD150node" A - 6 433.8 ac

L=6500' Lca=3780' n=0.023

149 2184

"LineA610node" A - 13 232.3 ac

CITY LIMITS

A - 1 190.3 ac "LineD100node"

L=6180' Lca=3100' n=0.032

L=8773' Lca=4450' n=0.030

119 2360

"LineC130node" A - 4 355.1 ac

SEE APR-1991 MORENO MDP HYDROLOGY

K-1 K-2 K-3

LINE K

b=20' d=5' ss=2:1 Q=1780

33" Q=45

63" Q=360

63" Q=390

310 1916

L=5170' Lca=2664' n=0.015

L=10570' Lca=5550' n=0.016

"LineA320node" A - 20 263.9 ac

100 1924

A - 3 246.8 ac "LineB120node"

L=5555' Lca=2025' n=0.030

JUNIPER AVE.

110 1880

HIGHLAND BLVD.

120 1828

339 1842

OLIVER ST.

IRONWOOD AVE.

NASON ST.

MORENO BEACH DR.

PETIT ST.

90" Q=540

"LineG340node" A - 17 160.2 ac

L=3380' Lca=1490' n=0.015

NASON BASIN

HEMLOCK AVE.

340 1784

209 1836

"LineF2210node" A - 10 283 ac

KELDONIS BLVD.

"LineB140node" A - 5 211.4 ac

L=2500' Lca=1505' n=0.017

135 1796

130 1864

*Note 1: Duplicates of node 140 exist because both hydrographs are being routed through the same basin.

U.S. HWY 60

320 1792

"LineG350node" A - 16 338.4 ac

L=4905' Lca=2932' n=0.015

L=5300' Lca=2500' n=0.015

L=4140' Lca=1630' n=0.015

140 1768 *See Note 1

140 1768 *See Note 1

1788

U.S. HWY 60

CITY LIMITS

SINCLAIR ST.

155 1728

EUCALYPTUS AVE.

"LineF160node" A - 7 265.3 ac

"LineG370node" A - 15 75.8 ac

L=6760' Lca=3772' n=0.018

FIR ST.

LASSELLE ST.

MORRISON ST.

EUCALYPTUS AVE.

LINE I

COLD CREEK COURT STORM DRAIN LINE A

210 1704

160 1700

THEODORE ST.

"LineF220node" A - 12 329.1 ac

L=3935' Lca=1975' n=0.015

DRACAEA AVE.

DRACAEA AVE.

J-1 J-2 J-3 J-4 J-5 J-6 J-7 J-8 J-9 J-10

LINE J

LINE H

H-1 H-1a H-2 H-3 H-4 H-5 H-5a H-6 H-7 H-8 H-9 H-10

SEE TR31128/TR31129 FOR REVISED LINE H SYSTEM HYDROLOGY

MORENO BEACH DR.

359 1700

350 1668

L=7090' Lca=3925' n=0.015

"LineF170node" A - 8 330.5 ac

COTTONWOOD AVE.

COTTONWOOD AVE.

NASON ST.

QUINCY ST.

BAY AVE.

BAY AVE.

170 1620

"LineG360node" A - 18 186.0 ac

L=6000' Lca=2735' n=0.015

219 1604

"LineF230extra" A - 9 63.5 ac

L=2435' Lca=1135' n=0.015

"LineF220node" A - 11 224.1 ac

ALESSANDRO BLVD.

ALESSANDRO BLVD.

SEE APR-1991 MORENO MDP HYDROLOGY

BRODIAEA AVE.

BRODIAEA AVE.

L=4405' Lca=2120' n=0.017

*Note 2: Duplicates of node 220 exist because multiple hydrographs are being routed through the same basin.

220 1574 *See Note 2

360 1568

KELDONIS BLVD.

DAVIS RD.

CACTUS AVE.

CACTUS AVE.

220 1572 *See Note 2

370 1552

LINE F

F-4 F-5 F-6 F-7 F-8 F-9 F-13 F-14

"LineF370node" A - 19 331.4 ac

184 2300

L=7800' Lca=4850' n=0.029

JOHN F. KENNEDY DR.

SEE TR33532 FOR REVISED LINE J SYSTEM HYDROLOGY

SEE TR22709/TR33532 FOR REVISED LINE F SYSTEM HYDROLOGY

DBL 8'X4' RCB Q=335

b=40' d=10' ss=1.5:1 Q=6800

OLIVER ST.

LINE H

LINE J

LINE I

LINE F

369 2460

IRIS AVE.

IRIS AVE.

CITY LIMITS

CITY LIMITS

SCALE 1"=800'

-1200 -800 -400 0 400 800 1200

LEGEND

REVISION #2		NOT A PART OF REVISION #2	
	SUB AREA BOUNDARY		DRAINAGE BOUNDARY
	FLOW PATH		PROPOSED STORM DRAIN
	PROPOSED BASIN		PROPOSED OPEN CHANNEL
369 / 2460	NODE NUMBER / ELEVATION		EXISTING FACILITY
A - 19 / 331.4 ac	SUBAREA NAME / SUBAREA ACREAGE	Q=10	10 YEAR FLOW IN CFS
		Q=100	100 YEAR FLOW IN CFS

NOTES

1. ADOPTED IN OCTOBER 1980
2. REVISION #1 IN APRIL 1991
3. REVISION #2 IN PROGRESS

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RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

MORENO

MASTER DRAINAGE PLAN REVISION NO. 2 HYDROLOGY MAP

ADOPTED OCTOBER 1980

REVISED APRIL 1991

REVISED JUNE 2014

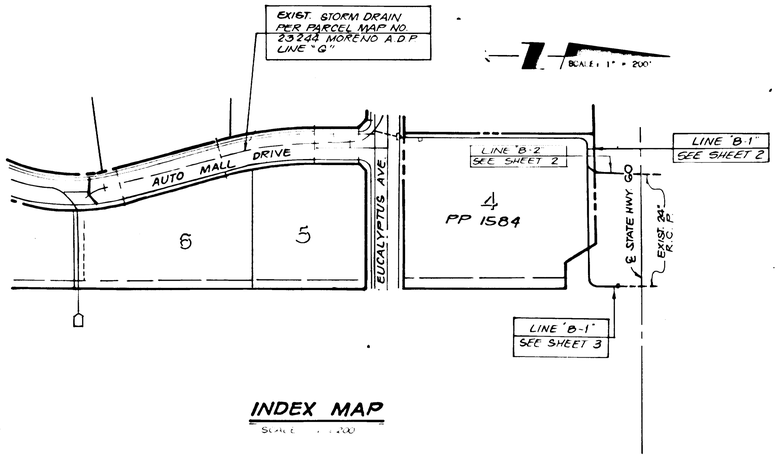
PARCEL MAP 23244
STORM DRAIN PLANS

GENERAL NOTES

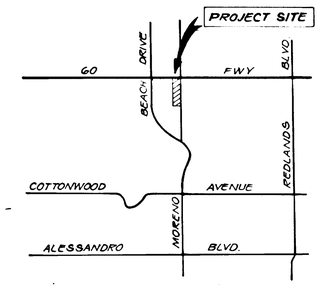
1. THE CONTRACTOR SHALL CONSTRUCT THE FLOOD CONTROL IMPROVEMENTS SHOWN ON THE DRAWINGS IN CONFORMANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT'S SPECIAL PROVISIONS AND DETAILED SPECIFICATIONS DATED SEPTEMBER, 1989 AND DESIGN MANUAL STANDARD DRAWINGS DATED MAY, 1971.
2. ALL CONSTRUCTION TO BE IN CONFORMANCE WITH THE REGULATION OF CAL-OSHA.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CLEARING OF THE PROPOSE WORK AREA AND RELOCATION COSTS OF ALL EXISTING UTILITIES. PERMITEE MUST INFORM CITY OF CONSTRUCTION AT 714- 243-2120
4. ALL STATIONING REFERS TO CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE NOTED.
5. STATIONING FOR LATERALS AND CONNECTOR PIPE REFER TO THE CENTERLINE-CENTERLINE INTERSECTION.
6. FORTY-EIGHT HOURS BEFORE EXCAVATION, CALL UNDERGROUND SERVICE ALERT 1-800-422-4133.
7. ALL ELEVATIONS ARE IN FEET AND DECIMALS THEREOF BASED ON U.S.C. AND G.S. DATUM.
8. ALL CROSS SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
9. ELEVATIONS OF UTILITIES ARE APPROXIMATE UNLESS OTHERWISE NOTED.
10. NOTICE TO CONTRACTOR: THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT FOR THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN AND ANY OTHER LINES NOT SHOWN ON THESE PLANS OR NOT RECORDED.
11. ALL BACKFILL TO BE 90% RELATIVE COMPACTION UNLESS OTHERWISE SPECIFIED AND SHALL BE CERTIFIED BY THE CITY'S SOILS ENGINEER RETESTING SHALL BE AT THE DEVELOPER'S EXPENSE.
12. OPENINGS RESULTING FROM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6" OF CLASS "B:" CONCRETE.
13. BEDDING PIPE WITH LESS THAN TWO FEET OF COVER SHALL CONFORM TO LOS ANGELES COUNTY FLOOD CONTROL DISTRICT STANDARD DRAWINGS 2-D213,3 AND 2-D177 FOR CONCRETE BACKFILL IN TRENCHES. ALL OTHER PIPE SHALL CONFORM TO RCFC & WCD STD. DWG. M185.
14. THE CONCRETE COVE ON THE INSIDE OF ALL REINFORCED CONCRETE PIPE MUST BE INCREASED TO PROVIDE A MINIMUM OF 1-1/2" OVER THE REINFORCING OR 2" THICKENED INVERT FOR C.I.P.P. WHEN THE DESIGN VELOCITIES EXCEED 20 FEET PER SECOND. THE CONCRETE DESIGN STRENGTH IN THESE REACHES SHALL BE fc=4,000 PSI FOR VELOCITIES EXCEEDING 20 FEET PER SECOND, fc=5,000 PSI SHALL BE PROVIDED FOR VELOCITIES EXCEEDING 30 FEET PER SECOND.
15. CAST IN PLACE PIPE CAN BE USED AS AN ALTERNATIVE TO R.C.P. ONLY WHERE THERE IS 3 FEET MINIMUM COVER ABOVE THE PIPE.

CAL TRANS GENERAL NOTES

1. An encroachment permit is required before any work may begin in/or near the State right of way.
2. All work within the State right of way shall conform to the latest State Standard Plans and Specifications or as directed by the State's Representative.
3. No equipment or materials may be stored on the State right of way.
4. All disturbed areas in the State right of way must be treated for erosion control (hydroseeding or equivalent, or as directed by the State's Representative.) The responsibility for maintaining erosion control will not be released until the seeding is well established. The contractor will be responsible for the cost of Caltrans cleaning any drainage structures and channels which have become cluttered with debris and/or silt as a result of, or caused by, the construction project.
5. Access control on the freeway will be maintained at all times (work inside State right of way must be fenced off with no access to work area from freeway).
6. No freeway ramps or freeway lanes may be closed or obstructed at anytime, unless specifically allowed per the encroachment permit and/or as directed by the States's Representative.
7. All fence relocated to facilitate construction of this project inside the State right of way shall be replaced with CL-6 fence, as shown in the State's Standard Plans, or block wall in accordance with acceptable local agency standards.
8. Where Type Cl-6 fence does not exist, the right of way fence must be upgraded to Type Cl-6 fence, as shown in the Standard Plans.
9. All State drainage structures must first be completely cleaned of debris, and/or silt, by the contractor prior to making the connection.
10. The contractor shall be responsible for insuring that any State drainage facility which is connected to or directly affected by contractors operation shall be clean and operational prior to final acceptance of permit work by State. Adequate clean out and access openings shall be provided in any construction within the State's right of way for future maintenance and repair work, as needed. This work shall be furnished at no cost to the State.
11. Where survey monuments exist, such monuments shall be protected or shall be referenced and reset, pursuant to Business and Professions Code, Section 8700 to 8500 (Land Surveyor's Act).
12. The exact location of all signs shall be determined in the field by the States' Representative.
13. All signs, roadside markers, electroliers, and etc., shall be protected and/or replaced in kind to the current State Standard Plans and current Traffic Manual, at no cost to the State.



INDEX MAP
SCALE 1" = 200'



VICINITY MAP
N.T.S.

ESTIMATED QUANTITIES

ITEM	QTY	UNITS
24" RCP (CLASS IV)	496	LF
42" RCP (D-1600)	34	LF
36" RCP (D-1250)	256	LF
30" RCP (D-1250)	236	LF
MANHOLE NO. 1 PER RCFCD STD. DWG. NO. MH 251	4	EA
REMOVE AND REPLACE EXISTING CALTRANS FENCE	± 250	LF
CONTOUR GRADE AREA AND BACKFILL EXISTING GROUND	LUMP	SUM
REMOVE EXISTING PIPE ENDWALL	2	EA.
DRAINAGE INLET TYPE GI PER CALTRANS STD. DWG. NO. D73 MODIFIED.	2	EA
MANHOLE NO. 4 PER RCFCD STD. DWG. NO. MH 254	1	EA
CATCH BASIN NO. 1 PER RCFCD STD. DWG. NO. CB100 LD 201 CASE "C" WITH 8" CURB.	1	EA
6" CLASS "B" PIPE CONCRETE BACKFILL	34	LF

PRIVATE ENGINEER'S NOTICE TO CONTRACTOR

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONAL HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF DESIGN PROFESSIONAL.

UNDERGROUND SERVICE ALERT
1-800-422-4133
CALL TWO WORKING DAYS BEFORE YOU DIG

REGISTERED PROFESSIONAL ENGINEER
CEAZAR V. AGUILAR
NO. 041679
EXP. 3-31-92
CIVIL
STATE OF CALIFORNIA

BENCH MARK
LOCATION: U.S.C. & G.S. R-375 M-124 CO. DSGN. FD. BRASS DISK STPD. R-375, TOP CONC. POST 2.50' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD'FS. OF MARKER POST.
ELEVATION: 1845.26

REFERENCE BLOCK

DESIGNED BY	DRAWN BY	CHECKED BY
W.E.M.	R.A.M.	C.V.A

REVISIONS					
MARK	DATE	INITIAL	DESCRIPTION	DATE	APPVD

APPROVED BY: CEAZAR V. AGUILAR
DATE: 10/11/90 REGISTERED CIVIL ENGINEER NO. 41679 REGISTRATION EXP. 3-31-92

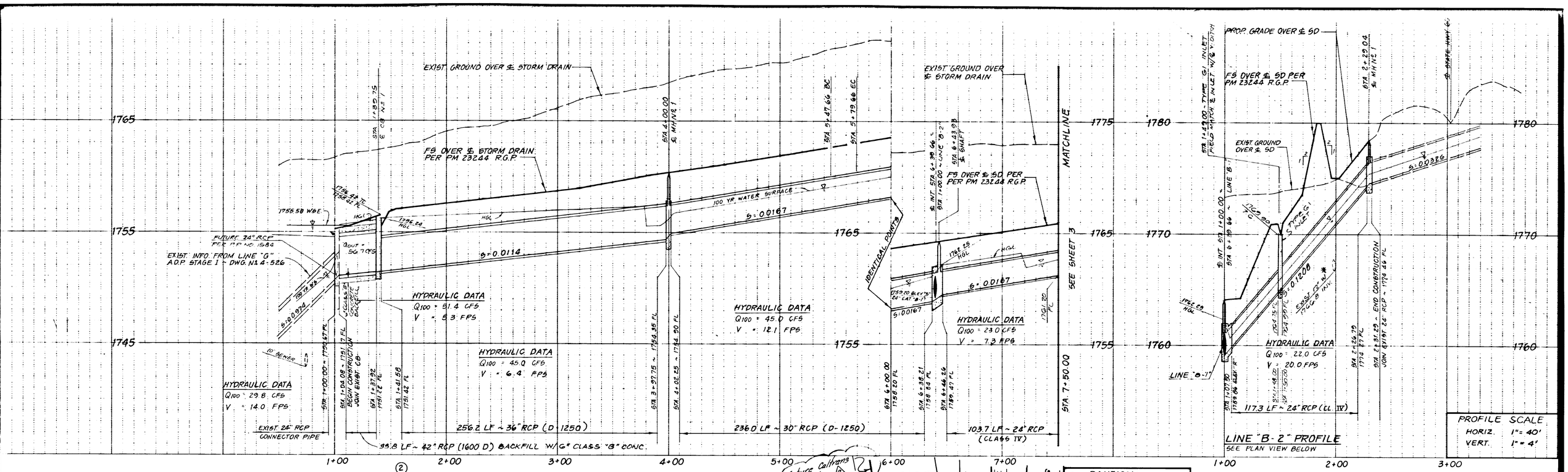
APPROVED BY:
DATE: 10/12/90 JOHN K. FEENSTRA R.C.E. 13870 EXP. 3-31-93 DEPUTY CITY ENGINEER OF MORENO VALLEY

THE KEITH COMPANIES

SCALE: AS SHOWN
DATE: SEPT. 1990

CITY OF MORENO VALLEY
STORM DRAIN IMPROVEMENT PLANS
LINE "B-1" & LINE "B-2"
P.M. 23244
TITLE SHEET

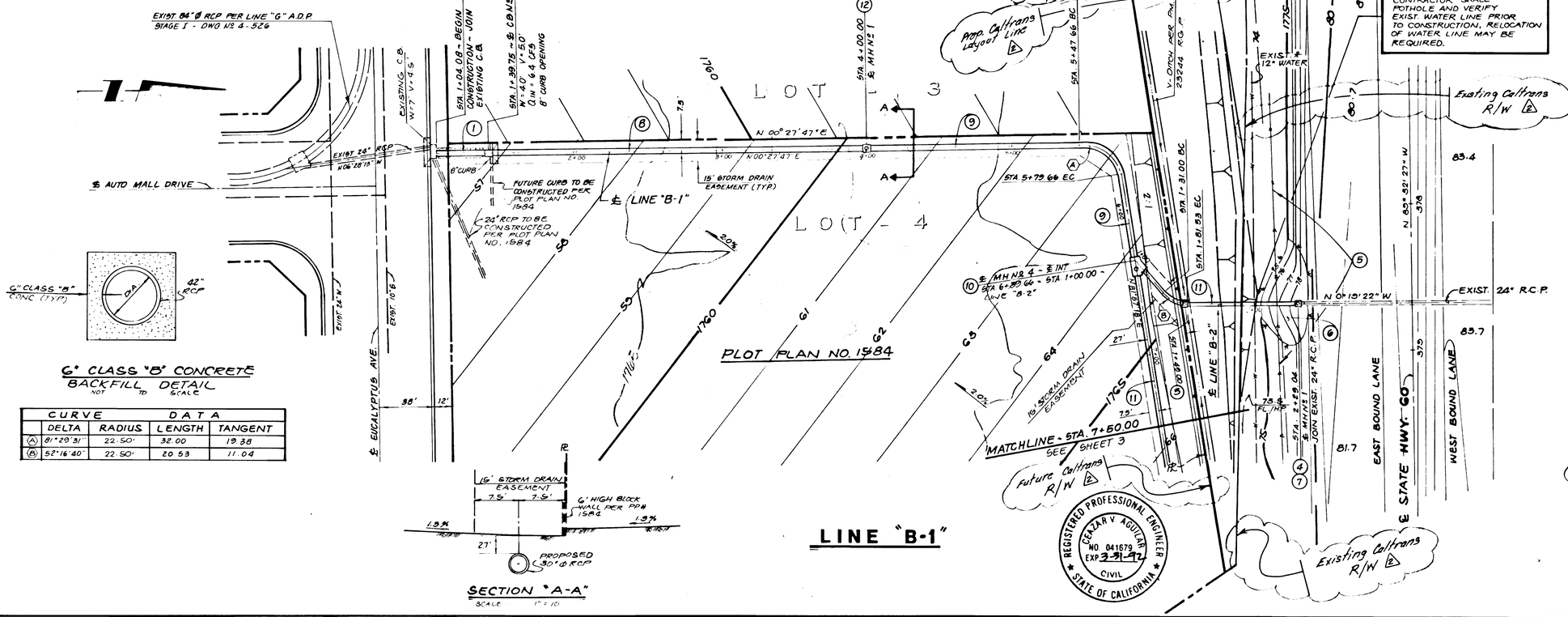
SHEET 1 OF 3 SHTS.
FILE NO. C710015



PROFILE SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'

