Hydrology and Hydraulics

for

CARMAX #4033 REDLANDS

Redlands, CA

MAY, 2023 | 2ND SUBMITTAL

Prepared By:

Kimley»Horn

Certification by Engineer or Authorized Qualified Designee

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John Pollock, PE Date

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Hydrology Manual. San Bernardino County, August 1986

San Bernardino County Detention Basin Design Criteria, September 1987

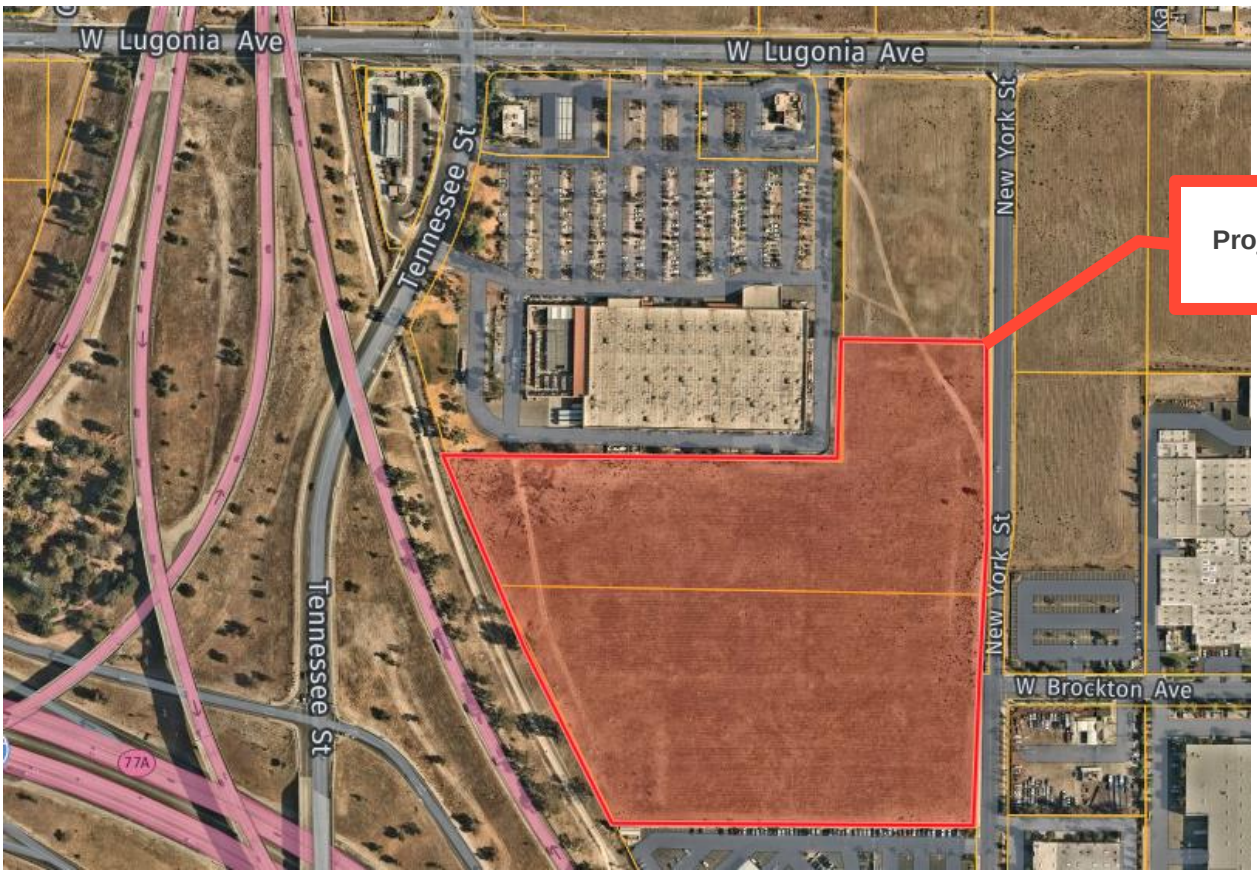
INTRODUCTION

PROJECT DESCRIPTION AND PURPOSE

This project is proposing to develop an existing vacant 18.50-acre site, to 17.56 acres of developed land with 0.94 acres detention basin. The overall affected drainage area will be an 18.50-acre site. The project consists of an automobile dealership with a carwash, with a vehicle staging lot, sales display lot, and customer-employee parking. The existing property is located in City of Redlands within San Bernardino County (SBC), CA. The site is in the valley region of SBC in Redlands, CA. It is located west of the intersection of West Brockton Avenue and New York Street.

The purpose of this report is to provide information about the design of the Storm Water Management System for the project. This investigation was conducted to evaluate the hydrologic and hydraulic conditions of the project described above. The purpose of this report is to determine the impact the proposed development has on the local existing drainage system and to mitigate post development peak flows beyond the pre-development peak flows.

Figure 1: Project Site Location



PROJECT SITE CONDITIONS

EXISTING SITE (PRE-DEVELOPMENT) CONDITIONS

The existing site is a vacant 18.50-acre lot. The existing site is 100% pervious. The existing topography drains from the southeast to northwest (elevations ranging from 1302 to 1281). Overland flows enter a Caltrans Channel west of the site and discharge into Santa Ana River Reach 5. Refer to the Existing Hydrology Exhibit in **Appendix D.** The adjacent surrounding conditions also drain in the same manner as the project site, so no offsite drainage is being accepted.

PROPOSED SITE (POST-DEVELOPMENT) CONDITIONS

The post-development condition for the project site consists of one main drainage area which is tributary to the western Caltrans Channel. The overall project drainage area was sub-divided into 10 sub-areas. Runoff from the drainage sub-areas is intercepted by the proposed inlets or swales onsite, which then convey flows into a proposed infiltration basin for detention. The detention basin will infiltrate the required stormwater volume and discharge any additional runoff into the Caltrans Channel. It will retain the 100-year storm up to the 24-hour event so that the ultimate post construction stormwater flow is no more than the pre-construction stormwater flow. The proposed detention basin is proposed to include an outlet pipe that connects directly into the western Caltrans channel. There is a small area to the northwest of the project site that due to site topography cannot be captured and routed to the detention basin, but the area was still included in the detention sizing calculations. Refer to the Proposed Hydrology Exhibit in **Appendix D.**

PRECIPITATION

Precipitation values for the hydrologic analysis were determined from site specific precipitation frequency estimates published online in the NOAA Atlas 14. For this site, the 100 year storm precipitation was used in the volume calculations. **Appendix A** contains the site-specific tabular output from NOAA Atlas 14.

WATERSHED DESCRIPTION

The project is relatively flat and the regional topography slopes to the northwest. The closest receiving waters to the project site discharges into the Santa Ana River 5.

SOIL TYPES

The type of soil and its conditions are major factors affecting infiltration and resultant storm water runoff. The Natural Resources Conservation Service (NRCS) has classified soils into four general hydrologic groups for comparing infiltration and runoff rates. This Project Site has a hydrologic soil group classification of A. Group A soils typically have low runoff potential with high infiltration rates when thoroughly wetted and consist chiefly of deep, well drained sands or gravels. See **Appendix B** for soil type classifications.