LINE "B-2" PROFILE

SEE PLAN VIEW BELOW



CURVE DATA			
DELTA	RADIUS	LENGTH	TANGENT
Ⓐ 81°28'31"	22.50'	32.00	19.38
Ⓑ 52°16'40"	22.50'	20.53	11.04

CONSTRUCTION NOTES

1. CONSTRUCT 42" R.C.P. (D-1600) BACKFILL WITH G" CLASS "B" CONCRETE PER DETAIL THIS SHEET.
2. CONSTRUCT CATCH BASIN NO. 1 PER RCFCD STD DWG. NO. D8100 W = 4.0' V = 6.0' L.D 201 CASE "C"
3. CONSTRUCT DRAINAGE INLET TYPE G1 PER CALTRANS STD. DWG. NO. D78. MODIFIED H = 5.2' SEE DETAIL ON SHEET NO 3
4. JOIN EXIST. 24" R.C.P WITH MANHOLE NO. 1 PER R.C.F.C.D. STD. DWG. NO. MH 251.
5. REMOVE AND REPLACE ± 105 LF. OF EXISTING CALTRANS FENCE.
6. CONTOUR GRADE AREA AND BACKFILL EXISTING GROUND AS SHOWN.
7. REMOVE EXISTING PIPE ENDWALL
8. CONSTRUCT 36" RCP (D-1250)
9. CONSTRUCT 30" RCP (D-1250)
10. CONSTRUCT MANHOLE NO 4 PER RCFCD STD. DWG. NO. 254 A = 30" B = 24" C = 7.5' D = 24" D_2 = 30" ELEV. "R" = 1759.86 ELEV. "S" = 1750.20
11. CONSTRUCT 24" RCP (CLASS IV)
12. CONSTRUCT MANHOLE NO 1 PER RCFCD STD DWG. NO. MH 251

⚠ NOTE:
THE PROPOSED GRADING & DRAINAGE IMPROVEMENTS DEPICTED ON THIS SHEET SUPERSEDES THE GRADING INDICATED ON P.M. 23244 ROUGH GRADING PLANS

℄ CAUTION:
CONTRACTOR SHALL POTHOLE AND VERIFY EXIST. WATER LINE PRIOR TO CONSTRUCTION. RELOCATION OF WATER LINE MAY BE REQUIRED.

REGISTERED PROFESSIONAL ENGINEER
CEAZAR V. AGUILAR
NO. 041679
EXP. 3-31-92
CIVIL
STATE OF CALIFORNIA

BENCH MARK
LOCATION: U.S.C. AND G.S. R-375 M-124 CO-DSGN.FD. BRASS DISK STPD. R-375 TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 2710SG. 55' N. OF IRONWOOD AVE. 6' HIGHER THAN ROAD 1'S OF MARKER POST.
ELEVATION: 1845.26

REFERENCE BLOCK

DESIGNED BY: W.E.M.
DRAWN BY: R.A.M.
CHECKED BY: C.V.A.

REVISIONS					
MARK	DATE	INITIAL	DESCRIPTION	DATE	APPVD
⚠	1-17-91		ADD NOTE	3/11/91	JMF
℄	3/22/91	JMF	Added notes to show existing and future Caltrans R/W's and prop. Caltrans layout line	3/22/91	JMF

APPROVED BY: CEAZAR V. AGUILAR
DATE: 10/11/90 REGISTERED CIVIL ENGINEER NO. 41679 REGISTRATION EXP. 3-31-92

APPROVED BY:
DATE: 10/12/90 JOHN K. FEENSTRA R.C.E. 13870 EXP. 3-31-93 DEPUTY CITY ENGINEER OF MORENO VALLEY

THE KEITH COMPANIES
6296 RIVER CREST DRIVE SUITE K RIVERSIDE, CA. 92507 (714) 653 0234

SCALE: SCALE 1" = 40'
DATE: SEPT. 1990

CITY OF MORENO VALLEY

STORM DRAIN IMPROVEMENT PLANS
LINE "B-1" & LINE "B-2"
PARCEL MAP 23244

SHEET: 2 OF 3 SHTS.
FILE NO. C 71001S

INSTALL ONE LENGTH OF PIPE AND PLUG @ STA. 11+92 FOR INTERIM PIPE CONSTRUCTION

PROPOSED FINISHED SURFACE ABOVE E STORMDRAIN

EXISTING GROUND OVER PIPE

100 YR. WATER SURFACE

PLUG WITH CONC. BULKHEAD PER R.C.F.C. STD. DWG. NO. M816

AUTO MALL DRIVE LATERAL

C.B. NO. 4 CONNECTOR PIPE

DETAIL N.T.S.

FINISHED SURFACE OVER E OF STORM DRAIN

EXIST. GROUND @ E OF STORM DRAIN

HYDRAULIC DATA
Q_{100} = 46.00 C.F.S.
V = 3.64 F.P.S.
D_n = 2.20'
S = 0.0113

HYDRAULIC DATA (INTERIM)
Q_{100} = 16 C.F.S.
V = 1.94 F.P.S.

HYDRAULIC DATA
Q_{100} = 50.00 C.F.S.
V = 7.07 FPS

HYDRAULIC DATA
Q_{100} = 67.00 C.F.S.
V = 6.06 FPS
S = 0.0048
D_n = 2.75'

HYDRAULIC DATA
Q_{100} = 81.00 C.F.S.
V = 6.44 FPS
S = 0.0048
D_n = 2.24'

HYDRAULIC DATA
Q_{100} = 81.00 C.F.S.
V = 6.44 FPS

HYDRAULIC DATA
Q_{100} = 81.0 C.F.S.
V = 6.4 FPS
70.0 LF-48"CMP

HYDRAULIC DATA
Q_{100} = 783.0 C.F.S.
V = 7.0 FPS
S = 0.0050

HYDRAULIC DATA
Q_{100} = 22.90 C.F.S.
V = 9.13 FPS

68 L.F. 30" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE

160 S.L.F. ~ 36" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE

211.2 L.F. ~ 42" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE

223.1 L.F. ~ 48" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE

181.3 L.F. ~ 48" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE

44.50 L.F. 24" RCP (CLASS IV) OR C.I.P.P. ALTERNATE

PROFILE SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'

19+00 18+00 17+00 16+00 15+00 14+00 13+00 12+00 11+00 10+00 0+00 1+00

TYPICAL SECTION
STA. 13+00.00

100' R/W
50' 50'
12' 38' 38' 12'
12" WATER
48" STORM DRAIN
6' 6'

DO NOT CONSTRUCT PAST STA. 11+92 UNTIL DIRECTED BY ENGINEER

LOT 9 LOT 8 LOT 7

MOTOR WAY

AUTO MALL DRIVE

MORENO BEACH DRIVE

CURVE DATA			
△	RADIUS	LEN./DIST.	TAN
(A) 38°07'25"	90.00'	59.88	31.10
(B) 27°54'31"	494.00'	240.63'	122.75'
(C) 82°34'45"	90.00'	129.71'	79.04'

SCALE: 1"=10'

SCALE: 1"=40'

SCALE: 1"=40 FEET

REGISTERED PROFESSIONAL ENGINEER CHRIS D. CUMMINS NO. 041983 Exp. 3/31/92 CIVIL STATE OF CALIFORNIA

CONSTRUCTION NOTES

1. CONSTRUCT TRANSITION STRUCTURE PER RCFCD STD. DWG. No. T.S. 303, A=39°00'42.7", B=24", C=6.8, D2=48", D1=42", ELEV. "R"=1741.07 ELEV. "S"=1740.00
2. CONSTRUCT MANHOLE PER RCFCD STD. DWG. No. M.H. 254, A=30°49'05.7", B=30", C=8.8", D2=42", D1=36", ELEV."R"=1742.33, ELEV."S"=1742.22
3. CONSTRUCT MANHOLE PER RCFCD STD. DWG. No. M.H. 252.
4. CONSTRUCT CATCH BASIN PER RCFCD STD. DWG. No. CB 100, SEE R.C.F.C.D. STD. DWG. № CB 109 FOR CORNER CONNECTION.
5. CONSTRUCT LOCAL DEPRESSION PER RCFCD STD. DWG. No. LD 201, CASE B.
6. CONSTRUCT LOCAL DEPRESSION PER RCFCD STD. DWG. No. LD 201, CASE C.
7. PLACE 1/4 TON RIP-RAP (2:1 MAX. SLOPE) AS SHOWN, 2.1' THK.) PER CALTRANS STD. SPEC. 72-2-02.
8. CONSTRUCT 48" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE.
9. CONSTRUCT 42" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE.
10. CONSTRUCT 36" R.C.P (1000-D) OR C.I.P.P. ALTERNATE.
12. CONSTRUCT 24" R.C.P. CLASS IV OR C.I.P.P. ALTERNATE
11. CONSTRUCT 30" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE
20. CONSTRUCT TYPE IX INLET PER R.C.F.C.D. STD. DWG. NO. CB 101 (MODIFIED) DETAIL AS SHOWN ON SHEET 3 H=3.5 FT.
17. CONSTRUCT WIRE MESH FENCE PER R.C.F.C.D. STD. DWG. № M818 H=6'-6" W/ 6" SPACINGS
18. CONSTRUCT 14 FT. DOUBLE DRIVE GATE PER R.C.F.C.D. STD. DWG. № M 801
19. CONSTRUCT CATCH BASIN PER CITY OF RIVERSIDE STD. DWG. NO. 407.
21. CONSTRUCT CONC. COLLAR PER R.C.F.C.D. STD. DWG. NO. M 803.
24. CONSTRUCT TYPE "C" END WALL PER CALTRANS STD. DWG NO. D90
25. CONSTRUCT 1/2 TON RIPRAP PER CALTRANS STD. SPEC. 72-2.02 AS SHOWN T=3.4 FT. MIN
14. CONSTRUCT 48" C.M.P. (16 GAUGE)

BENCH MARK

LOCATION: U.S.C. & G.S. R-375 M-124 CO. DSGN. FC. BRASS DISK STPD. R-375. TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD. I.S. OF MARKER POST.

ELEVATION: 1845.26'

REFERENCE BLOCK:

DESIGNED BY: C.V.A.
DRAWN BY: J.S.
CHECKED BY: C.V.A.

REVISIONS					
MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD
1	4-26-90	WA	SEE SHEET 2B FOR REVISIONS	5/8/90	JKF
2	4-26-90	WA	THESE ITEMS DELETED PER REVISIONS ON SHEET 2B	5/8/90	JKF

APPROVED BY: CHRIS D. CUMMINS, REGISTERED CIVIL ENGINEER NO. 041983
DATE: 1-6-89

APPROVED BY: JOHN K. FEENSTRA R.C.E. 13870 EXP. 3-31-93, DEPUTY CITY ENGINEER OF MORENO VALLEY
DATE: 11-8-89

THE KEITH COMPANIES

SCALE: 1" = 40'

DATE: DEC. 1988

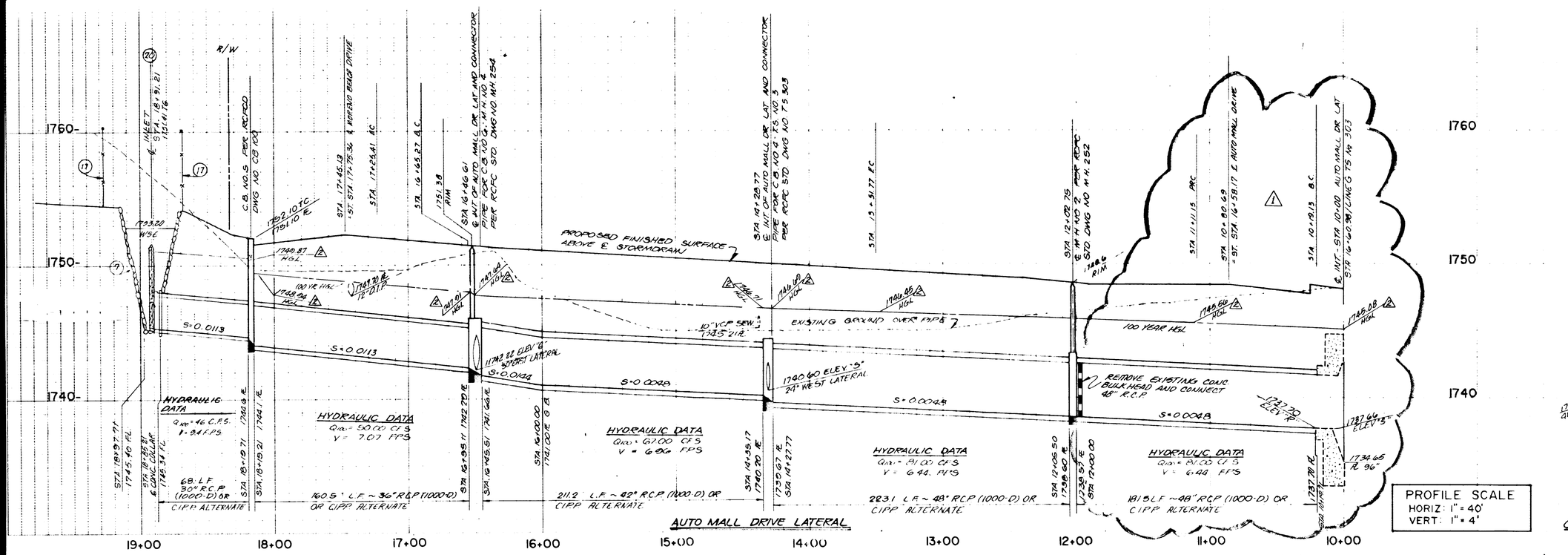
CITY OF MORENO VALLEY

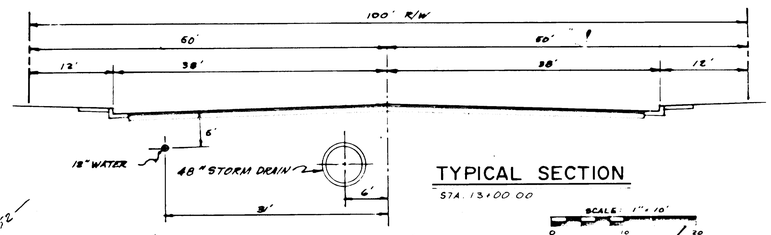
INTERIM

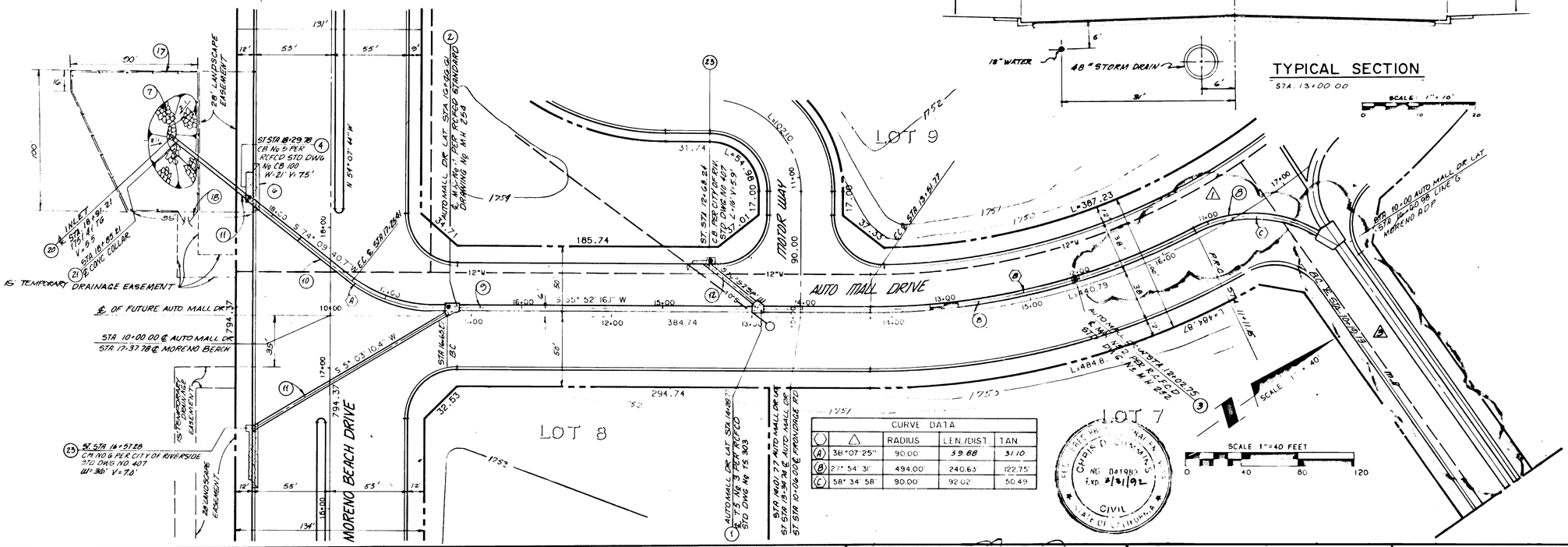
STORM DRAIN IMPROVEMENT PLANS
AUTO MALL DRIVE (INTERIM OUTLET)
P. M. 23244
MORENO VALLEY AUTO MALL

SHEET: 2A OF 3 SHTS.