LAND USE

The project site is located within the City of Redlands East Valley Corridor Specific Plan and has a land use designated as general commercial but was recommended that the site be rezoned to light industrial.

GROUNDWATER

Groundwater was not encountered during the Geotechnical field investigation prepared by Terracon Consultants, Inc. The maximum depth explored was approximately 51.5 feet. Historic groundwater levels from 2012-2019 recorded groundwater at great than 100 feet. Additional information can be found in the Geotechnical Engineering Report by Terracon Consultants, Inc dated October 6, 2022 (Project Number 60225109).

FEMA MAPPING

The project site is covered by FEMA Flood Insurance Rate Map (FIRM) Number 06071C8704H. The project area does not fall within a FEMA-mapped special flood hazard area. The site is classified as Zone X, which is an area of minimal flooding. The effective FIRMETTE is dated August 28, 2018 and is provided in **Appendix C.**

HYDROLOGIC ANALYSIS

METHODOLOGY

The design criteria for the hydrologic calculations for this project have been conducted per requirements as outlined in the San Bernardino County Hydrology Manual (August 1986).

Runoff calculations were performed using the Modified Rational Method as utilized by the HydroWin Advanced Engineering Software, (AES). The 100-year, 1 h-r storm was analyzed as it will generate the highest peak flow rate. AES was used to estimate time of concentrations and 100-year, 1-hr peak flow rates generated from the pre-development and post-development conditions. These Rational Method calculations are included in this report as **Appendix E**. Curve numbers were established from Figures C-3 and C-4 of the Hydrology Manual. Intensity values were obtained from NOAA Atlas 14.

Hydrograph calculations were performed using a computer program developed by AES. AES was used to estimate the 100-year peak runoff volumes over a 24-hour period for the proposed condition. These unit hydrograph calculations are included in this report as **Appendix F**. This method calculates a unit hydrograph using time of concentration, soil loss rates, low loss fraction and an S-graph as specified in the Hydrology Manual.

The computer program Pond Pack from Bentley was used to design and model the proposed detention basin and outlet structure for this project. The stage storage analysis and the hydrographs from AES were imported into PondPack to determine the required storage volume to mitigate proposed flows to the pre-development peak flows. The basin routing calculations are included in this report as **Appendix G**.

CONCLUSIONS

As discussed in the contents of this report, the development of the existing vacant site into the proposed development is not expected to cause a significant impact to downstream facilities for storms up to the 100-year condition. The mitigated development discharges less stormwater flows than existing site conditions.

Table 1. 100-year Peak Flow Comparison

Analysis	Storm	Total Site Acreage	Peak Flow (cfs)
Existing	100-yr	18.50	36.75
Proposed	100-yr	18.50	44.49 (Mitigated)

The detention system for the project site is designated to attenuate the post-development flows (46.86 cfs) peak flow to less than half the pre-development flow of 36.75 cfs. The infiltration/detention tank provides 201,640 cf of storage and has a max water surface elevation of 1279.37 ft. The peak flows discharge through a 18" orifice at a max flow of 9.36 cfs.

In conclusion, the following was covered in this report:

- The pre-development discharge patterns and points were discussed
- The post-development discharge patterns and points were discussed
- The pre-development flow rates for the 100-year event were determined
- The post-development un-mitigated flow rates for the 100-year event were determined
- The required post-development mitigation up to the 100-year event was analyzed
- Satisfactory post-development flow rates were demonstrated

HYDRAULIC ANALYSIS

METHODOLOGY

A new on-site storm drain system, designed for the 100-yr 1-hr storm, will be installed to collect surface runoff at designated storm inlet locations across the site and convey flows downstream. Each inlet will be sized to limit ponding depths to less than the 6-inch curb height.

Hydraulic calculations will be performed for the main storm drainpipes utilizing Flowmaster, a software program developed by Bentley. The software utilizes Manning's equation to determine acceptable friction slopes for design. Pipe sizing calculations will also performed for the storm drain system within the project site.

Inlet sizing calculations will be provided in the final design, but will not be included in the preliminary submittal.

APPENDIX A

NOAA ATLAS 14

highlight values used on calcs

NOAA Atlas 14, Volume 6, Version 2
Location name: Redlands, California, USA*
Latitude: 34.0669°, Longitude: -117.1971°
Elevation: 1295.07 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.16** (0.960-1.40)	**1.49** (1.24-1.81)	**1.93** (1.61-2.36)	**2.30** (1.90-2.83)	**2.81** (2.23-3.58)	**3.20** (2.50-4.16)	**3.61** (2.75-4.82)	**4.04** (2.98-5.54)	**4.63** (3.28-6.62)	**5.10** (3.47-7.56)
10-min	**0.828** (0.690-1.01)	**1.07** (0.888-1.30)	**1.39** (1.15-1.69)	**1.65** (1.36-2.03)	**2.02** (1.60-2.56)	**2.30** (1.79-2.99)	**2.59** (1.97-3.46)	**2.90** (2.14-3.97)	**3.32** (2.35-4.75)	**3.65** (2.49-5.41)
15-min	**0.668** (0.556-0.812)	**0.864** (0.716-1.05)	**1.12** (0.928-1.36)	**1.33** (1.10-1.64)	**1.62** (1.29-2.07)	**1.85** (1.44-2.41)	**2.09** (1.58-2.78)	**2.34** (1.72-3.20)	**2.68** (1.89-3.83)	**2.94** (2.01-4.36)
30-min	**0.496** (0.414-0.602)	**0.640** (0.532-0.778)	**0.830** (0.688-1.01)	**0.988** (0.812-1.21)	**1.21** (0.958-1.53)	**1.38** (1.07-1.79)	**1.55** (1.18-2.07)	**1.73** (1.28-2.38)	**1.99** (1.40-2.84)	**2.19** (1.49-3.24)
60-min	**0.362** (0.301-0.439)	**0.466** (0.387-0.566)	**0.605** (0.501-0.737)	**0.719** (0.591-0.884)	**0.878** (0.697-1.12)	**1.00** (0.779-1.30)	**1.13** (0.856-1.50)	**1.26** (0.930-1.73)	**1.45** (1.02-2.07)	**1.59** (1.08-2.36)
2-hr	**0.257** (0.214-0.312)	**0.330** (0.274-0.400)	**0.426** (0.353-0.518)	**0.504** (0.415-0.620)	**0.614** (0.488-0.780)	**0.698** (0.543-0.908)	**0.785** (0.596-1.05)	**0.876** (0.645-1.20)	**1.00** (0.706-1.43)	**1.10** (0.748-1.63)
3-hr	**0.211** (0.175-0.256)	**0.270** (0.224-0.328)	**0.348** (0.289-0.424)	**0.412** (0.339-0.507)	**0.500** (0.398-0.636)	**0.569** (0.442-0.739)	**0.639** (0.484-0.851)	**0.712** (0.524-0.976)	**0.811** (0.572-1.16)	**0.889** (0.606-1.32)
6-hr	**0.149** (0.124-0.181)	**0.190** (0.158-0.231)	**0.245** (0.203-0.299)	**0.290** (0.238-0.356)	**0.351** (0.279-0.447)	**0.398** (0.310-0.518)	**0.447** (0.339-0.595)	**0.497** (0.366-0.681)	**0.565** (0.399-0.808)	**0.618** (0.421-0.915)
12-hr	**0.099** (0.082-0.120)	**0.127** (0.105-0.154)	**0.163** (0.135-0.199)	**0.193** (0.159-0.237)	**0.234** (0.186-0.297)	**0.265** (0.206-0.344)	**0.296** (0.225-0.395)	**0.329** (0.242-0.451)	**0.373** (0.263-0.533)	**0.407** (0.277-0.603)
24-hr	**0.066** (0.059-0.076)	**0.086** (0.076-0.099)	**0.111** (0.098-0.128)	**0.131** (0.115-0.153)	**0.159** (0.135-0.191)	**0.180** (0.149-0.221)	**0.201** (0.163-0.253)	**0.223** (0.176-0.289)	**0.252** (0.191-0.340)	**0.275** (0.201-0.383)
2-day	**0.041** (0.036-0.047)	**0.054** (0.048-0.062)	**0.071** (0.062-0.082)	**0.084** (0.074-0.098)	**0.103** (0.087-0.124)	**0.117** (0.097-0.144)	**0.131** (0.107-0.166)	**0.146** (0.115-0.190)	**0.167** (0.126-0.225)	**0.183** (0.134-0.255)
3-day	**0.030** (0.026-0.034)	**0.039** (0.035-0.045)	**0.052** (0.046-0.061)	**0.063** (0.055-0.074)	**0.078** (0.066-0.094)	**0.089** (0.074-0.110)	**0.101** (0.082-0.128)	**0.114** (0.090-0.147)	**0.131** (0.099-0.176)	**0.144** (0.106-0.201)
4-day	**0.024** (0.021-0.028)	**0.032** (0.028-0.037)	**0.043** (0.038-0.050)	**0.052** (0.046-0.061)	**0.065** (0.055-0.078)	**0.075** (0.062-0.092)	**0.085** (0.069-0.107)	**0.096** (0.076-0.124)	**0.111** (0.084-0.150)	**0.123** (0.090-0.171)
7-day	**0.016** (0.014-0.018)	**0.021** (0.019-0.025)	**0.029** (0.025-0.033)	**0.035** (0.031-0.041)	**0.044** (0.037-0.053)	**0.051** (0.042-0.062)	**0.058** (0.047-0.073)	**0.065** (0.051-0.084)	**0.075** (0.057-0.102)	**0.084** (0.061-0.117)
10-day	**0.012** (0.011-0.014)	**0.016** (0.014-0.019)	**0.022** (0.019-0.026)	**0.027** (0.023-0.031)	**0.034** (0.028-0.040)	**0.039** (0.032-0.048)	**0.044** (0.036-0.056)	**0.050** (0.040-0.065)	**0.058** (0.044-0.079)	**0.065** (0.047-0.090)
20-day	**0.007** (0.007-0.009)	**0.010** (0.009-0.012)	**0.014** (0.012-0.016)	**0.017** (0.015-0.020)	**0.021** (0.018-0.026)	**0.025** (0.020-0.030)	**0.028** (0.023-0.036)	**0.032** (0.025-0.041)	**0.037** (0.028-0.050)	**0.042** (0.030-0.058)
30-day	**0.006** (0.005-0.007)	**0.008** (0.007-0.009)	**0.011** (0.010-0.013)	**0.013** (0.012-0.016)	**0.017** (0.014-0.020)	**0.020** (0.016-0.024)	**0.022** (0.018-0.028)	**0.025** (0.020-0.033)	**0.030** (0.023-0.040)	**0.033** (0.024-0.046)
45-day	**0.005** (0.004-0.005)	**0.006** (0.006-0.007)	**0.009** (0.008-0.010)	**0.011** (0.009-0.012)	**0.013** (0.011-0.016)	**0.016** (0.013-0.019)	**0.018** (0.015-0.023)	**0.020** (0.016-0.026)	**0.024** (0.018-0.032)	**0.027** (0.020-0.037)
60-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.006)	**0.008** (0.007-0.009)	**0.009** (0.008-0.011)	**0.012** (0.010-0.014)	**0.014** (0.011-0.017)	**0.016** (0.013-0.020)	**0.018** (0.014-0.023)	**0.021** (0.016-0.028)	**0.023** (0.017-0.032)

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

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

Please refer to NOAA Atlas 14 document for more information.

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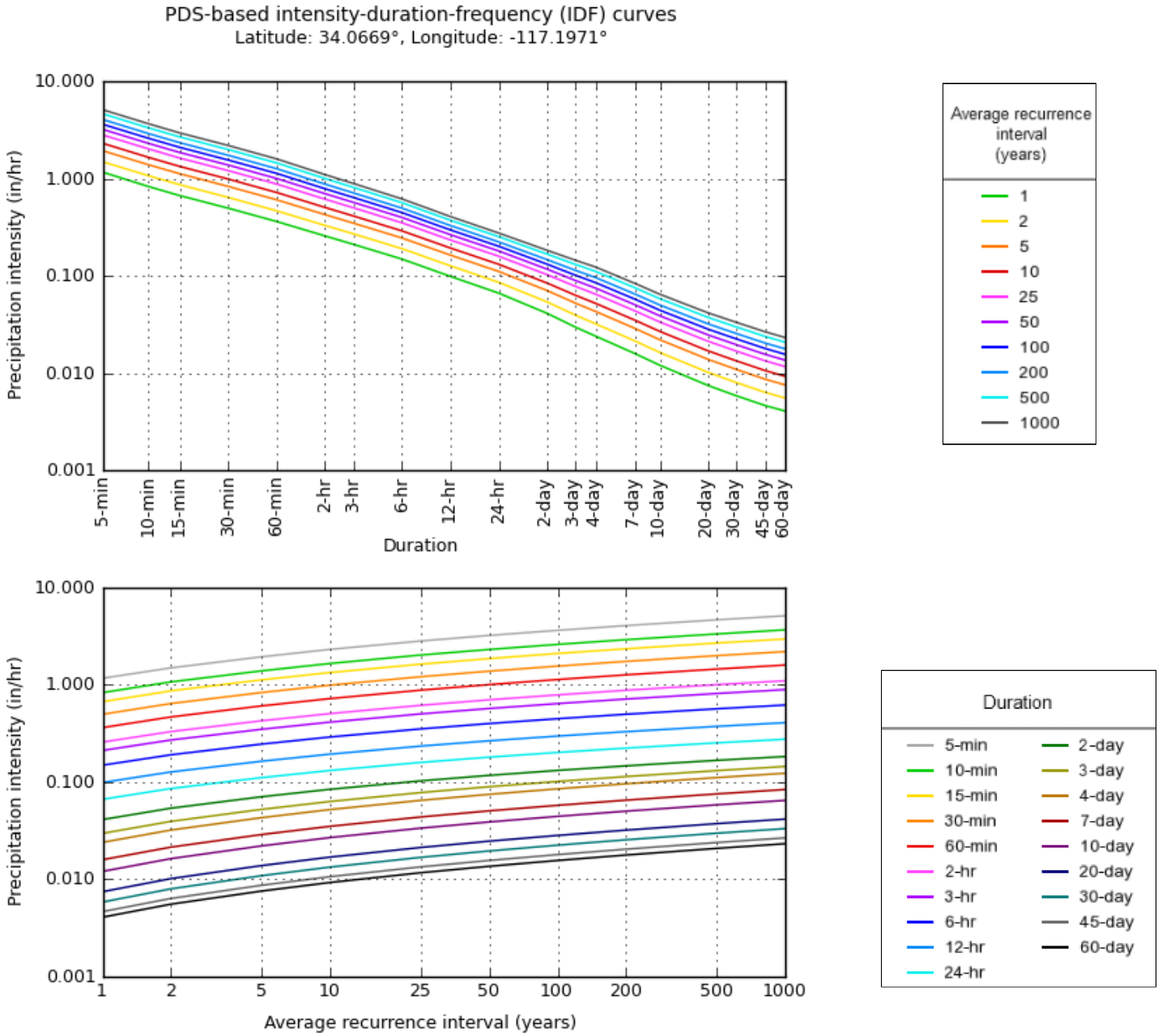
PF graphical