FILE NO. 710-015







CONSTRUCTION NOTES

1. CONSTRUCT TRANSITION STRUCTURE PER RCFCD STD. DWG. No. T-5.505, A=39°00'42.7", B=24", C=6.8', D2=48", D1=42", ELEV. "R"=1741.07 ELEV. "S"=1740.60
2. CONSTRUCT MANHOLE PER RCFCD STD. DWG. No. M.H. 254, A=30°49'05.7", B=30", C=8.8', D2=42", D1=36", ELEV."R"=1742.33, ELEV."S"=1742.22
3. CONSTRUCT MANHOLE PER RCFCD STD. DWG. No. M.H. 252.
4. CONSTRUCT CATCH BASIN PER RCFCD STD. DWG. No. CB 100, SEE R.C.F.C.D. STD DWG. № CB109 FOR CORNER CONNECTION.
5. CONSTRUCT LOCAL DEPRESSION PER RCFCD STD. DWG. No. LD 201, CASE B.
6. CONSTRUCT LOCAL DEPRESSION PER RCFCD STD. DWG. No. LD 201, CASE C.
7. PLACE 1/4 TON RIP-RAP (2' MAX. SLOPE) AS SHOWN. (2' THK.) PER CALTRANS STD SPEC 72-2.02.
8. CONSTRUCT 48" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE.
9. CONSTRUCT 42" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE.
10. CONSTRUCT 36" R.C.P (1000-D) OR C.I.P.P. ALTERNATE.
12. CONSTRUCT 24" R.C.P. CLASS IV OR C.I.P.P. ALTERNATE
11. CONSTRUCT 30" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE
22. CONSTRUCT TYPE IX INLET PER R.C.F.C.D. STD. DWG NO CB 107 (MODIFIED) DETAIL AS SHOWN ON SHEET 3 V=3.9 FT
17. CONSTRUCT WIRE MESH FENCE PER R.C.F.C.D. STD. DWG. № M818 H=6'-6" W/ 6" SPACINGS
18. CONSTRUCT 14 FT. DOUBLE DRIVE GATE PER R.C.F.C.D. STD. DWG. № M 801
25. CONSTRUCT CATCH BASIN PER CITY OF RIVERSIDE STD. DWG. NO. 407.
21. CONSTRUCT CONC. COLLAR PER R.C.F.C.D. STD. DWG. NO. M 803

BENCH MARK
LOCATION: U.S.C. & G.S. R-375 M-124 CO. DSGN. FD. BRASS DISK STPD. R-375, TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53' N. OF IRONWOOD AVE., 6' HIGHER THAN RD. 75' S. OF MARKER POST.
ELEVATION: 1845.26'

REFERENCE BLOCK

DESIGNED BY: C.V.A.
DRAWN BY: V.S.
CHECKED BY: C.V.A.

MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD
1	4-26-90	C.V.A.	UPDATE PLANS TO REMOVE CONC. BULKHEAD, CONST. 48" RCP, AND JOIN INTO PROPOSED LINE "G"		
2	4-26-90	C.V.A.	REVISE H.G.L.		
3	4-26-90	C.V.A.	REVISE PER LINE "G" MORENO A.D.P. PARCEL MAP 23244, DWG. NO. 4-526		

APPROVED BY: CHRIS D. CUMMINS — REGISTERED CIVIL ENGINEER NO. 041989
DATE: 4-24-90
APPROVED BY: JOHN E. FLEENOR, RCE. 18870 EXP. 3-31-92 — DEPUTY CITY ENGINEER, OF MORENO VALLEY
DATE: 5/8/90

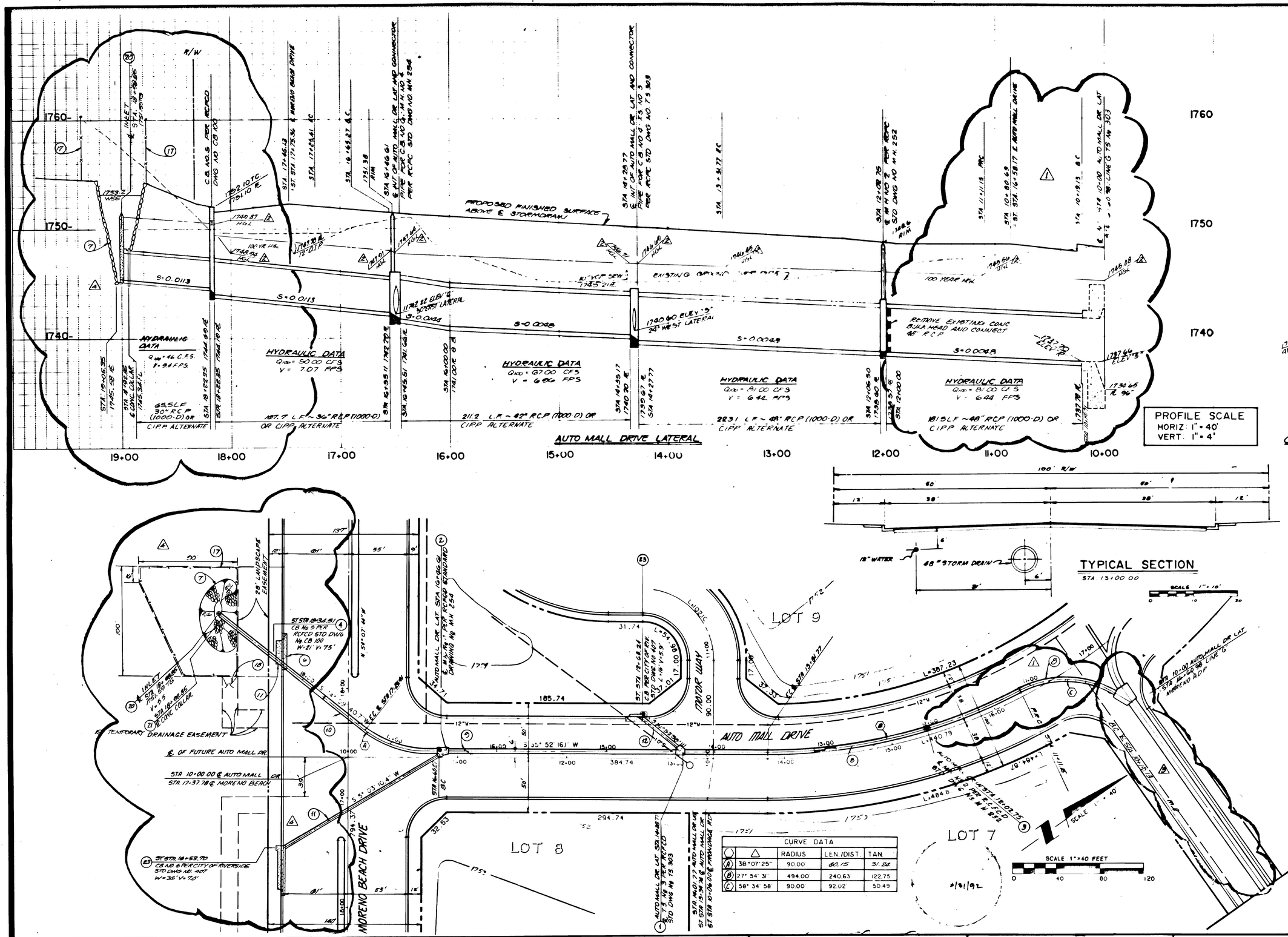
THE KEITH COcompanies

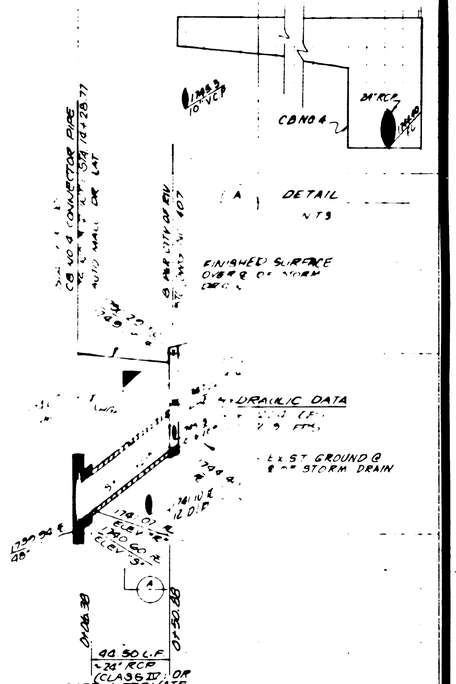
SCALE: 1" = 40'
DATE: DEC. 1988

CITY OF MORENO VALLEY

STORM DRAIN IMPROVEMENT PLANS
AUTO MALL DRIVE LATERAL
P. M. 23244
MORENO VALLEY AUTO MALL

SHEET: 28 OF 3 SHTS.
FILE NO. 710-015





CONSTRUCTION NOTES

1. CONSTRUCT TRANSITION STRUCTURE PER RCFCD STD. DWG. No. T 5 303, A=39°00'42.7" B=24" ; C=6.8 ; D2=48" ; Di=42" ; ELEV. "R"=1741.07 ELEV. "S"=1740.60
2. CONSTRUCT MANHOLE PER RCFCD STD. DWG. No. M.H. 254, A=30°49'05.7" , B=30" ; C=8.8' D2=42" ; Di=36" , ELEV."R"=1742.33, ELEV."S"=1742.22
3. CONSTRUCT MANHOLE PER RCFCD STD. DWG. No. M.H. 252.
4. CONSTRUCT CATCH BASIN PER RCFCD STD. DWG. No. CB. 100. SEE R.C.F.C.D. STD DWG. № CB 109 FOR CORNER CONNECTION.
5. CONSTRUCT LOCAL DEPRESSION PER RCFCD STD. DWG. No. LD 201 ; CASE B.
6. CONSTRUCT LOCAL DEPRESSION PER RCFCD STD. DWG. No. LD 201 ; CASE C.
7. PLACE 1/4 TON RIP-RAP (2) MAX. SLOPE) AS SHOWN. (2' THK.) PER CALTRANS STD. SPEC. 72.2.02.
8. CONSTRUCT 48" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE.
9. CONSTRUCT 42" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE.
10. CONSTRUCT 36" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE.
12. CONSTRUCT 24" R.C.P. CLASS III OR C.I.P.P. ALTERNATE
11. CONSTRUCT 30" R.C.P. (1000-D) OR C.I.P.P. ALTERNATE
22. CONSTRUCT TYPE IX INLET PER R.C.F.C.D STD DWG NO CB 101 (MODIFIED) DETAIL AS SHOWN ON SHEET 3 V=35 FT
17. CONSTRUCT WIRE MESH FENCE PER R.C.F.C.D STD DWG № M 818 H=6'-6" W/ 6" SPACINGS
18. CONSTRUCT 14 FT. DOUBLE DRIVE GATE PER R.C.F.C.D. STD. DWG. № M 801
19. CONSTRUCT CATCH BASIN PER CITY OF RIVERSIDE STD. DWG. NO. 407.
21. CONSTRUCT CONC. COLLAR PER R.C.F.C.D STD DWG NO M 803

BENCH MARK

LOCATION: U.S.C. & G.S. R-375 M-124 CO. DSGN. FC. BRASS DISK STPD. R-375. TOP CONC. POST 2.50' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD TS. OF MARKER POST.

ELEVATION: 1845.26'

REFERENCE BLOCK

DESIGNED BY C.V.A.
DRAWN BY V.S.
CHECKED BY C.V.A.

REVISIONS					
MARK	DATE	INITIAL	DESCRIPTION	DATE	APP'VD
1	4-26-90	CVA	UPDATE PLANS TO REMOVE CONC BULKHEAD CONST. 48" RCP AND VOAL INTO PROPOSED LINE "G"	5/8/90	JKF
2	4-26-90	CVA	REVISE HGL	5/8/90	JKF
3	4-26-90	CVA	REVISE PER LINE "G" MOREAD A.D.P. PARCEL MAP 23244, DWG. NO. 4-526	5/8/90	JKF
4			ENLARGED MORENO BEACH DR. 0' SOUTH OF ℄ MOVED C.B.	5/8/90	JKF

APPROVED BY: CHRIS D. CUMMINS
DATE: 4-24-90 REGISTERED CIVIL ENGINEER NO. 04/1989

APPROVED BY: JOHN F. [illegible] RCE 38170 EXP. 3-31-92
DATE: 5/8/90 DEPUTY CITY ENGINEER OF MORENO VALLEY

THE KEITH COMPANIES

SCALE: 1" = 40'

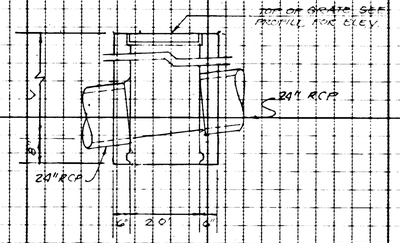
DATE: DEC. 1988

CITY OF MORENO VALLEY

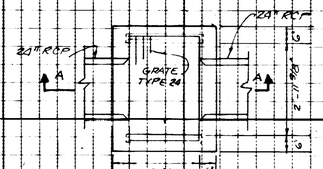
STORM DRAIN IMPROVEMENT PLANS
AUTO MALL DRIVE LATERAL
P. M. 23244
MORENO VALLEY AUTO MALL

SHEET: 2C OF 3 SHTS.

FILE NO. 710-015

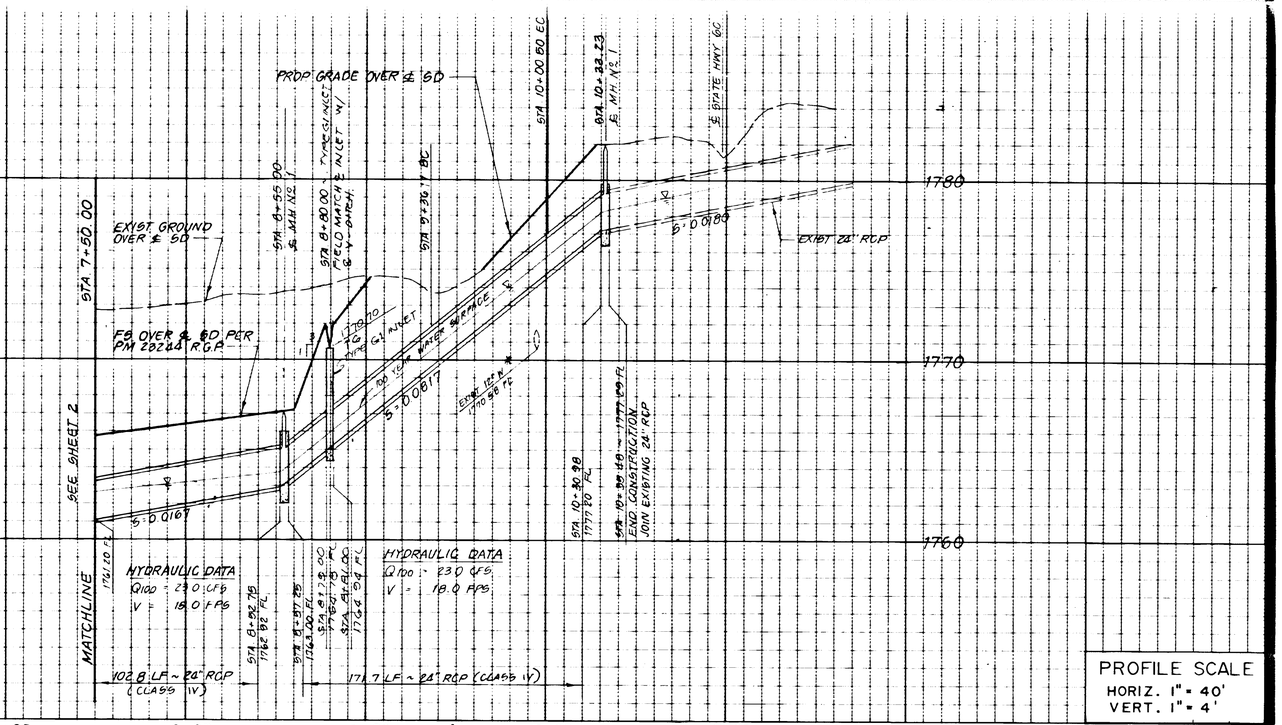


SECTION A-A



TYPE G1 INLET DETAIL (MODIFIED)

NOT TO SCALE



PROFILE SCALE
HORIZ. 1" = 40'
VERT. 1" = 4'

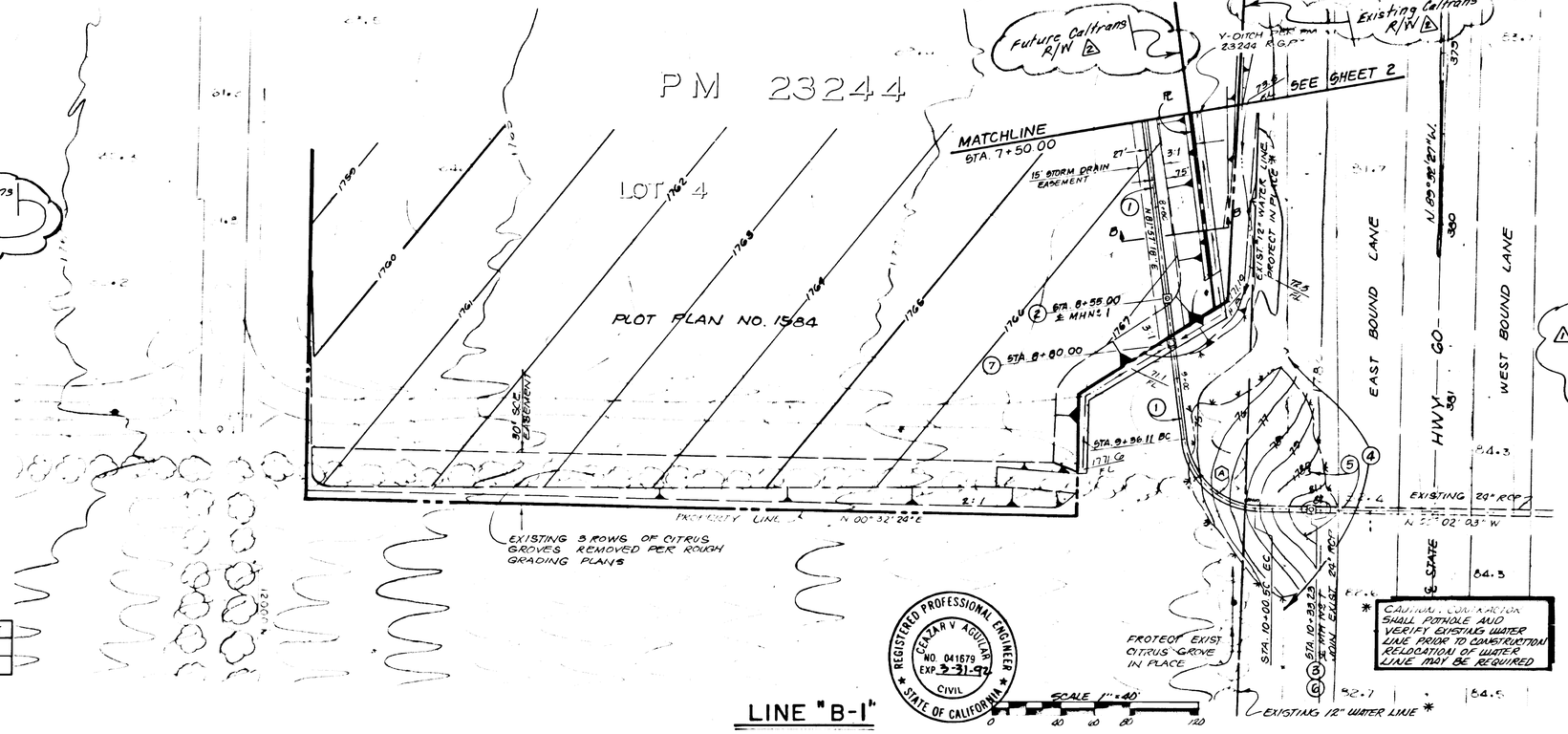
SECTION B-B

SCALE 1" = 10'

PM 23244

LOT 4

PLOT PLAN NO. 1584



CONSTRUCTION NOTES

1. CONSTRUCT 24" R.C.P. (CLASS III)
2. CONSTRUCT MANHOLE No. 1 PER R.C.F.C.D. STD. DWG No. MH 251
3. JOIN EXISTING 24" RCP WITH MANHOLE No. 1 PER RCFCD STD DWG No. MH 251
4. REMOVE AND REPLACE EXISTING CALTRANS ± 145 LF FENCE
5. CONTOUR GRADE AREA AND BACKFILL EXISTING TRENCH AS SHOWN
6. REMOVE EXISTING PIPE END WALL.
7. CONSTRUCT DRAINAGE INLET TYPE G1 PER CALTRANS STD. DWG. No. D73. MODIFIED H= 6.02' SEE DETAIL THIS SHEET.