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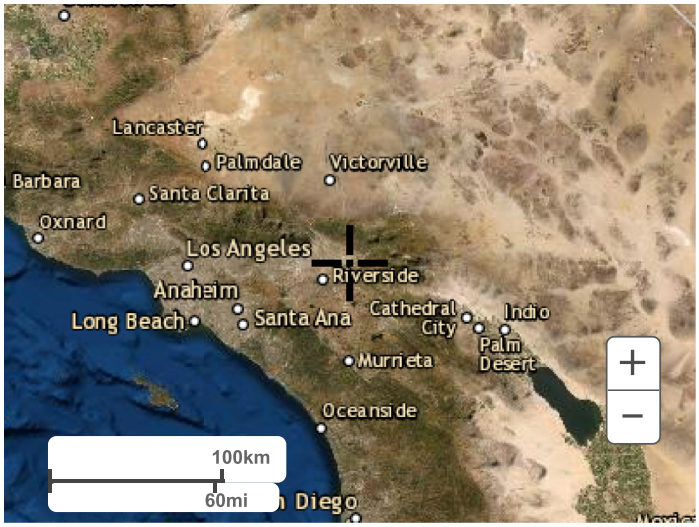
Maps & aerials

Small scale terrain

Large scale terrain

Large scale map

Large scale aerial



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Disclaimer

NOAA Atlas 14, Volume 6, Version 2
Location name: Redlands, California, USA*
Latitude: 34.0669°, Longitude: -117.1971°
Elevation: 1295.07 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.097 (0.080-0.117)	0.124 (0.103-0.151)	0.161 (0.134-0.197)	0.192 (0.158-0.236)	0.234 (0.186-0.298)	0.267 (0.208-0.347)	0.301 (0.229-0.402)	0.337 (0.248-0.462)	0.386 (0.273-0.552)	0.425 (0.289-0.630)
10-min	0.138 (0.115-0.168)	0.178 (0.148-0.217)	0.231 (0.192-0.282)	0.275 (0.226-0.338)	0.336 (0.267-0.427)	0.383 (0.298-0.498)	0.432 (0.328-0.576)	0.483 (0.356-0.662)	0.553 (0.391-0.792)	0.609 (0.415-0.902)
15-min	0.167 (0.139-0.203)	0.216 (0.179-0.262)	0.280 (0.232-0.341)	0.333 (0.274-0.409)	0.406 (0.323-0.517)	0.463 (0.360-0.602)	0.523 (0.396-0.696)	0.584 (0.430-0.801)	0.669 (0.472-0.957)	0.736 (0.502-1.09)
30-min	0.248 (0.207-0.301)	0.320 (0.266-0.389)	0.415 (0.344-0.506)	0.494 (0.406-0.607)	0.603 (0.479-0.767)	0.688 (0.535-0.894)	0.775 (0.588-1.03)	0.867 (0.639-1.19)	0.993 (0.701-1.42)	1.09 (0.745-1.62)
60-min	0.362 (0.301-0.439)	0.466 (0.387-0.566)	0.605 (0.501-0.737)	0.719 (0.591-0.884)	0.878 (0.697-1.12)	1.00 (0.779-1.30)	1.13 (0.856-1.50)	1.26 (0.930-1.73)	1.45 (1.02-2.07)	1.59 (1.08-2.36)
2-hr	0.514 (0.428-0.624)	0.659 (0.548-0.801)	0.851 (0.706-1.04)	1.01 (0.830-1.24)	1.23 (0.975-1.56)	1.40 (1.09-1.82)	1.57 (1.19-2.09)	1.75 (1.29-2.40)	2.00 (1.41-2.86)	2.19 (1.50-3.25)
3-hr	0.633 (0.527-0.768)	0.811 (0.674-0.985)	1.05 (0.867-1.27)	1.24 (1.02-1.52)	1.50 (1.19-1.91)	1.71 (1.33-2.22)	1.92 (1.45-2.56)	2.14 (1.57-2.93)	2.44 (1.72-3.48)	2.67 (1.82-3.96)
6-hr	0.891 (0.741-1.08)	1.14 (0.947-1.39)	1.47 (1.22-1.79)	1.74 (1.43-2.13)	2.10 (1.67-2.67)	2.39 (1.86-3.10)	2.68 (2.03-3.56)	2.97 (2.19-4.08)	3.38 (2.39-4.84)	3.70 (2.52-5.48)
12-hr	1.19 (0.991-1.45)	1.53 (1.27-1.86)	1.97 (1.63-2.40)	2.33 (1.91-2.86)	2.82 (2.24-3.58)	3.19 (2.48-4.15)	3.57 (2.71-4.76)	3.96 (2.92-5.43)	4.49 (3.17-6.43)	4.90 (3.34-7.27)
24-hr	1.59 (1.41-1.84)	2.06 (1.82-2.37)	2.66 (2.35-3.08)	3.15 (2.76-3.68)	3.81 (3.23-4.59)	4.32 (3.58-5.31)	4.83 (3.91-6.08)	5.35 (4.22-6.93)	6.06 (4.58-8.16)	6.60 (4.83-9.20)
2-day	1.97 (1.75-2.28)	2.58 (2.29-2.98)	3.39 (2.99-3.92)	4.04 (3.53-4.71)	4.93 (4.18-5.94)	5.62 (4.66-6.91)	6.31 (5.12-7.95)	7.03 (5.54-9.10)	8.01 (6.06-10.8)	8.77 (6.42-12.2)
3-day	2.13 (1.89-2.46)	2.84 (2.51-3.27)	3.77 (3.32-4.36)	4.54 (3.97-5.29)	5.60 (4.75-6.75)	6.44 (5.34-7.91)	7.29 (5.91-9.19)	8.19 (6.46-10.6)	9.42 (7.13-12.7)	10.4 (7.61-14.5)
4-day	2.30 (2.04-2.65)	3.08 (2.73-3.56)	4.13 (3.64-4.78)	5.00 (4.38-5.83)	6.21 (5.26-7.49)	7.17 (5.95-8.82)	8.16 (6.61-10.3)	9.21 (7.26-11.9)	10.7 (8.06-14.4)	11.8 (8.64-16.5)
7-day	2.67 (2.37-3.08)	3.60 (3.18-4.15)	4.85 (4.28-5.61)	5.89 (5.15-6.87)	7.34 (6.22-8.84)	8.49 (7.04-10.4)	9.68 (7.84-12.2)	10.9 (8.62-14.1)	12.7 (9.59-17.1)	14.1 (10.3-19.6)
10-day	2.90 (2.56-3.34)	3.92 (3.46-4.52)	5.29 (4.67-6.12)	6.44 (5.64-7.52)	8.05 (6.82-9.70)	9.32 (7.74-11.5)	10.6 (8.62-13.4)	12.0 (9.49-15.6)	14.0 (10.6-18.8)	15.5 (11.4-21.6)
20-day	3.58 (3.17-4.13)	4.88 (4.32-5.63)	6.64 (5.86-7.69)	8.12 (7.11-9.47)	10.2 (8.64-12.3)	11.8 (9.83-14.6)	13.6 (11.0-17.1)	15.4 (12.1-19.9)	17.9 (13.6-24.2)	20.0 (14.6-27.8)
30-day	4.21 (3.73-4.85)	5.76 (5.09-6.64)	7.85 (6.93-9.09)	9.62 (8.42-11.2)	12.1 (10.3-14.6)	14.1 (11.7-17.3)	16.2 (13.1-20.4)	18.4 (14.5-23.8)	21.4 (16.2-28.9)	23.9 (17.5-33.4)
45-day	5.03 (4.45-5.79)	6.87 (6.08-7.93)	9.38 (8.28-10.9)	11.5 (10.1-13.4)	14.5 (12.3-17.5)	16.9 (14.0-20.8)	19.4 (15.7-24.4)	22.0 (17.4-28.5)	25.8 (19.5-34.8)	28.8 (21.1-40.2)
60-day	5.88 (5.20-6.77)	8.01 (7.08-9.24)	10.9 (9.62-12.6)	13.4 (11.7-15.6)	16.8 (14.3-20.3)	19.6 (16.3-24.1)	22.5 (18.2-28.3)	25.6 (20.2-33.1)	29.9 (22.7-40.4)	33.4 (24.5-46.6)