⚠ NOTE:
THE PROPOSED GRADING & DRAINAGE IMPROVEMENTS DEPICTED ON THIS SHEET SUPERSEDES THE GRADING INDICATED ON P.M. 23244 ROUGH GRADING PLANS

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
(A)	81°59'21"	45.00'	64.39'	39.11'

LINE "B-1"

REGISTERED PROFESSIONAL ENGINEER CEZAR V. AGUILAR NO. 041679 EXP. 3-31-92 CIVIL STATE OF CALIFORNIA

BENCH MARK

LOCATION U.S.C. & G.S. R-375 M-124 CO. DSGN. FD. BRASS DISK STPD. R-375, TOP CONC. POST 250' WEST HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP#271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD' I'S. OF MARKER POST.'

ELEV. 1845.26

REFERENCE BLOCK:

DESIGNED BY: W.E.M.
DRAWN BY: R.A.M.
CHECKED BY: C.V.A.

MARK	DATE	INITIAL	DESCRIPTION	DATE	APPVD
⚠1	1-17-91		ADD NOTE	3/11/91	JWF
⚠2	3/27/91	JMF	Added notes to show existing and future Caltrans R/W	5/22/91	JWF

APPROVED BY: CEAZAR V. AGUILAR
DATE: 10/11/90
REGISTERED CIVIL ENGINEER NO. 41679
REGISTRATION EXP. 3-31-92

APPROVED BY: JOHN K. FEENSTRA
DATE: 10/12/90
REGISTERED CIVIL ENGINEER NO. 13870
DEPUTY CITY ENGINEER EXP. 3-31-93

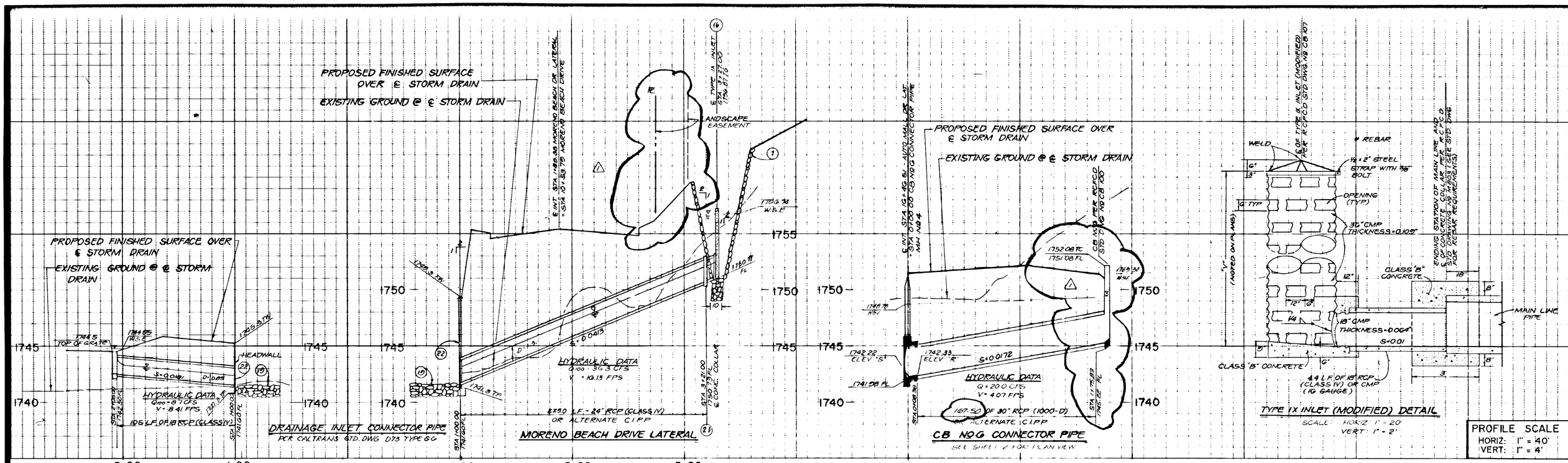
THE KEITH COMPANIES
6296 RIVER CREST DRIVE
SUITE K
RIVERSIDE, CA. 92507
(714) 653-0234

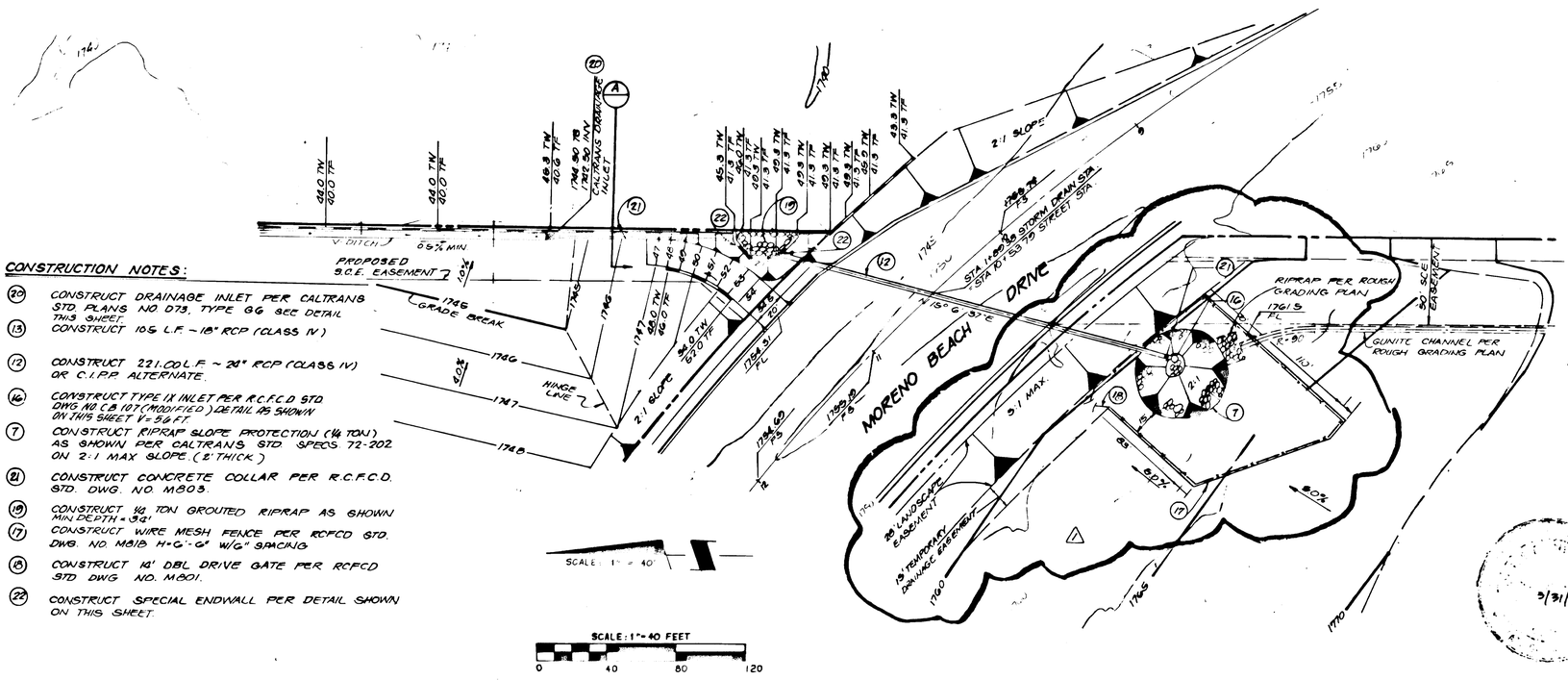
SCALE: 1" = 40'
DATE: SEPT. 1990

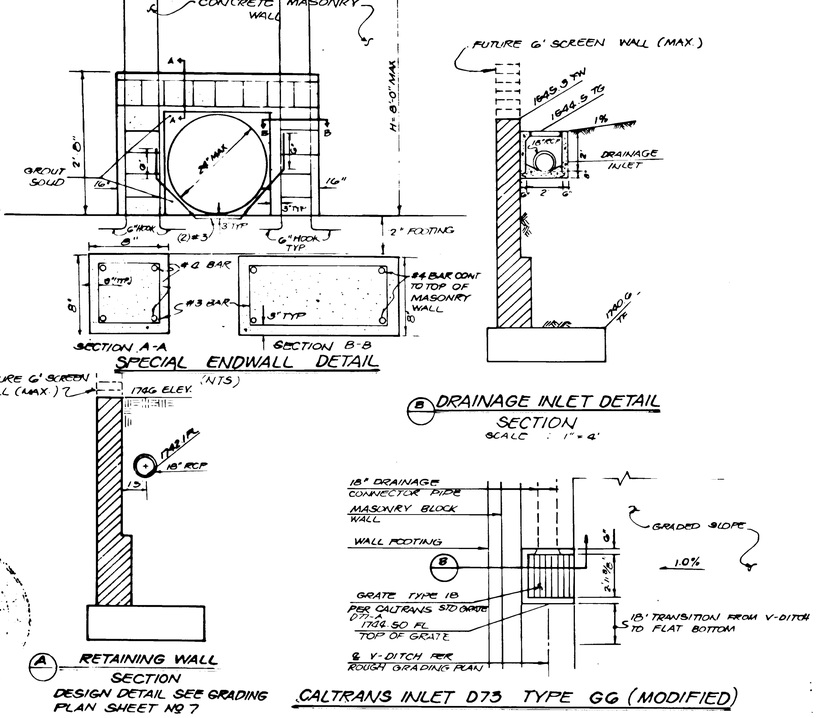
CITY OF MORENO VALLEY

STORM DRAIN IMPROVEMENT PLANS
LINE "B-1"
PARCEL MAP 23244

SHEET: 3 OF 3 SHTS.
FILE NO. C 710015







3/31/92

BENCH MARK LOCATION: U.S.C. & G.S. R-375 M-124 CO. DSGN. FD. BRASS DISC STPD. R-375. TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD. 1'S. OF MARKER POST. ELEVATION: 1845.26'	REFERENCE BLOCK:	DESIGNED BY: CVA DRAWN BY: RR CHECKED BY: CVA	REVISIONS MARK | DATE | INITIAL | DESCRIPTION | APP'VD △ | | | ENLARGED MORENO BEACH DR & SOUTH OF ℄ MOVED C.B. | 9/21/90	APPROVED BY: CHRIS D. CUMMINS DATE: 10-5-89 REGISTERED CIVIL ENGINEER NO. 041983 APPROVED BY: JOHN K. FEENSTRA R.C.E. 13870 EXP. 3-31-93 DEPUTY CITY ENGINEER OF MORENO VALLEY DATE: 11-8-89

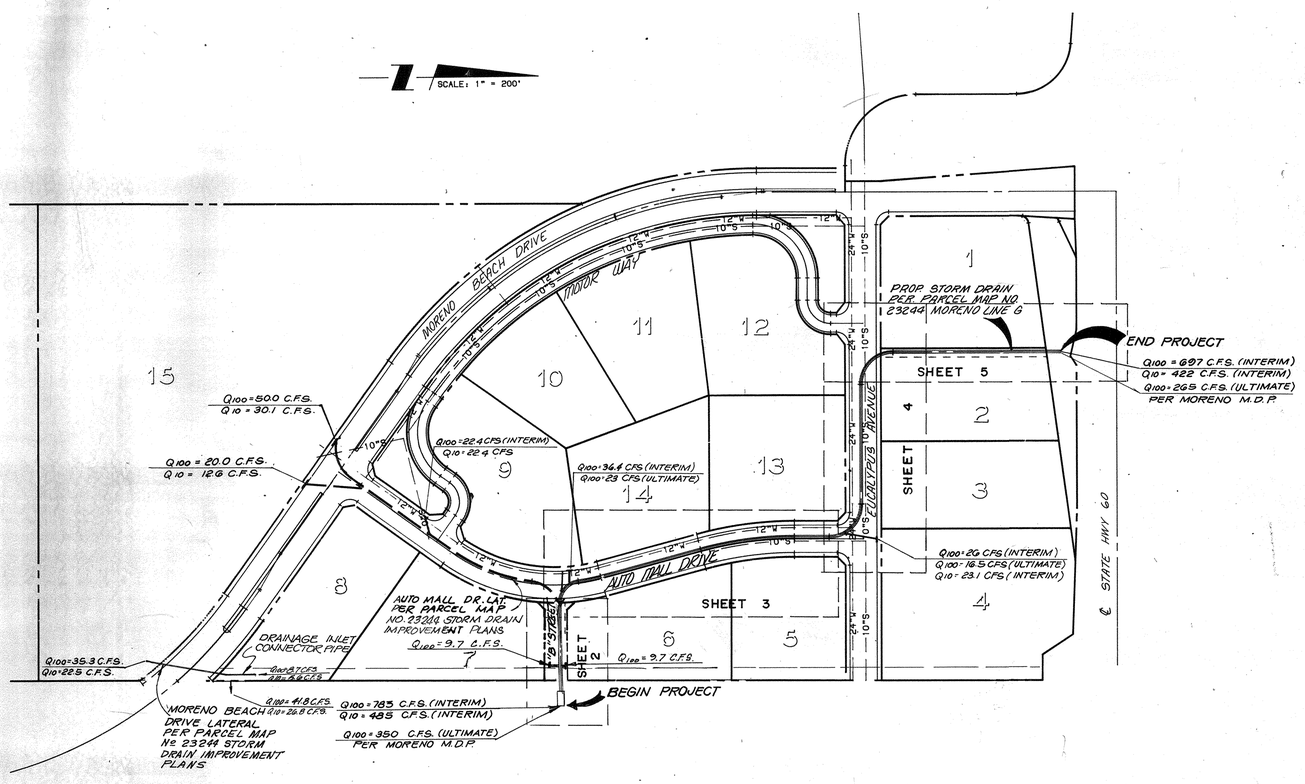
SCALE: 1" = 40'	DATE: DEC. 1988.	**CITY OF MORENO VALLEY** STORM DRAIN IMPROVEMENT PLANS. MORENO BEACH DRIVE LATERAL P. M. 23244 MORENO VALLEY AUTO MALL

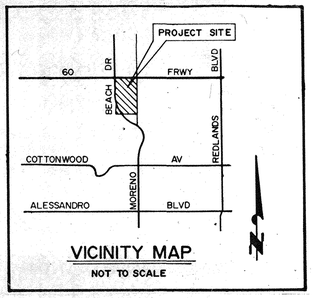
SHEET: 3A OF 3 SHTS.
FILE NO. 710-015

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

GENERAL NOTES

1. THE CONTRACTOR SHALL CONSTRUCT THE FLOOD CONTROL IMPROVEMENTS SHOWN ON THE DRAWINGS IN CONFORMANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT'S SPECIAL PROVISIONS AND DETAILED SPECIFICATIONS DATED SEPTEMBER 1984, AND DESIGN MANUAL STANDARD DRAWINGS DATED MAY 1971.
2. ALL CONSTRUCTION TO BE IN CONFORMANCE WITH THE REGULATION OF CAL-OSHA.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CLEARING OF THE PROPOSED WORK AREA AND RELOCATION COSTS OF ALL EXISTING UTILITIES. PERMITTEE MUST INFORM CITY OF CONSTRUCTION AT (714) 242-3120
4. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER OR CONTRACTOR TO APPLY TO THE CITY OF MORENO VALLEY ENGINEERING DEPARTMENT, PERMIT SECTION, FOR ENCROACHMENT PERMIT FOR ALL WORK ON EXISTING CITY MAINTAINED ROADS, AND FOR UTILITY WORK WITHIN OFFERS OF DEDICATION FOR PUBLIC USE.
5. CONSTRUCTION INSPECTION WILL BE PERFORMED BY RIVERSIDE COUNTY FLOOD CONTROL. CONTACT LEONARD DUNN AT (714) 787-1263. THE DISTRICT MUST BE NOTIFIED TWO WEEKS PRIOR TO CONSTRUCTION.
6. ALL STATIONING REFERS TO CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE NOTED.
7. STATIONING FOR LATERALS AND CONNECTOR PIPE REFER TO THE CENTERLINE-CENTERLINE INTERSECTION.
8. FORTY-EIGHT HOURS BEFORE EXCAVATION, CALL UNDERGROUND SERVICE ALERT 1-800-422-4133.
9. ALL ELEVATIONS ARE IN FEET AND DECIMALS THEREOF BASED ON U.S.C. AND G.S. DATUM.
10. ALL CROSS SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
11. ELEVATIONS OF UTILITIES ARE APPROXIMATE UNLESS OTHERWISE NOTED.
12. NOTICE TO THE CONTRACTOR: THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT FOR THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN AND ANY OTHER LINES NOT SHOWN ON THESE PLANS OR NOT RECORDED.
13. ALL BACKFILL TO BE 90% RELATIVE COMPACTION UNLESS OTHERWISE SPECIFIED, AND SHALL BE CERTIFIED BY THE CITY'S SOILS ENGINEER PRIOR TO PAVING. RETESTING SHALL BE AT THE DEVELOPER'S EXPENSE.
14. OPENINGS RESULTING FROM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6" OF CLASS "B" CONCRETE.
15. BEDDING PIPE WITH LESS THAN TWO FEET OF COVER SHALL CONFORM TO LOS ANGELES COUNTY FLOOD CONTROL DISTRICT STANDARD DRAWINGS 2-D213.3 AND 2-D177 FOR CONCRETE BACKFILL IN TRENCHES. ALL OTHER PIPE SHALL CONFORM TO RCFCD&WCD STD. DWG. M 815
16. "V" IS THE DEPTH OF INLET OF CATCH BASINS MEASURED FROM THE TOP OF CURB TO INVERT OF CONNECTOR PIPE.
17. CATCH BASINS SHALL BE LOCATED SO THAT THE LOCAL DEPRESSION SHALL BEGIN AT EXISTING CURB RETURN JOINT, UNLESS OTHERWISE SPECIFIED.
18. ALL CURB, GUTTERS, SIDEWALKS, DRIVEWAYS AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED IN KIND AND AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS UNLESS OTHERWISE NOTED.
19. THE CONCRETE COVER OF THE INSIDE OF ALL REINFORCED CONCRETE PIPE MUST BE INCREASED TO PROVIDE A MINIMUM OF 1-1/2" OVER THE REINFORCING WHEN THE DESIGN VELOCITIES EXCEED 20 FEET PER SECOND. THE CONCRETE DESIGN STRENGTH IN THESE REACHES SHALL BE fc=5,000 PSI FOR VELOCITIES EXCEEDING 20 FEET PER SECOND
20. CAST IN PLACE PIPE CAN BE USED AS AN ALTERNATIVE TO R.C.P. ONLY WHERE THERE IS 3 FEET MINIMUM COVER ABOVE THE PIPE.





VICINITY MAP

NOT TO SCALE

NOTICE- THE CONTRACTOR SHALL NOTIFY THE DISTRICT IN WRITING A MINIMUM OF TWO WEEKS BEFORE BEGINNING CONSTRUCTION AND SHALL NOT BEGIN CONSTRUCTION BEFORE OBTAINING AUTHORIZATION TO PROCEED.

INDEX MAP

200 100 0 200

AS BUILT
APPROVED BY: [illegible]
DATE 10/22/91

REGISTERED PROFESSIONAL ENGINEER FRANK J. PEARS Exp. 9-30-93 No. 21809 CIVIL STATE OF CALIFORNIA

THE FOLLOWING ITEMS ARE TO BE INSPECTED AND MAINTAINED BY THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

96" R.C.P. OR C.I.P.P. ALTERNATE FROM STA. 14+54.49 TO STA. 25+20.66

84" R.C.P. OR C.I.P.P. ALTERNATE FROM STA. 25+20.66 TO STA. 31+30.00

72" R.C.P. OR C.I.P.P. ALTERNATE FROM STA. 31+30.00 TO STA. 34+54.50

84" R.C.P. OR C.I.P.P. ALTERNATE FROM STA. 34+54.50 TO STA. 34+67.00

ALL MANHOLES AND OTHER STRUCTURES REQUIRED TO COMPLETE THE CONSTRUCTION OF THE ABOVE MENTIONED FACILITIES EXCLUDING CATCH BASINS AND CONNECTOR PIPES AND INLET AND OUTLET STRUCTURES. THE INLET AND OUTLET STRUCTURES THE 96" RCP OR C.I.P.P. ALTERNATE FROM STA. 13+93.49 TO STA. 14+54.49 AND 84" RCP OR C.I.P.P. ALTERNATE FROM STA. 34+67.00 TO STA. 35+55.60 INCLUDING THE CONCRETE LINED OPEN CHANNEL FROM STA. 35+69.40 TO STA. 36+00.74 ARE TO BE MAINTAINED BY THE CITY OF MORENO VALLEY.

INDEX

TITLE SHEET	SHEET 1 TO 1A
PLAN AND PROFILE	SHEET 2 TO 5
OUTLET STRUCTURE DETAIL	SHEET 6
CHANNEL DETAIL	SHEET 7

R. C. F. C. D. STANDARD DRAWINGS

CB 100 CATCH BASIN NO. 1
JS 227 JUNCTION STRUCTURE NO. 2
JS 229 JUNCTION STRUCTURE NO. 4
MH 252 MANHOLE NO. 2
TS 303 TRANSITION STRUCTURE NO. 3
CH 326 TRAPAZOIDAL CHANNEL DETAILS
M 815 BEDDING AND PAYLINES
M 801 CHAIN LINK FENCE AND 14' DOUBLE DRIVE GATE DETAILS

RIVERSIDE CO. STANDARD DRAWINGS

210 6-FT CONCRETE CROSS GUTTER

CALTRANS STANDARD DRAWINGS

D-90-A PIPE CULVERT HEADWALLS AND WINGWALLS

CAST-IN-PLACE PIPE RECOMMENDATIONS

1. FOR QUALITY CONTROL DURING PLACEMENT, EMPLOY AN EXPERIENCED R.C.E. OR TECHNICIAN HAVING SUITABLE C.I.P.P. EXPERIENCE.
2. CONTROL CONCRETE BY MEANS OF 6" X 12" TEST CYLINDERS-MIN. OR 1 SET OF FOUR (4) CYLINDERS/100 C.Y. AND NOT LESS THAN TWO (2) SETS CYLINDERS PER EACH DAYS POUR.
3. SUPPLYING BATCH PLANT SHALL BE INSPECTED AT THE START OF CONSTRUCTION AND NOT LESS THAN ONCE EACH WEEK THEREAFTER TO OBSERVE PLANT OPERATIONS, BATCH WEIGHTS, AND OTHER CONCRETE CONTROL MEASURES.
4. CONCRETE MIXES SHALL NOT HAVE LESS THAN SIX (6) SACKS OF PORTLAND CEMENT/CU. YD.
5. CONCRETE MIX DESIGNS SHALL BE SUBMITTED BY CONTRACTOR FOR APPROVAL PRIOR TO START OF CONSTRUCTION.
6. IF AND WHEN FLOW VELOCITY EXCEEDS 20 F.P.S. A 140° SEGMENT OF THE C.I.P.P. INVERT SHALL BE THICKENED 2 INCHES IN WALL THICKNESS AS "SACRIFICIAL CONCRETE" TO RESIST ABRASION. COMPRESSIVE STRENGTH OF CONCRETE FOR DESIGN VELOCITIES ≥ 20.0 F.P.S. SHALL BE fc=5,000 P.S.I.
7. MAXIMUM PERMISSIBLE CONCRETE SLUMP SHALL BE -1/2", MIN. TO 2-1/2" MAX.
8. CONTRACTOR SHALL ALLOW INSPECTOR INTO PIPE WHILE UNDER CONSTRUCTION AND "ROD" FOR WALL THICKNESS AT A MIN. OF EVERY 25 C.Y. OF THE POUR.
9. AT THE END OF ALL POURS AND AT THE END OF EACH WORKING DAY THE CONTRACTOR SHALL INSTALL #4 DOWELS 24" LONG 12" INTO THE LAST POUR AT 12" CENTERS AROUND THE CIRCUMFERENCE OF CAST-IN-PLACE PIPE.

REGISTERED PROFESSIONAL ENGINEER CHRIS D. CUMMINS NO: 041983 Exp. 3/31/92 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER SUPERVISION OF
CHRIS D. CUMMINS
DATE: 1-6-89
REGISTERED CIVIL ENGINEER NO. 041983
REGISTRATION EXPIRES 3-31-92

THE KEITH COMPANIES Inland Empire
• Planning • Civil Engineering • Architecture • Landscape Architecture • Land Surveying • Construction Management
6296 River Crest Drive, Suite K, Riverside, CA 92507 (714) 653-0234

BENCH MARK U.S.C.& G.S. R-375 M-124 CO. DSGN. FD. BRASS DISK STPD. R-375. TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63 N.E. OF PP # 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD'I'S.OF MARKER POST.
ELEV. = 1845.26

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: Frank J. Pears
PLANNING ENGINEER R.E. NO. 21809
DATE: 4/18/90
APPROVED BY: Kenneth R. Edwards
CHIEF ENGINEER R.E. NO. 12400
DATE: 4-19-90

CITY OF MORENO VALLEY
APPROVED BY: John K. Peenstra
JOHN K PEENSTRA DEPUTY CITY ENGINEER CITY OF MORENO VALLEY RIVERSIDE COUNTY, CA.
R.C.E. 13870 (EXP. 3/31/93)
DATE: 4/5/90

LINE "G" MORENO A.D.P.
STAGE I
PARCEL MAP 23244
TITLE SHEET

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 1 OF 7

•P• LINE G A.D.P. TITLE SHEET - 99(0.43)PF: 710015 10121 29-Dec-88 03:29 PM / 710015-526

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

CALTRANS GENERAL NOTES:

1. AN ENCROACHMENT PERMIT IS REQUIRED BEFORE ANY WORK MAY BEGIN IN/OR NEAR THE STATE RIGHT-OF-WAY.
2. ALL WORK WITHIN THE STATE RIGHT-OF-WAY SHALL CONFORM TO THE LATEST STATE STANDARD PLANS AND SPECIFICATIONS OR AS DIRECTED BY THE STATE'S REPRESENTATIVE.
3. NO EQUIPMENT OR MATERIALS MAY BE STORED ON THE STATE RIGHT-OF-WAY.
4. ALL DISTURBED AREAS IN THE STATE RIGHT-OF-WAY MUST BE TREATED FOR EROSION CONTROL (HYDROSEEDING OR EQUIVALENT, OR AS DIRECTED BY THE STATE'S REPRESENTATIVE). THE RESPONSIBILITY FOR MAINTAINING EROSION CONTROL WILL NOT BE RELEASED UNTIL THE SEEDING IS WELL ESTABLISHED. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST OF CALTRANS CLEANING ANY DRAINAGE STRUCTURES AND CHANNELS WHICH HAVE BECOME CLUTTERED WITH DEBRIS AND/OR SILT AS A RESULT OF, OR CAUSED BY, CONSTRUCTION PROJECT.
5. ACCESS CONTROL ON THE FREEWAY WILL BE MAINTAINED AT ALL TIMES (WORK INSIDE STATE RIGHT-OF-WAY MUST BE FENCED OFF WITH NO ACCESS TO WORK AREA FROM FREEWAY).
6. NO FREEWAY RAMPS OR FREEWAY LANES WILL BE MAINTAINED AT ANYTIME, UNLESS SPECIFICALLY ALLOWED PER THE ENCROACHMENT PERMIT AND/OR AS DIRECTED BY THE STATE'S REPRESENTATIVE.
7. ALL FENCE RELOCATED TO FACILITATE CONSTRUCTION OF THIS PROJECT INSIDE STATE RIGHT-OF-WAY SHALL BE REPLACED WITH CL-6 FENCE AS SHOWN IN THE STATE'S STANDARD PLANS, OR BLOCK WALL IN ACCORDANCE WITH ACCEPTABLE LOCAL AGENCY STANDARDS.
8. ALL STATE DRAINAGE STRUCTURES MUST FIRST BE COMPLETELY CLEANED OF DEBRIS, AND/OR SILT BY THE CONTRACTOR PRIOR TO MAKING THE CONNECTION.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSURING THAT ANY STATE DRAINAGE FACILITY WHICH IS CONNECTED TO OR DIRECTLY AFFECTED BY CONTRACTORS OPERATION SHALL BE CLEAN AND OPERATIONAL PRIOR TO FINAL ACCEPTANCE OF PERMIT WORK BY STATE. ADEQUATE CLEAN OUTS AND ACCESS OPENINGS SHALL BE PROVIDED IN ANY CONSTRUCTION WITHIN THE STATE'S RIGHT-OF-WAY FOR FUTURE MAINTENANCE AND REPAIR WORK, AS NEEDED. THIS SHALL BE FURNISHED AT NO COST TO THE STATE.
10. WHERE SURVEY MONUMENTS EXIST, SUCH MONUMENTS SHALL BE PROTECTED OR SHALL BE REFERENCED AND RESET, PURSUANT TO BUSINESS AND PROFESSION CODE, SECTION 8700 TO 8805 (LAND SURVEYORS ACT).

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURE SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR. SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

AS BUILT
APPROVED BY: [illegible]
DATE 10/22/91

REGISTERED PROFESSIONAL ENGINEER
CHRIS D. CUMMINS
NO. 041983
Exp. 3/31/92
CIVIL
STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF
CHRIS D. CUMMINS
DATE: 2/13/90
REGISTERED CIVIL ENGINEER NO. 041983
REGISTRATION EXPIRES 3-92

THE KEITH COMPANIES
INLAND EMPIRE
6296 RIVER CREST DRIVE, SUIT K, CA.92507 (714)6530234

BENCH MARK U.S.C. & G.S. R-375
M-124 CO. DSGN. FD. BRASS DISK STPD, R-375 TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056,53 N. OF IRONWOOD AVE. 6' HIGHER THAN R' I'S. OF MARKER POST.

ELEV. = 1845.26'

REVISIONS			
REF.	DESCRIPTION	APPR	DATE

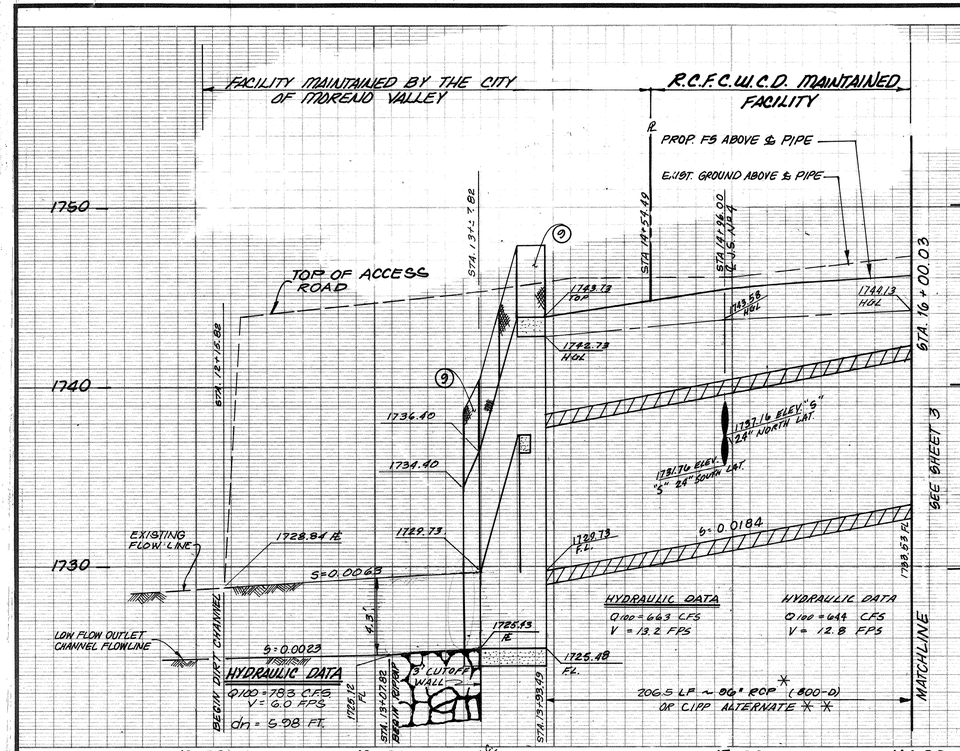
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: PLANNING ENGINEER R.E. NO. 21809 DATE:
APPROVED BY: CHIEF ENGINEER R.E. NO. 12400 DATE:

County of Riverside
APPROVED BY: JOHN K. FEENSTRA, DEPUTY CITY ENGINEER, CITY OF MORENO VALLEY, RIVERSIDE COUNTY, CA. R.C.E. 13870 (EXP. 3/31/93) DATE: 4/3/90

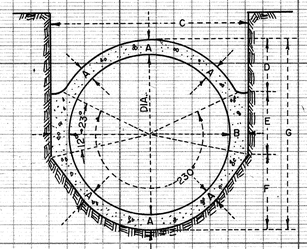
LINE "G" MORENO A.D.P.
STAGE I
PARCEL MAP 23244
TITLE SHEET

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 1A OF 7

•P• LINE G A.D.P. SHT.2/7 - 63[0.43]PF: 710015 10123 12-Feb-90 01:15 PM / 710015-999



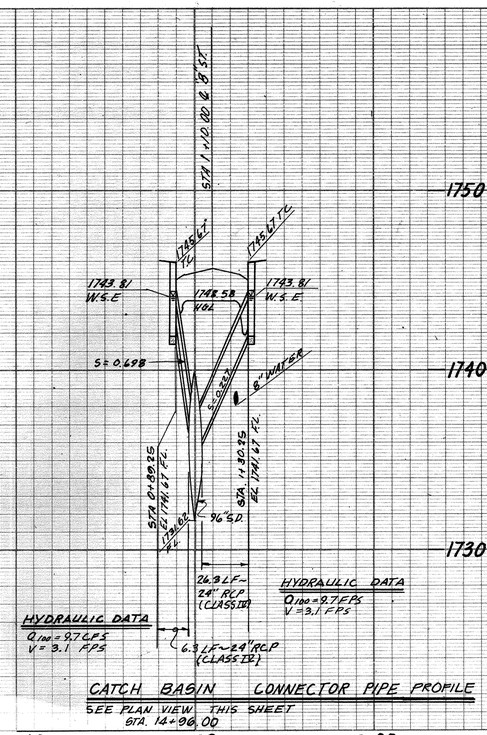
CAST-IN-PLACE PIPE TYPICAL SECTIONS



I.D.	A	B	C	D	E	F	G
72"	7"	8 1/2"	89"	25"	27 1/2"	33 1/2"	86"
84"	8"	9 1/2"	103"	29"	32"	39"	100"
96"	9"	10 1/2"	117"	33"	36"	45"	114"

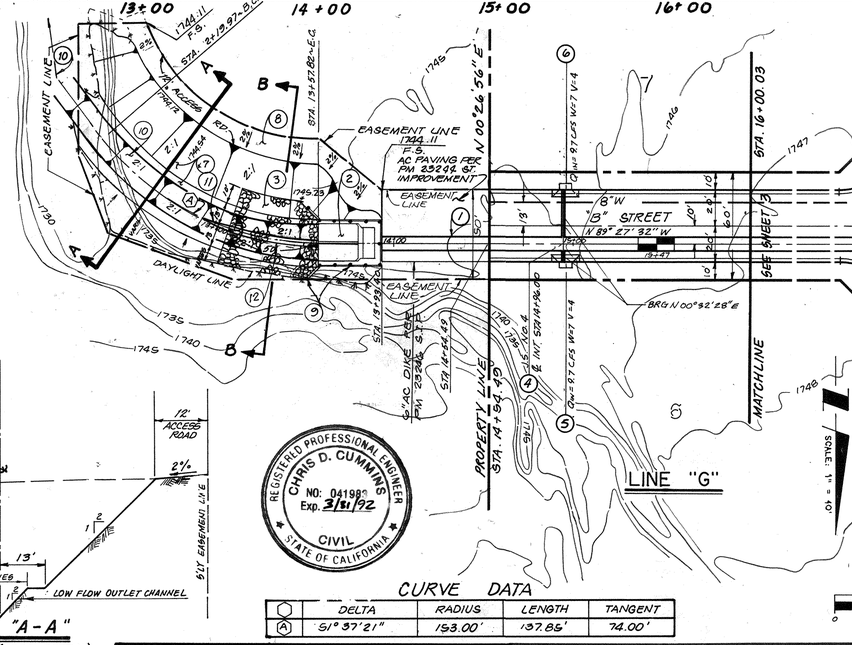
* IF R.C.P. IS USED, PROVIDE 1-1/2" MINIMUM CONCRETE COVER OF THE INSIDE OF THE PIPE OVER REINFORCEMENT IN ORDER TO ACCOUNT FOR NON-BACKWATER CONDITION

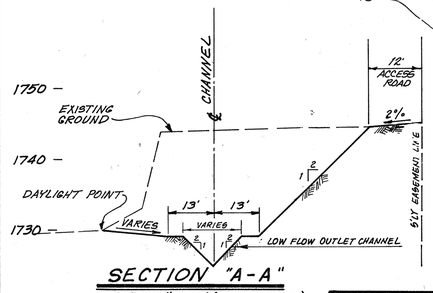
** IF C.I.P.P. IS USED, PROVIDE "SACRIFICIAL CONCRETE" AS NOTED ON ITEM 6 (SHEET 1) CAST-IN-PLACE RECOMMENDATIONS IN ORDER TO ACCOUNT NON-BACKWATER CONDITION.