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

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

Please refer to NOAA Atlas 14 document for more information.

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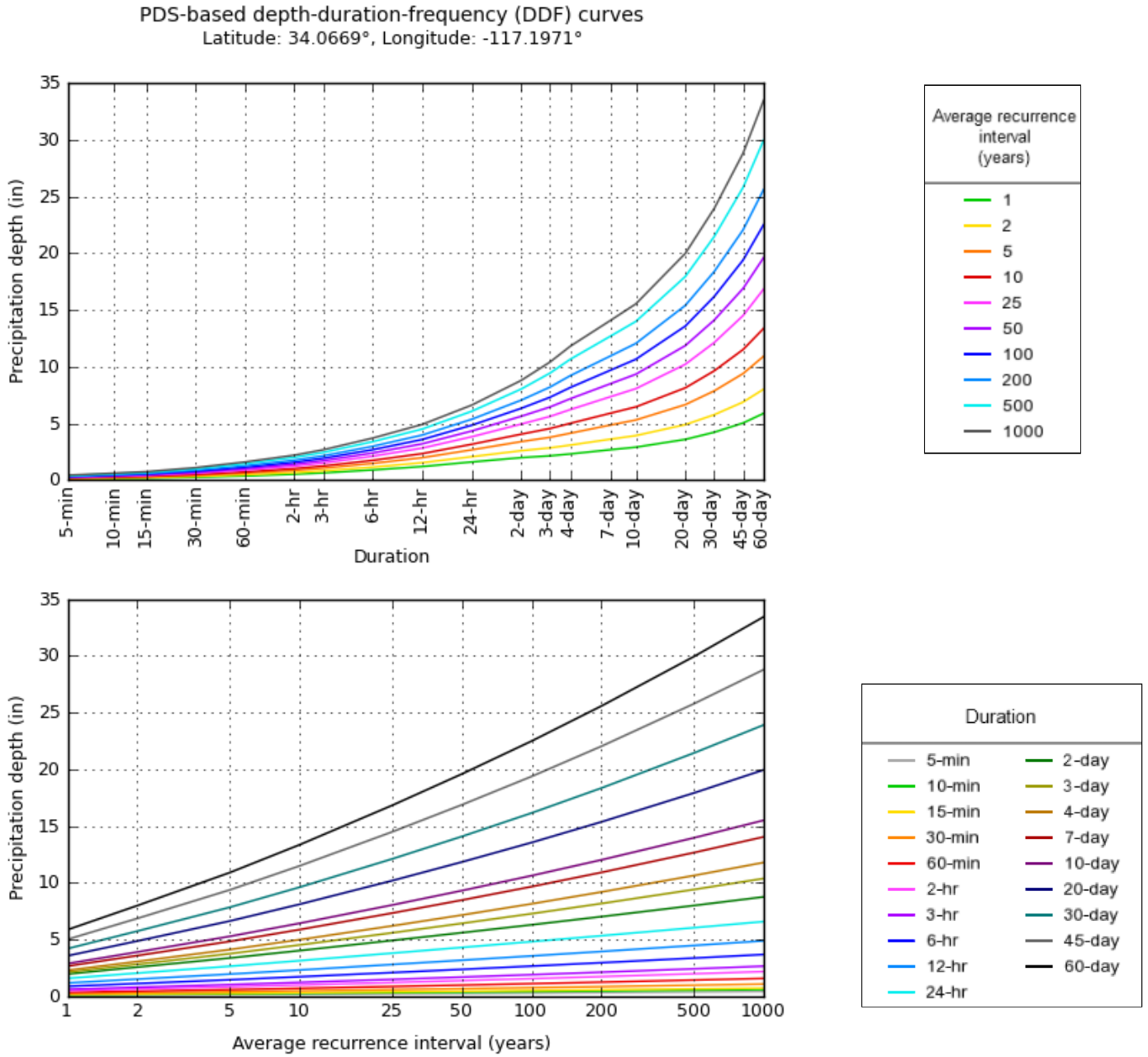
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Nov 3 23:09:56 2022

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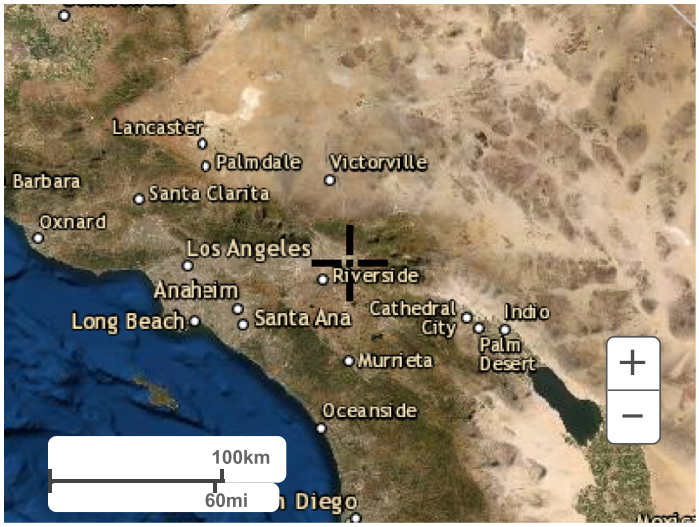
Maps & aerials

Small scale terrain

Large scale terrain

Large scale map

Large scale aerial



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

Disclaimer

APPENDIX B

WEB SOILS REPORT

Soil Map—San Bernardino County Southwestern Part, California

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 1:24,000.

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: San Bernardino County Southwestern Part, California
Survey Area Data: Version 14, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 17, 2022—Jun 12, 2022

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
TuB	Tujunga loamy sand, 0 to 5 percent slopes	18.2	100.0%
Totals for Area of Interest		**18.2**	**100.0%**

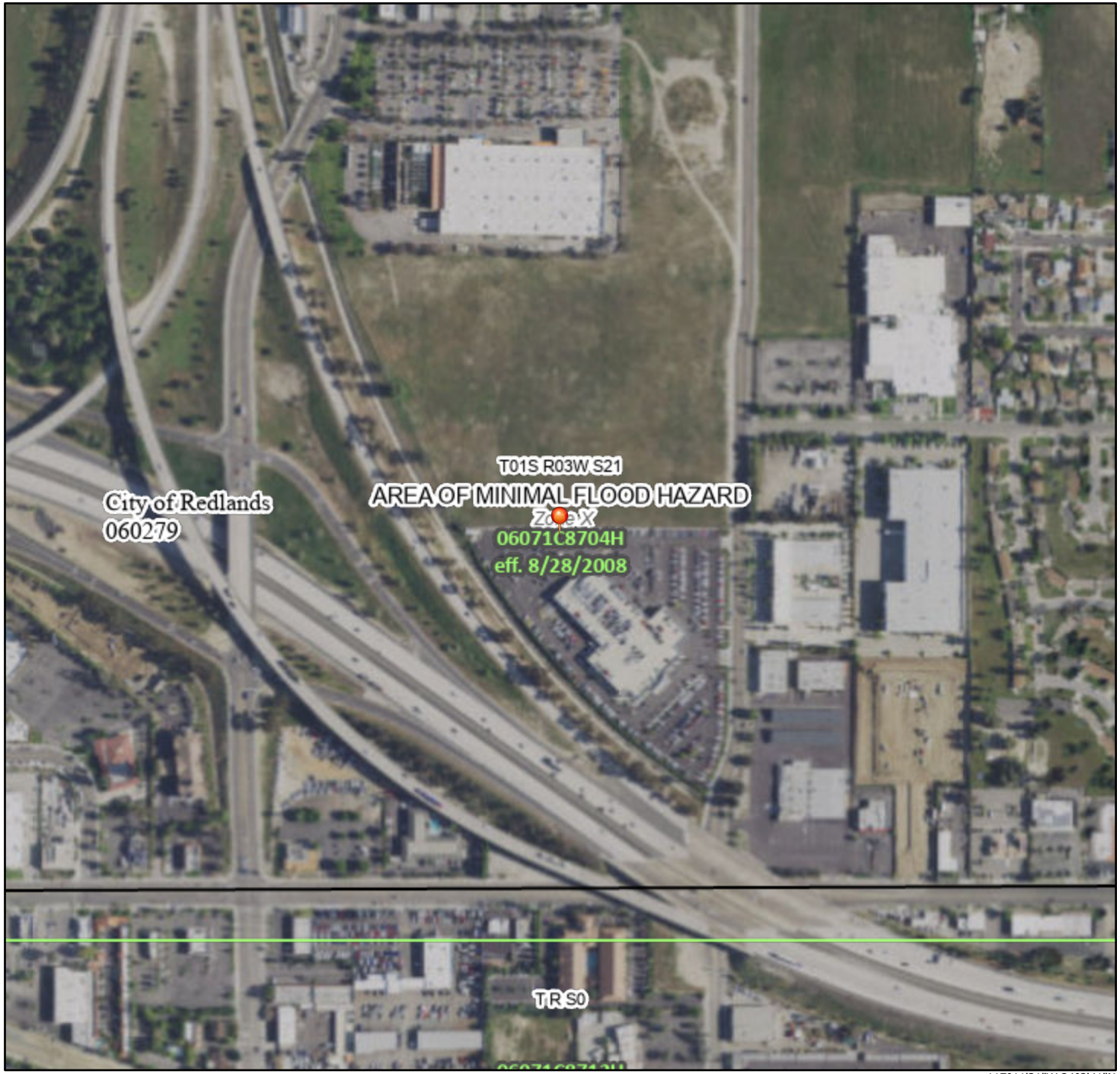
APPENDIX C

FEMA FIRMette

National Flood Hazard Layer FIRMette

FEMA

117°12'9"W 34°4'11"N



117°11'31"W 34°3'41"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/10/2023 at 4:11 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