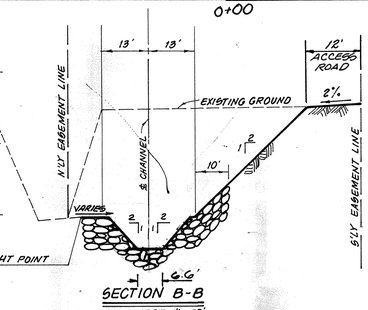
CATCH BASIN CONNECTOR PIPE PROFILE
SEE PLAN VIEW THIS SHEET STA. 14+90.00

PROFILE SCALE
HORZ: 1" = 40'
VERT: 1" = 4'

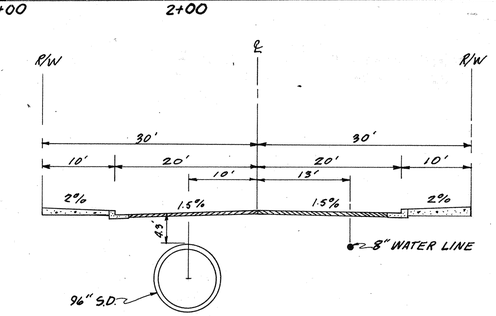




SECTION "A-A"
SCALE: 1" = 20' (HORIZONTAL)
1" = 10' (VERTICAL)



SECTION B-B
SCALE: HORIZ. 1" = 20'
VERT. 1" = 10'



TYPICAL SECTION
STA 15+47.00
SCALE: 1"=10'

AS BUILT
APPROVED BY: [illegible]
DATE 10/21/91

CONSTRUCTION NOTES

1. CONST. 96" R.C.P. (800-D) OR CIPP ALTERNATE
2. CONST. OUTLET STRUCTURE PER DETAIL SHOWN ON SHEET 6
3. CONST. 1-TON RIPRAP, T=4.3 FEET PER CALTRANS STD. SPECS. 72-2.02
4. CONST. JUNCTION STRUCTURE NO. 4 PER R.C.F.C.D.& W.C.D. STD. DWG. NO. JS 229 CASE 1
5. CONST. CATCH BASIN PER R.C.F.C.D. & W.C.D. STD. DWG. NO. CB 100 W=7' V=4.0 "LD" 201 CASE "B" 6.3 ~ 24" R.C.P. (CLASS IV)
6. CONST. CATCH BASIN PER R.C.F.C.D. & W.C.D. STD. DWG. NO. CB 100 W=7 V=4.0 L D 201 CASE "B" 26.3' ~ 24" R.C.P. (CLASS IV).
7. CONST. DIRT CHANNEL AT S=0.006 B=26' (DETAIL THIS SHT.)
8. CONST. 12 FT ACCESS ROAD
9. CONST. 4-FT CHAIN LINK FENCE PER R C F C D WCD. STD. DWG. NO. M801.
10. CONST. ± 400 LF LOW FLOW OUTLET CHANNEL AT S=0.0023 SEE DETAIL THIS SHEET. GRADE TO DRAIN
11. CONST. BOTTOM WIDTH TRANSITION FROM b=3' TO b=0' L=15'
12. CONST. BOTTOM WIDTH TRANSITION FROM b=10' TO b=3' L=50'

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
A	51° 37' 21"	193.00'	197.85'	74.00'

REGISTERED PROFESSIONAL ENGINEER CHRIS D. CUMMINS NO: 041983 Exp. 3/31/92 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER FRANK J. PEARS Exp. 9-30-93 No. 21809 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER SUPERVISION OF
CHRIS D. CUMMINS
REGISTERED CIVIL ENGINEER NO. 041983
DATE 1-6-89 REGISTRATION EXPIRES 3-31-92

THE KEITH COMPANIES Inland Empire
• Planning • Civil Engineering • Architecture • Landscape Architecture • Land Surveying • Construction Management
6296 River Crest Drive, Suite K, Riverside, CA 92507 (714) 653-0234

BENCH MARK U.S.C. & G.S. R 375
M 124 CO. DSGN FD. BRASS DISK STPD. R 375, TOP CONC. POST 250 W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53 N. OF IRONWOOD AVE. 6' HIGHER THAN RD. IS OF MARKER POST ELEV.= 1845.26

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: Frank J. Pears
PLANNING ENGINEER R.E. NO. 21809
DATE: 4/18/90

APPROVED BY: Kenneth L. Edwards
CHIEF ENGINEER R.E. NO. 12400
DATE: 4-19-90

CITY OF MORENO VALLEY
APPROVED BY: [signature]
JOHN K. FEENSTRA
DEPUTY CITY ENGINEER R.C.E.13870
CITY OF MORENO VALLEY (EXP. 3-31-93)
RIVERSIDE COUNTY, CA.
DATE: 4/5/90

LINE "G" MORENO A.D.P.
STAGE 1
PARCEL MAP 23244
STA. 13+57.82 TO STA. 16+06.03

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 2 OF 7

P ST. P & P "B" STREET - 98(0.43)PF: 710015 10134 21-Nov-89 01:35 PM / 710015-999

R.C.F.C.W.C.D. MAINTAINED FACILITY

MATCHLINE STA. 16+00.03 SEE SHEET NO 2

MATCHLINE STA. 24+78.16 SEE SHEET NO 4

STA. 16+60.93 ℄ INT.

STA. 17+28.11 = STA. 17+29.75 ℄ AUTO MALL DR.

STA. 17+53.40 PRC

STA. 18+25.52 E.C.

STA. 18+90.00 ℄ M.H. NO. 2

STA. 21+15.71 B.C.

STA. 23+80.39 E.C.

STA. 23+90.02 ℄ M.H. NO. 3

REF. 24+80.39 ℄ M.H. NO. 4

EXISTING GROUND & ℄ OVER STORM DRAIN

PROPOSED FINISHED SURFACE OVER PIPE

H.G.L.

1755 1750 1740

SCALE: 1"= 40'
0 40 80

PROFILE SCALES
HORIZ: 1"= 40'
VERT: 1"= 4'

HYDRAULIC DATA
Q=644 CFS
V=12.0 FPS

CA94LF-96" R.C.P. (800-D) OR C.I.P.P. ALTERNATE

1739.66 ELEV'S
40' AUTO MALL DRIVE LATERAL

1739.29 ELEV'S 30" WEST LAT.

S=0.0100

S=0.0048

HYDRAULIC DATA
Q = 601 C.F.S.
V = 12.0 F.P.S.

HYDRAULIC DATA
Q=565.0 CFS
V= 11.2 FPS
207.2 L.F. ~ 96" RCP (800-D) OR C.I.P.P. ALTERNATE

HYDRAULIC DATA
Q =565.0 CFS
V = 11.2 FPS
403.3 L.F. ~ 96" RCP (800-D) OR C.I.P.P. ALTERNATE

S=0.0023

HYDRAULIC DATA
Q =565.0 CFS
V = 11.2 FPS
89.91 L.F.-96" RCP (800-D) OR C.I.P.P. ALTERNATE

16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00

F.S. OVER STORM DRAIN

STA. 17+10.26 ℄ U.S. NO. 2

H.G.L.

1741.25 IN

1748.78 H.G.L.

C.B. NO. 2 V = 4.5

S=0.0048

1739.23 ELEV'S 30" WEST LAT.

1735.51 IN 96"

HYDRAULIC DATA
Q = 36 C.F.S.
V = 7.33 F.P.S.

42.81 L.F. 30" R.C.P. (1250-D)

STA. 0+19.26

STA. 0+50.00

1750 1740 1730

0+00 1+00

CATCH BASIN CONNECTOR PIPE PROFILE
SEE PLAN VIEW - THIS SHEET
STA 17+04.26

CONSTRUCTION NOTES

1. CONSTRUCT 96" R.C.P. (800-D) OR C.I.P.P. ALTERNATE
2. CONSTRUCT MANHOLE NO. 4 PER R.C.F.C.D. STD. DWG. NO. MH. 254 SEE SHT. 7 FOR PLAN DETAIL.
   LINE "G"
   A=24°, B=48", C=19.71, D =D =96",
   ELEV. "R"=1737.70, ELEV. "S"=1737.66
3. CONSTRUCT JUNCTION STRUCTURE NO. 2 PER R.C.F.C.D. STD. DWG. NO. JS 227
   A=25°, B=30", C=13.70', D=96", E=10.80',
   F=4.40', G=3.70', L=8.20', ELEV."R"=1739.59
   ELEV."S"=1739.23 SEE CB NO. 2
   CONNECTOR PIPE PROFILE THIS SHEET
   SEE SHT. 7 FOR PLAN DETAIL
4. CONSTRUCT MH NO. 2 PER R.C.F.C.D STD. DWG. NO. MH 252
5. CONSTRUCT CATCH BASIN NO. 1 PER R.C.F.C.D. STD. DWG. NO. CB 100 LD 201 CASE "C" 43' ~ 30" R.C.P. (1200-D) OR C.I.P.P. ALTERNATE.

* IF R.C.P. IS USED, PROVIDE 1-1/2" MINIMUM CONCRETE COVER OF THE INSIDE OF THE PIPE OVER REINFORCEMENT IN ORDER TO ACCOUNT FOR NON-BACKWATER CONDITION

** IF C.I.P.P. IS USED, PROVIDE "SACRIFICIAL CONCRETE" AS NOTED ON ITEM 6 (SHEET 1) CAST-IN-PLACE RECOMMENDATIONS IN ORDER TO ACCOUNT FOR NON-BACKWATER CONDITION.

PM 23244 STREET IMPVMT. PLANS SEE SHEET 5 & 6

AUTO MALL DRIVE LATERAL

STA. 16+97.60 & AUTO MALL DR. = STA. 10+00.00 & "B" STREET

MATCHLINE SEE SHEET 2

STA. 16+80.81 B.C.

STA. 16+60.93 LINE "G" = STA. 10+00.00 AUTO MALL DRIVE LATERAL & INT. M.H. NO. 4

STA. 18+90.00 ℄ M.H. NO 2

STA. 18+25.52 E.C.

STA. 21+15.71 B.C.

STA. 14+54.50

1808.39

LOT 7 LOT 6 LOT 14 LOT 13 LOT 5

AUTO MALL DRIVE

CURVE DATA	△	RADIUS	LEN./DIST.	TANGENT
(A)	83°11'01"	50.00	72.59	44.38
(B)	08°21'53"	494.00	72.12	36.12
(C)	15°06'11"	1006.00'	265.18'	133.36'

LINE "G"

SCALE: 1"= 40'
0 40 80 120

TYPICAL SECTION
STA. 20+00.00
SCALE: 1"=10'
0 5 10

100' 50' 12' 38' 50' 38' 12'

6' 96" STORM DRAIN 12" WATER 31'

STA. 23+80.39 E.C.

STA. 23+90.02 ℄ M.H. NO 2

STA. 24+78.16

STA. 25+00.00

N 00°27'47" E

L=276.78

L=263.60

L=250.42

120.27

32.53

321.37

366.04

4 EUCALYPTUS AVE.

1270.49

AS BUILT
APPROVED BY: JDS
DATE 10/22/91

REGISTERED PROFESSIONAL ENGINEER CHRIS D. CUMMINS NO: 041983 Exp. 3/31/92 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER FRANK J. PEARS Exp. 9-30-93 No. 21809 Civil STATE OF CALIFORNIA

PLANS PREPARED UNDER SUPERVISION OF
CHRIS D. CUMMINS
REGISTERED CIVIL ENGINEER NO. 041983
DATE: 1-8-90 REGISTRATION EXPIRES 3-31-92

THE KEITH COMPANIES
Inland Empire
• Planning • Civil Engineering • Architecture • Landscape Architecture • Land Surveying • Construction Management
6296 River Crest Drive, Suite K, Riverside, CA 92507 (714) 653-0254

BENCH MARK U.S.C. & G.S. R-375 M-124 CO. DSGN. FD. BRASS DISK STPD. R-375, TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' NE. OF PM# 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD' I'S. OF MARKER POST. ELEV. = 1845.26'

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Frank J. Pears
PLANNING ENGINEER R.E. NO. 21809
DATE: 4/18/90

APPROVED BY: Kenneth R. Edwards
CHIEF ENGINEER R.E. NO. 12400
DATE: 4-19-90

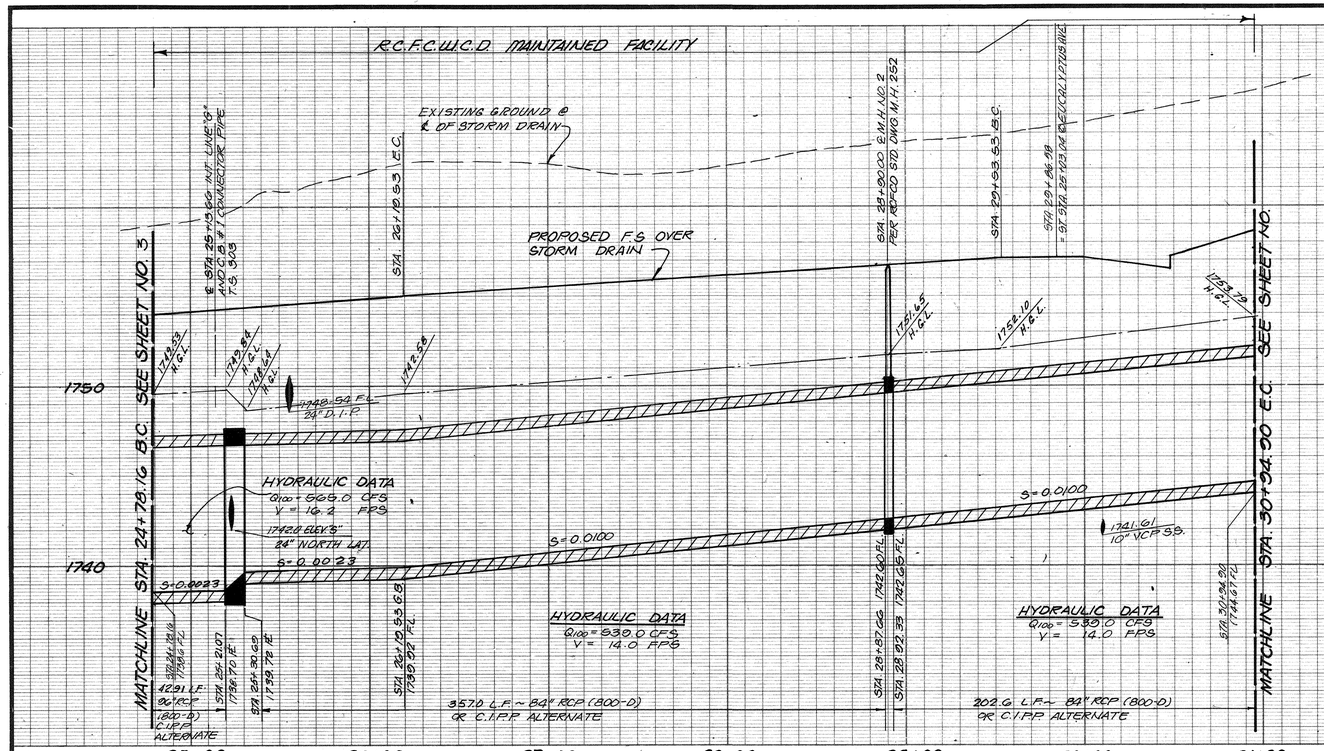
CITY OF MORENO VALLEY

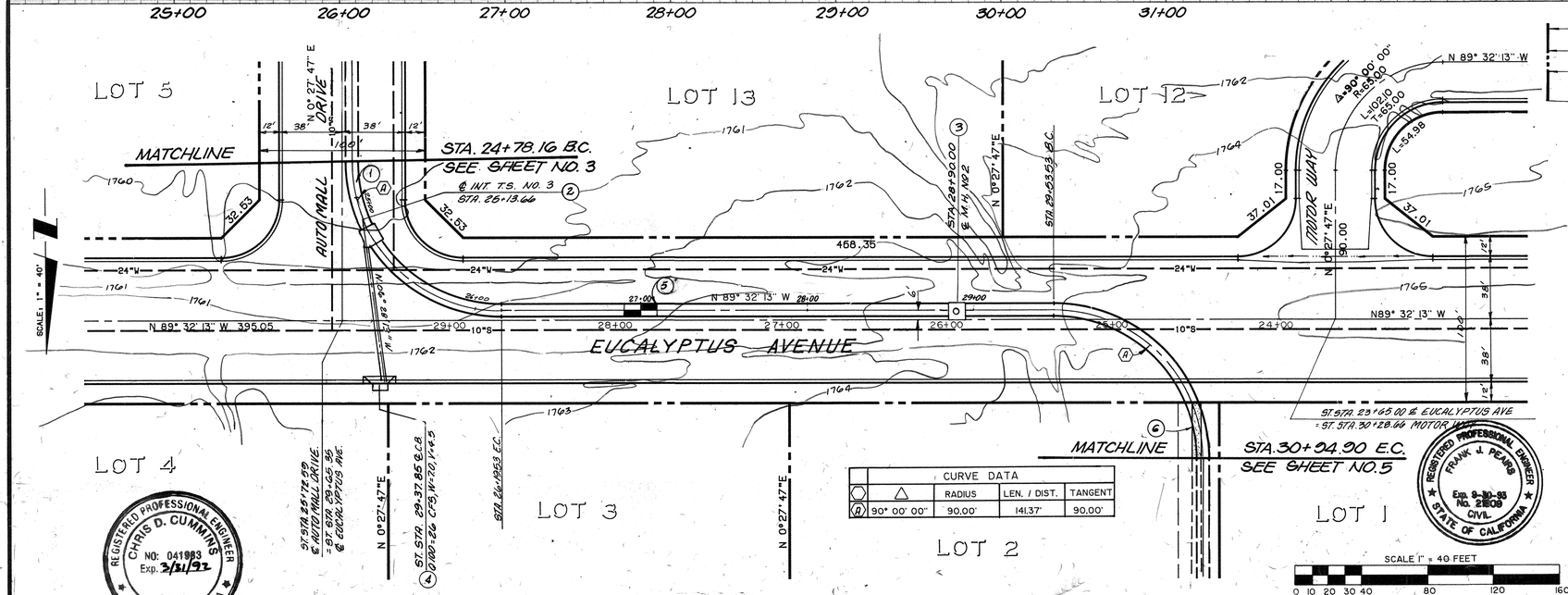
APPROVED BY: John K. Feenstra
JOHN K. FEENSTRA
DEPUTY CITY ENGINEER
CITY OF MORENO VALLEY
RIVERSIDE COUNTY, CA.
R.C.E. 13870 (EXP. 3/31/93)
DATE: 4/5/90