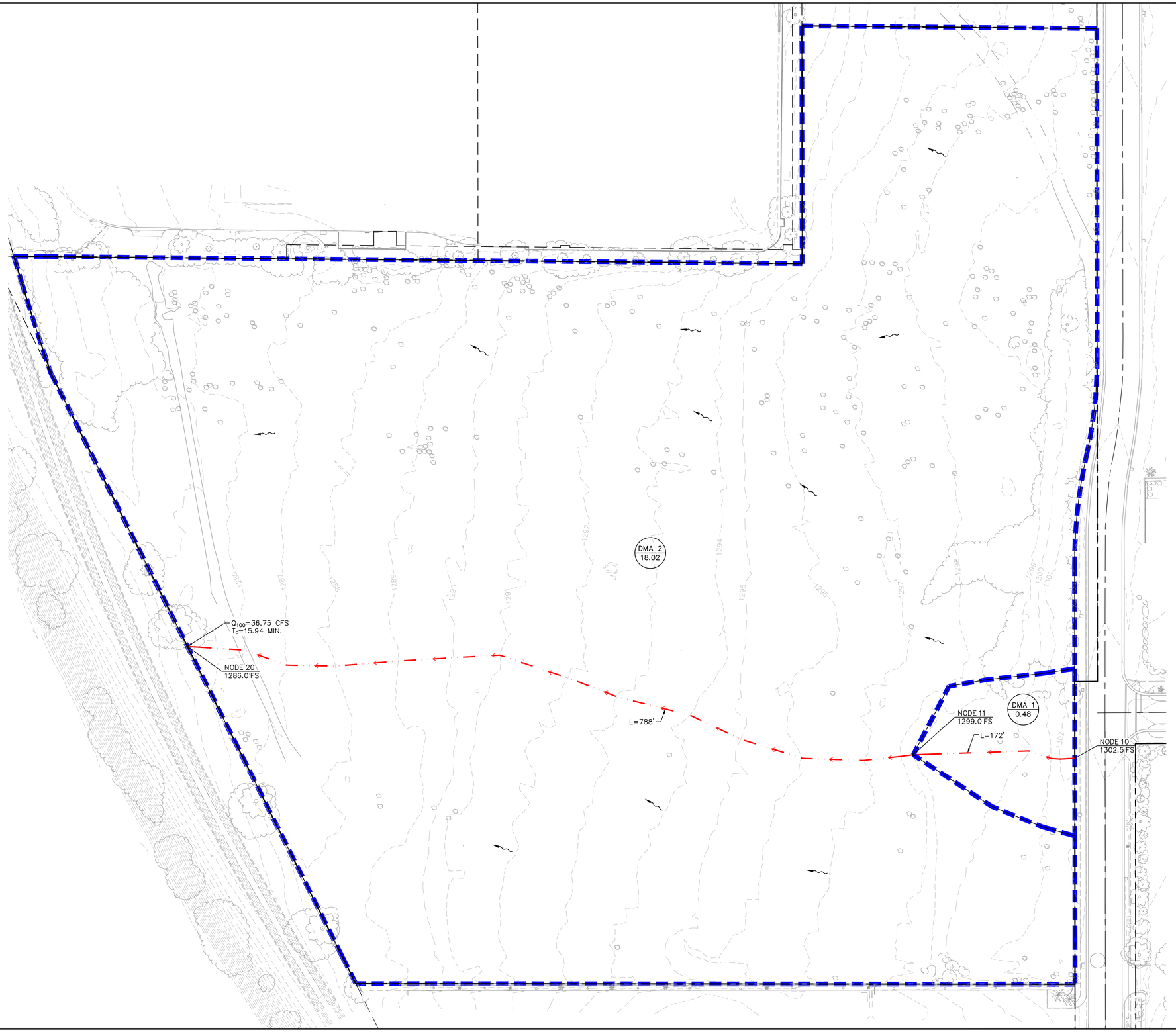
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX D

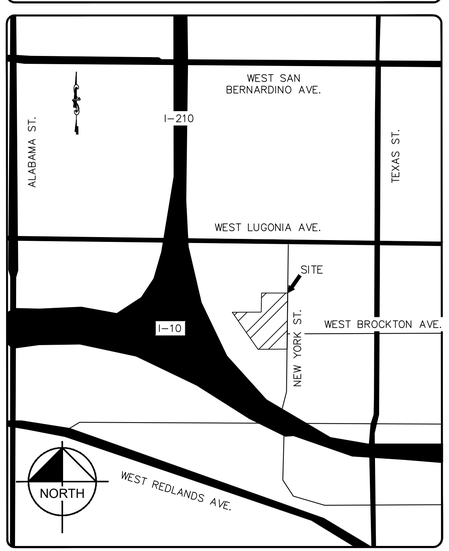
HYDROLOGY EXHIBITS

LEGEND

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



VICINITY MAP - NOT TO SCALE



NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
1" = 60'
WHEN PRINTED AT FULL SIZE
(24" BY 36")