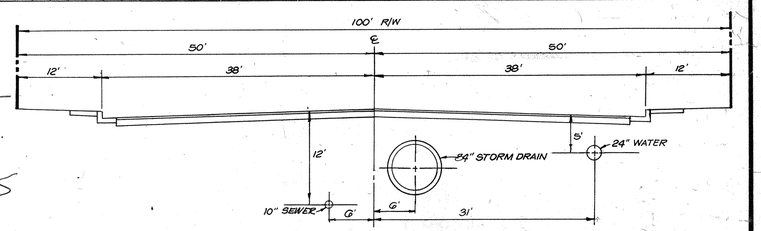
LINE "G" MORENO A.D.P.
STAGE I
PARCEL MAP 23244
STA. 16+00.00 TO 24+78.16

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 3 OF 7

•P• STORM DRAIN "A" ST. SH. 2 - 99(0.43)PF; 710015 122 21-Dec-88 11:05 AM / 710015-510







CONSTRUCTION NOTES

1. CONSTRUCT 96" R.C.P. (800-D) OR C.I.P.P. ALTERNATE
2. CONSTRUCT TRANSITION STRUCTURE NO. 3 PER RCFCD STD. DWG. NO. T. S. 303 A=15.7° B= 24" C= 18.2', D2= 96" ELEV."R"= 1742.66, ELEV."S"= 1742.00 SEE NO. 1 CONNECTOR PIPE PROFILE THIS SHEET SEE SHT. 7 FOR PLAN DETAIL
3. CONSTRUCT MANHOLE NO. 2 PER RCFCD STD. DWG. NO. MH 252
4. CONSTRUCT CATCH BASIN NO. 1 PER RCFCD STD. DWG. NO. C. B. 100 L. D. 201 CASE C 82 LF- 24" RCP (CLASS IV) OR C. I. P. P. ALTERNATE
5. CONSTRUCT 84" R.C.P. (800-D) OR C.I.P.P. ALTERNATE
6. CONSTRUCT 6 FT CROSS GUTTER PER COUNTY OF RIVERSIDE STD. DWG. NO. 210

AS BUILT
APPROVED BY: JHS
DATE 10/22/91

REGISTERED PROFESSIONAL ENGINEER CHRIS D. CUMMINS NO: 041983 Exp. 3/31/92 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER FRANK J. PEARS Exp. 9-30-93 NO. 21809 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER SUPERVISION OF
CHRIS D. CUMMINS
REGISTERED CIVIL ENGINEER NO. 041983
DATE: 1-6-89 REGISTRATION EXPIRES 3-31-92

THE KEITH COMPANIES
Inland Empire
• Planning • Civil Engineering • Architecture • Landscape Architecture • Land Surveying • Construction Management
6296 River Crest Drive, Suite K, Riverside, CA 92507 (714) 653-0234

BENCH MARK U.S.C. & G.S. R-375
M-124 CO. DSGN. FD. BRASS DISK STPD. R-375, TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD' I'S. OF MARKER POST. ELEV. = 1845.26'

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: Frank J. Pears
PLANNING ENGINEER R.E. NO. 21809
DATE: 4/18/90
APPROVED BY: Kenneth Edwards
CHIEF ENGINEER R.E. NO. 12400
DATE: 4-18-90

CITY OF MORENO VALLEY
APPROVED BY: John K. Feenstra
JOHN K. FEENSTRA
DEPUTY CITY ENGINEER
CITY OF MORENO VALLEY
RIVERSIDE COUNTY, CA.
R.C.E. 13870 (EXP. 3/31/93)
DATE: 4/5/90

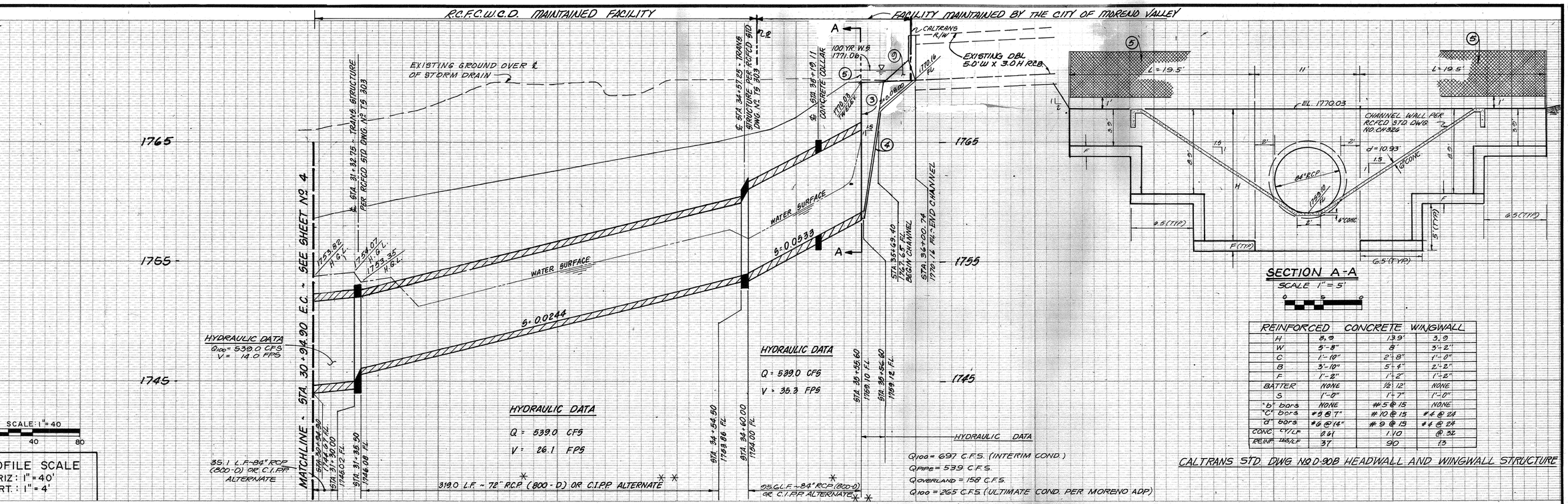
LINE "G" MORENO A.D.P.
STAGE I
PARCEL MAP 23244
STA. 24+78.16 TO STA. 30+94.90

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 4 OF 7

P STORM DRAIN HICKORY ST. SH. 2 - 99(0.43)PF: 710015 123 21-Dec-88 02:14 PM / 710015-520

R.C.F.C.W.C.D. MAINTAINED FACILITY

FACILITY MAINTAINED BY THE CITY OF MORENO VALLEY



SCALE: 1"=40

0 40 80

PROFILE SCALE
HORIZ: 1"=40'
VERT.: 1"=4'

SECTION A-A
SCALE 1" = 5'

0 5 0

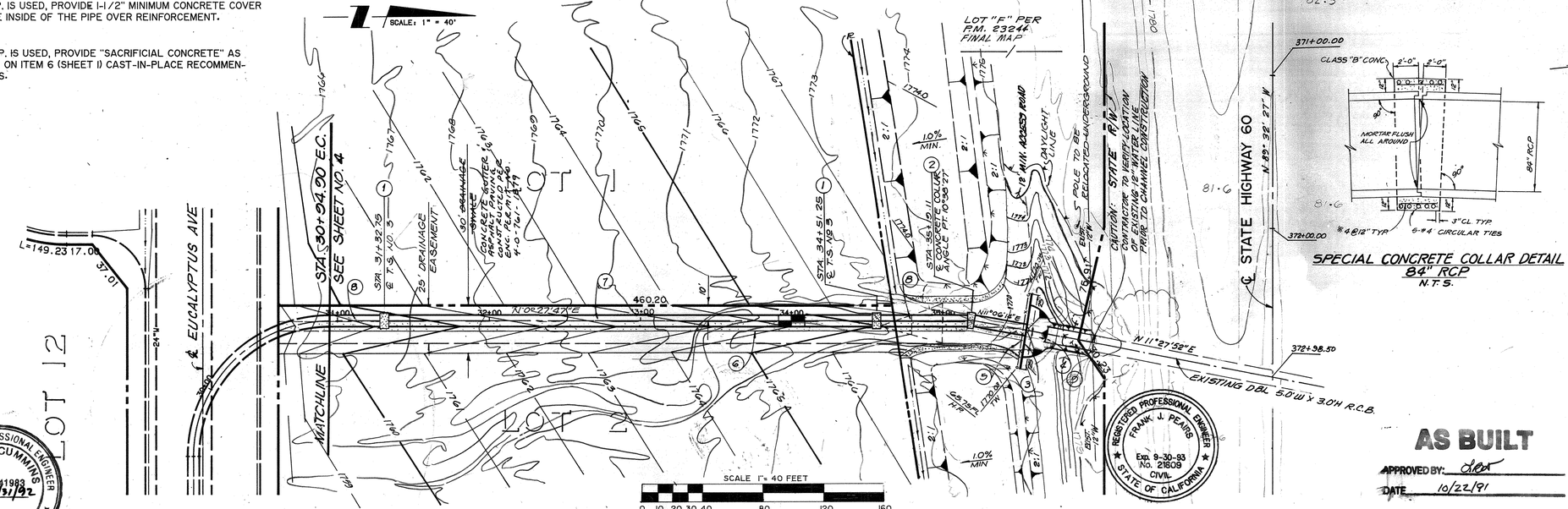
REINFORCED CONCRETE WINGWALL			
H	8.9	13.9'	3.9
W	5'-8"	8'	3'-2"
C	1'-10"	2'-8"	1'-0"
B	3'-10"	5'-4"	2'-2"
F	1'-2"	1'-2"	1'-2"
BATTER	NONE	12:12	NONE
S	1'-0"	1'-7"	1'-0"
"b" bars	NONE	#5 @ 15	NONE
"C" bars	#8 @ 7"	#10 @ 15	#4 @ 24
"d" bars	#8 @ 14"	#9 @ 15	#4 @ 24
CONC. CY/LF	2.61	1.10	@.36
REINF. LBS/LF	37	90	13

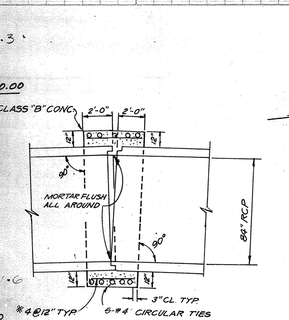
CALTRANS STD. DWG. NO D-90B HEADWALL AND WINGWALL STRUCTURE

* IF R.C.P. IS USED, PROVIDE 1-1/2" MINIMUM CONCRETE COVER OF THE INSIDE OF THE PIPE OVER REINFORCEMENT.

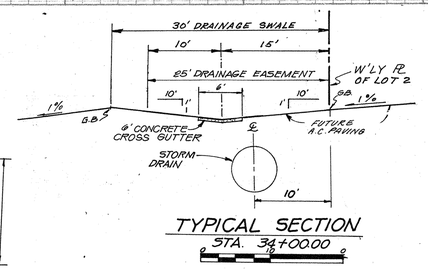
** IF C.I.P.P. IS USED, PROVIDE "SACRIFICIAL CONCRETE" AS NOTED ON ITEM 6 (SHEET 1) CAST-IN-PLACE RECOMMENDATIONS.

SCALE: 1" = 40'





SPECIAL CONCRETE COLLAR DETAIL
84" RCP
N.T.S.



TYPICAL SECTION
STA. 34+00.00

CONSTRUCTION NOTES

1. CONSTRUCT TRANSITION STRUCTURE NO. 3 PER RCFCD STD. DWG. NO. TS 303 SEE SHEET 7 FOR PLAN DETAIL
   STA. 31+32.75:
   DI = 72"± D2= 84"
   STA. 34+51.25:
   DI = 84", D2 = 72"
2. CONSTRUCT CONCRETE COLLAR. SEE SPECIAL COLLAR DETAIL THIS SHEET- SEE RCFCD STD DWG NO. 803 FOR NOTES
3. CONSTRUCT HEADWALL AND WINGWALL PER CALTRANS STD. PLANS D-90B. SEE HEADWALL DETAIL THIS SHEET
4. CONSTRUCT CONCRETE WALLS PER RCFCD STD. DWG. NO. CH 326 WITH 2' CUTOFF WALL (SEE DETAIL B). SEE SHEET 7 FOR PLAN DETAIL
5. CONSTRUCT 6 FT. CHAIN LINK FENCE, PER RC.FC.D. STD. DWG. NO. M801. PROVIDE 1 FT. OF CLEARANCE AT THE BOTTOM.
6. CONSTRUCT 6 FT CROSS GUTTER PER COUNTY OF RIVERSIDE STD. DWG. NO. 210
7. CONSTRUCT 72" R.C.P. (800-D) OR C.I.P.P. ALTERNATE
8. CONSTRUCT 84" R.C.P. (800-D) OR C.I.P.P. ALTERNATE
9. CONSTRUCT TRAPEZOIDAL CHANNEL PER RCFCD STD. DWG. NO. CH 326. b=1.0', d=2', z=1.5:1. SEE SHEET NO. 7 FOR CHANNEL DETAILS.

AS BUILT
APPROVED BY: [illegible]
DATE 10/22/91

REGISTERED PROFESSIONAL ENGINEER CHRIS D. CUMMINS NO: 041983 Exp. 3/31/92 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER FRANK J. PEARIS Exp. 9-30-93 No. 21809 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER SUPERVISION OF
CHRIS D. CUMMINS
REGISTERED CIVIL ENGINEER NO. 041983
DATE: 1-6-89 REGISTRATION EXPIRES 3-31-92

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BENCH MARK U.S.C. & G.S. R-375 M-124 CO. DSGN. FD. BRASS DISK STPD. R-375, TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 270156, 53' N. OF IRONWOOD AVE., 6' HIGHER THAN RD' I'S. OF MARKER POST. ELEV. = 1845.26'

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Frank J. Pearis
PLANNING ENGINEER R.E. NO. 21809
DATE: 4/18/90

APPROVED BY: Kenneth F. Edwards
CHIEF ENGINEER R.E. NO. 12400
DATE: 4-19-90

CITY OF MORENO VALLEY

APPROVED BY: John R. Feenstra
JOHN R. FEENSTRA
DEPUTY CITY ENGINEER R.C.E. 13870
CITY OF MORENO VALLEY (EXP. 3/31/93)
RIVERSIDE COUNTY, CA.
DATE: 4/8/90

LINE "G" MORENO A.D.P.

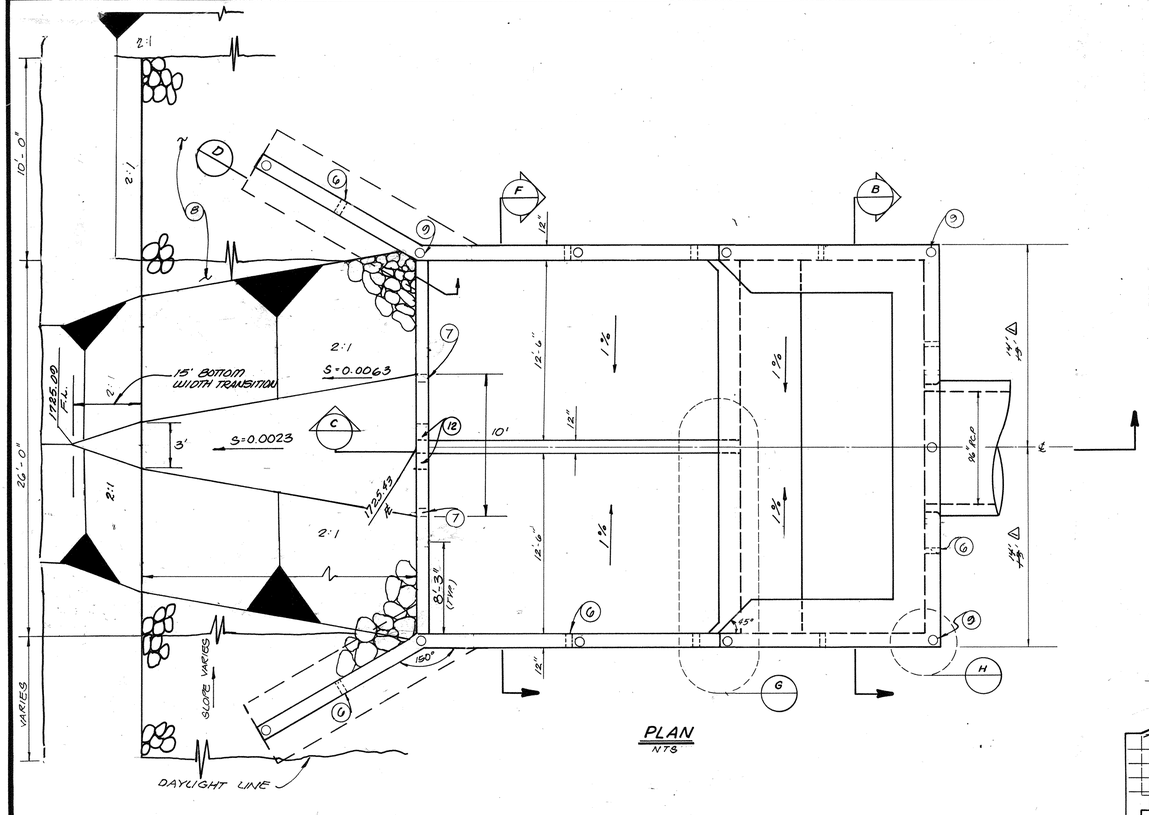
STAGE I

PARCEL MAP 23244

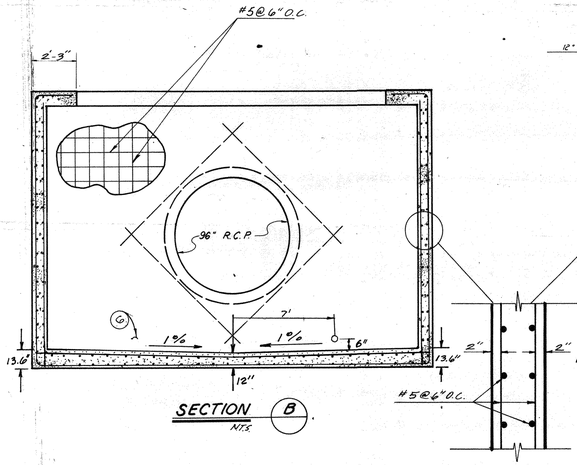
STA. 34+94.90 TO STA. 35+55.60

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 5 OF 7

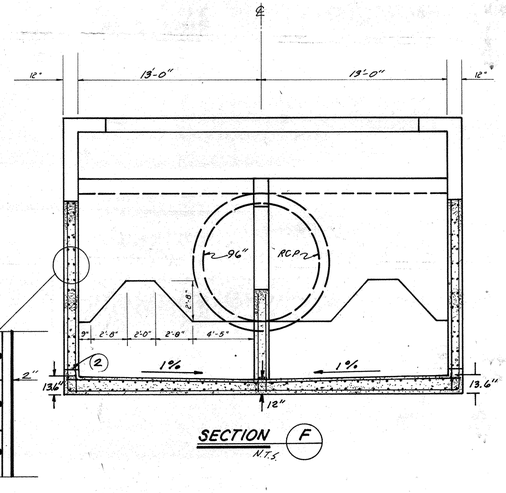
•P• STORM DRAIN HICKORY TO 60 FWY. SH3 - 99(0.43)PF: 710015 124 21-Dec-88 02:50 PM / 710015-520



PLAN
NTS



SECTION B
N.T.S.



SECTION F
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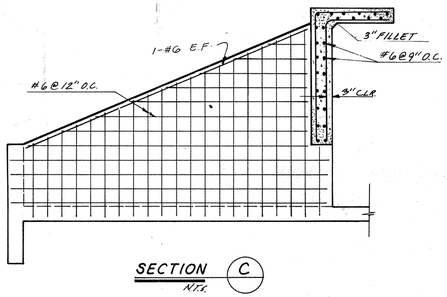

SECTION C
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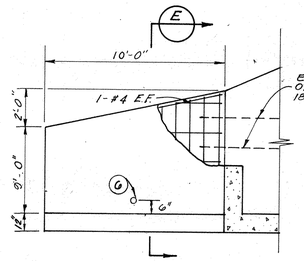
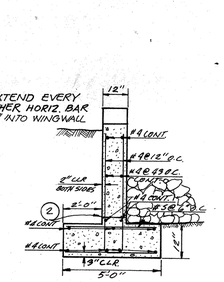
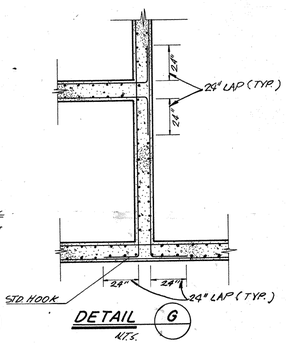


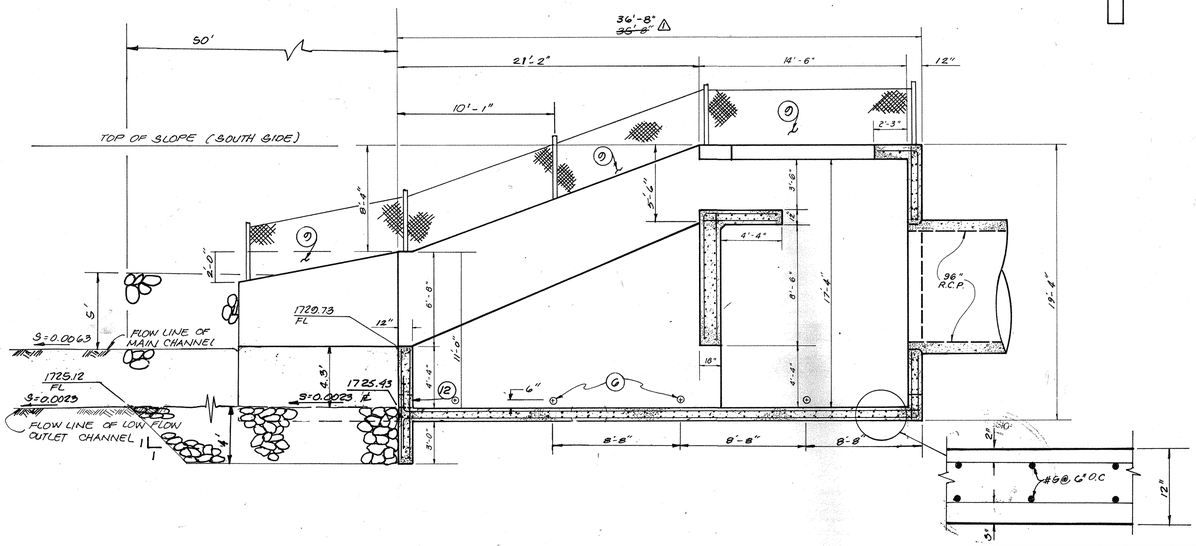
SECTION D
N.T.S.



SECTION E
N.T.S.



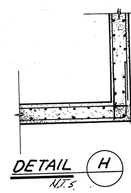
DETAIL G
N.T.S.



NOTES

1. ALL STEEL HAVE 2" COVER UNLESS OTHERWISE NOTED.
2. 6" STARTER WALL WITH CONST. JOINT TO BE USED ALL CASES.
3. ALL BARS BENDS AND HOOKS SHALL CONFIRM TO THE AMERICAN CONCRETE INSTITUTE'S BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, 1971 EDITION, SECTION 7.5.
4. PLACING OF REINFORCEMENT SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, 1971 EDITION, SECTION 7.5.
5. TRANSVERSE CONSTRUCTION JOINTS SHALL NOT BE PLACED WITHIN 30 INCHES OF INLETS.
6. CONST. 1-1/2" DIAM. WEEPHOLES WITH RODENT SCREENS AND 1 CU. FOOT OF FILTER MTERIAL AT EACH HOLE.
7. 6" DIAM. HOLE.
8. CONSTRUCT 1 TON RIPRAP PER CALTRANS STD. SPECS. 72-2.02. T=4.3'
9. CONSTRUCT 4 FT. CHAIN LINK FENCE PER RCFCD & WCD STD. DWG. NO. M801.
10. ALL EXPOSED CONCRETE EDGE SHALL HAVE 3/4 CHAMFER
11. LOW FLOW OUTLET CHANNEL.
12. PROVIDE 12" SQUARE OPENING

OUTLET STRUCTURE
TO BE MAINTAINED BY THE CITY OF MORENO VALLEY



DETAIL H
N.T.S.

REGISTERED PROFESSIONAL ENGINEER
CHRIS D. CUMMINS
NO: 041983
Exp. 3/31/92
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY: [signature]
DATE 10/22/91

PLANS PREPARED UNDER SUPERVISION OF:
[signature]
CHRIS D. CUMMINS
REGISTERED CIVIL ENGINEER NO. 041983
DATE 1-6-80 REGISTRATION EXPIRES 3-31-92

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BENCH MARK U.S.C. & G.S. R 375 M 124 CO. DSGN FD BRASS DISK STPD. R375, TOP CONC. POST 250 W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53 N. OF IRONWOOD AVE. 6' HIGHER THAN RD. IS OF MARKER POST ELEV. = 1845.26

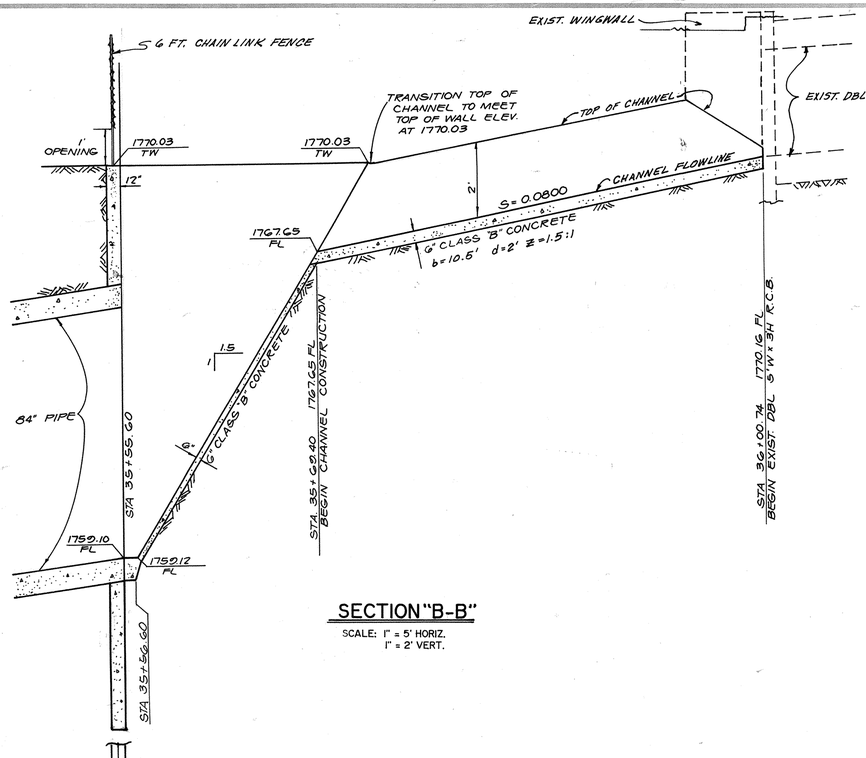
REVISIONS			
⚠	REVISED DIMENSIONS		
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: PLANNING ENGINEER R.E. NO. 21809 DATE:
APPROVED BY: CHIEF ENGINEER R.E. NO. 12400 DATE:

CITY OF MORENO VALLEY
APPROVED BY: [signature]
JOHN K. FEENSTRA
DEPUTY CITY ENGINEER
CITY OF MORENO VALLEY
RIVERSIDE COUNTY, CA
R.C.E. 13870 (EXP. 3-31-92)
DATE: 4/3/90

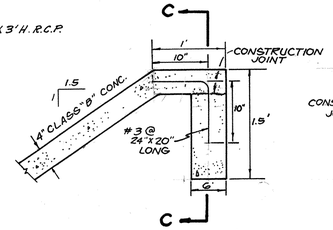
LINE "G" MORENO A.D.P. DETAIL SHEET PARCEL MAP 23244

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 6 OF 7



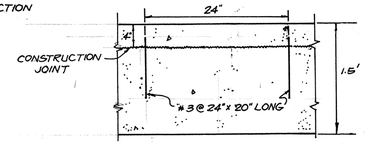
SECTION "B-B"

SCALE: 1" = 5' HORIZ.
1" = 2' VERT.



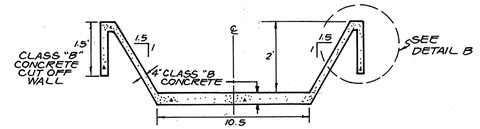
DETAIL "B"

SCALE: 1" = 1'



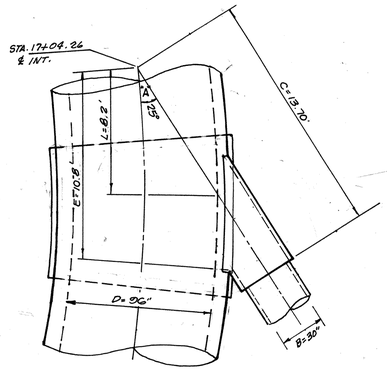
SECTION "C-C"

SCALE: 1" = 1'



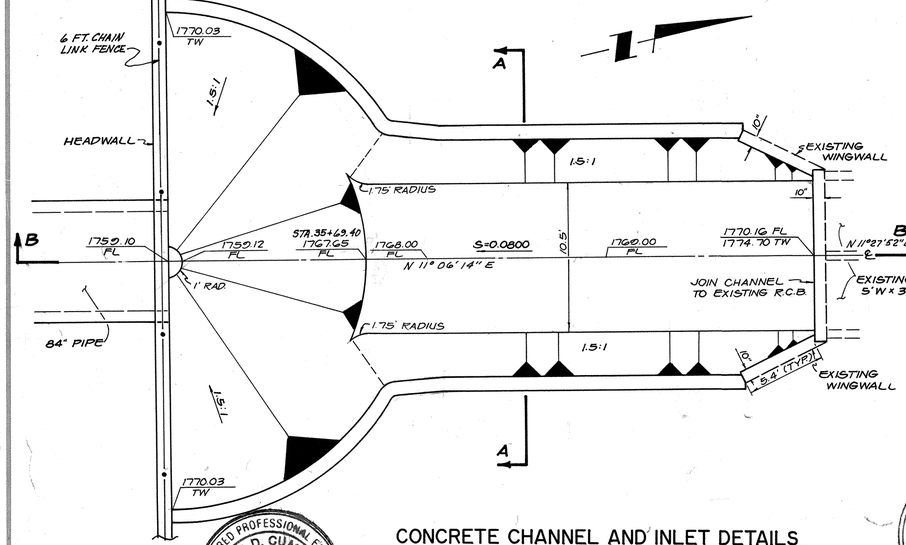
SECTION "A-A"

SCALE: 1" = 5' HORIZ.
1" = 2' VERT.



J.S. NO. 2 - ℄ INTERSECTION STA. 17+04.26

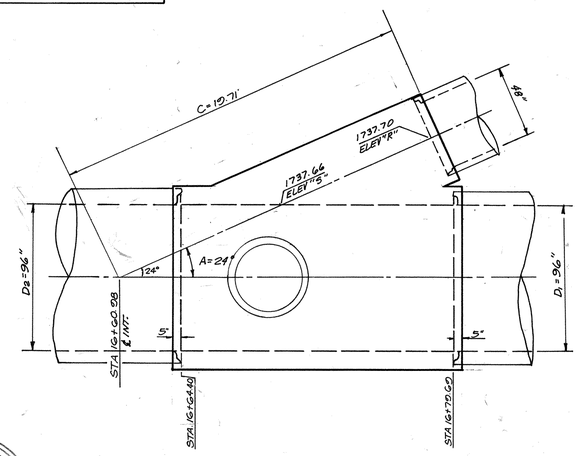
SCALE: 1" = 4'



CONCRETE CHANNEL AND INLET DETAILS

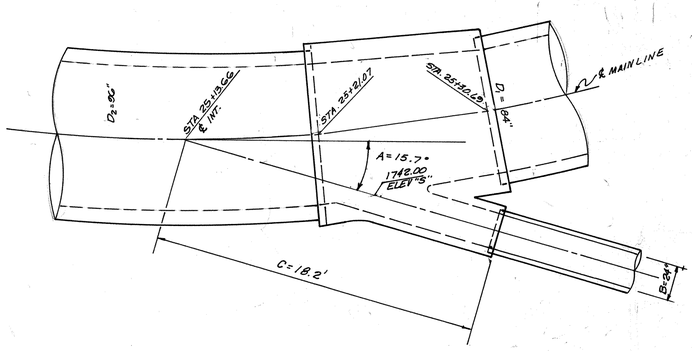
SCALE: 1" = 5'

INLET STRUCTURE
TO BE MAINTAINED BY THE CITY OF MORENO VALLEY



M.H. NO. 4-℄ INTERSECTION STA. 16+60.98

SCALE: 1" = 4'



T.S. 303-℄ INTERSECTION STA. 25+13.66

SCALE: 1" = 4'

REGISTERED PROFESSIONAL ENGINEER
CHRIS D. CUMMINS
NO. 041983
Exp. 3/31/92
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
FRANK J. PEARIS
Exp. 9-30-93
No. 21809
CIVIL
STATE OF CALIFORNIA

M.H. NO. 4, T.S. 303 AND J.S. NO. 2 TO BE MAINTAINED BY RC.F.C.D.

AS BUILT
APPROVED BY: [illegible]
DATE 10/22/91

PLANS PREPARED UNDER THE SUPERVISION OF
CHRIS D. CUMMINS
REGISTERED CIVIL ENGINEER NO. 041983
REGISTRATION EXPIRES 3-31-92
DATE: 2/13/90

THE KEITH COMPANIES
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BENCH MARK
U.S.C. & G.S. R-375 M-124 CO.
DSGN. FD. BRASS DISK STPD. R-375
TOP CONC. POST 250' W. HENDRICKS ALONG IRONWOOD AVE. 63' N.E. OF PP# 271056, 53' N. OF IRONWOOD AVE. 6' HIGHER THAN RD' TS. OF MARKER POST.
ELEV.= 1845.26'

REVISIONS

REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: Frank J. Pearis, PLANNING ENGINEER R.E. NO. 21809, DATE: 4/18/90
APPROVED BY: Kenneth R. Edwards, CHIEF ENGINEER R.E. NO. 12400, DATE: 4-18-90

CITY OF MORENO VALLEY
APPROVED BY: John K. Feenstra, JOHN K. FEENSTRA R.C.E. 13870 (EXP. 3/31/93), DEPUTY CITY ENGINEER, CITY OF MORENO VALLEY, DATE: 4/5/90

LINE "G" MORENO A.D.P.
DETAIL SHEET
PARCEL MAP 23244

PROJECT NO. 4-0-761
DRAWING NO. 4-526
SHEET NO. 7 OF 7