Kimley»Horn

EXISTING DRAINAGE EXHIBIT

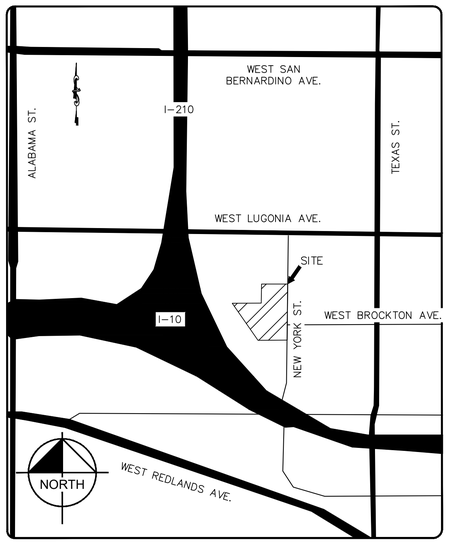
CARMAX #4033 REDLANDS

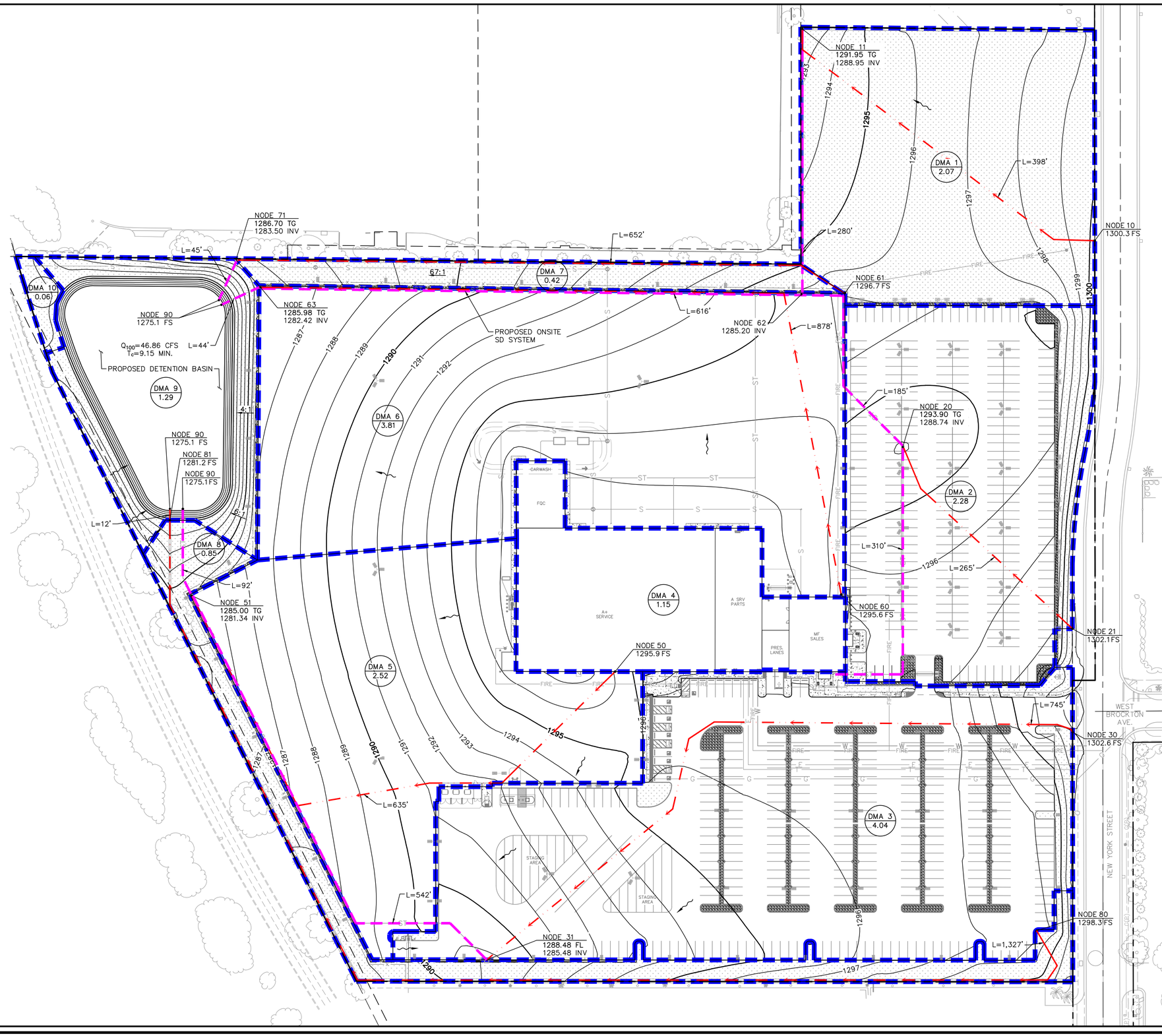
1/31/2023

LEGEND

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

VICINITY MAP - NOT TO SCALE





Kimley»Horn

PROPOSED DRAINAGE EXHIBIT

CARMAX #4033 REDLANDS

2/7/2023

APPENDIX E

RATIONAL METHOD CALCULATIONS

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2011 Advanced Engineering Software (aes)
             Ver. 18.0  Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************* DESCRIPTION OF STUDY *************************
* CARMAX REDLANDS                                                       *
* 100EX                                                                 *
* MS 01.31.2023                                                         *
 ************************************************************************

  FILE NAME: CM_100EX.DAT
  TIME/DATE OF STUDY: 16:03 01/31/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1300

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   172.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.50  DOWNSTREAM(FEET) =   1299.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.967
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.535
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                    A        0.48      0.30     1.000    85    8.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.40
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      1.40

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     20.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1299.00  DOWNSTREAM(FEET) =   1286.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   788.00   CHANNEL SLOPE =  0.0165
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.503
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    A       18.02      0.30     1.000    85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      19.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.88
  AVERAGE FLOW DEPTH(FEET) =   0.32   TRAVEL TIME(MIN.) =   6.97
  Tc(MIN.) =   15.94
  SUBAREA AREA(ACRES) =    18.02       SUBAREA RUNOFF(CFS) =   35.80
  EFFECTIVE AREA(ACRES) =     18.50     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       18.5          PEAK FLOW RATE(CFS) =      36.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   2.20
```

```
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     20.00 =     960.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       18.5  TC(MIN.) =     15.94
  EFFECTIVE AREA(ACRES) =     18.50  AREA-AVERAGED Fm(INCH/HR)=  0.30
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      36.75
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
        (c) Copyright 1983-2011 Advanced Engineering Software (aes)
            Ver. 18.0  Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************* DESCRIPTION OF STUDY *************************
* CARMAX REDLANDS                                                       *
* 100-YR PROPOSED                                                       *
* XO 1/25/23                                                            *
 *************************************************************************

  FILE NAME: CR100P.DAT
  TIME/DATE OF STUDY: 14:20 01/31/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1300

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   398.00
  ELEVATION DATA: UPSTREAM(FEET) =   1300.30  DOWNSTREAM(FEET) =   1291.95

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.765
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.428
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "GRASS"                    A        2.07      0.50     1.000    70   16.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.60
  TOTAL AREA(ACRES) =      2.07   PEAK FLOW RATE(CFS) =      3.60

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1288.95  DOWNSTREAM(FEET) =  1285.20
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.20
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.60
  PIPE TRAVEL TIME(MIN.) =   0.75    Tc(MIN.) =   17.52
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     62.00 =     678.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.52
  RAINFALL INTENSITY(INCH/HR) =   2.37
  AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       2.07
```

```
  TOTAL STREAM AREA(ACRES) =       2.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.60

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   265.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.10  DOWNSTREAM(FEET) =   1293.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.676
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.651
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.28      0.74     0.100    52    5.68
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.39
  TOTAL AREA(ACRES) =      2.28   PEAK FLOW RATE(CFS) =      9.39

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.68
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.651
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.15      0.74     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    4.74
  EFFECTIVE AREA(ACRES) =      3.43   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.4       PEAK FLOW RATE(CFS) =      14.13

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1288.74  DOWNSTREAM(FEET) =  1285.20
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.6 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.85
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.13
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    5.99
  LONGEST FLOWPATH FROM NODE     21.00 TO NODE     62.00 =     450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.99
  RAINFALL INTENSITY(INCH/HR) =   4.50
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.43
  TOTAL STREAM AREA(ACRES) =       3.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      14.13

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.60   17.52    2.365  0.50( 0.50) 1.00       2.1      10.00
      2       14.13    5.99    4.503  0.74( 0.07) 0.10       3.4      21.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.77    5.99    4.503  0.58( 0.15) 0.25       4.1      21.00
      2       10.91   17.52    2.365  0.53( 0.23) 0.44       5.5      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.77    Tc(MIN.) =     5.99
  EFFECTIVE AREA(ACRES) =       4.14   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.58  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     62.00 =     678.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     63.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =  1285.20  DOWNSTREAM(FEET) =  1282.42
  FLOW LENGTH(FEET) =   616.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.09
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.77
  PIPE TRAVEL TIME(MIN.) =   1.69    Tc(MIN.) =    7.68
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     63.00 =    1294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.68
  RAINFALL INTENSITY(INCH/HR) =   3.88
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.58
  AREA-AVERAGED Ap =  0.25
  EFFECTIVE STREAM AREA(ACRES) =       4.14
  TOTAL STREAM AREA(ACRES) =       5.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.77

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     63.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   878.00
  ELEVATION DATA: UPSTREAM(FEET) =   1295.60  DOWNSTREAM(FEET) =   1285.98

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.080
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        3.81      0.74     0.100    52   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.31
  TOTAL AREA(ACRES) =      3.81   PEAK FLOW RATE(CFS) =     10.31

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.28
  RAINFALL INTENSITY(INCH/HR) =   3.08
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.81
  TOTAL STREAM AREA(ACRES) =       3.81
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.31

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.77    7.68    3.880  0.58( 0.15) 0.25       4.1      21.00
      1       10.91   19.45    2.222  0.53( 0.23) 0.44       5.5      10.00
      2       10.31   11.28    3.080  0.74( 0.07) 0.10       3.8      60.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.65    7.68    3.880  0.61( 0.12) 0.19       6.7      21.00
      2       25.28   11.28    3.080  0.60( 0.13) 0.21       8.4      60.00
      3       18.27   19.45    2.222  0.56( 0.17) 0.30       9.3      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.65    Tc(MIN.) =     7.68
  EFFECTIVE AREA(ACRES) =       6.73   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =        9.3
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     63.00 =    1294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1282.42  DOWNSTREAM(FEET) =  1275.10
  FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.73
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.65
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.70
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1338.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   745.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.60  DOWNSTREAM(FEET) =   1288.48

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.467
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.422
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        4.04      0.74     0.100    52    9.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     12.17
  TOTAL AREA(ACRES) =      4.04   PEAK FLOW RATE(CFS) =     12.17

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     51.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1285.48  DOWNSTREAM(FEET) =  1281.34
  FLOW LENGTH(FEET) =   542.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.80
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.17
  PIPE TRAVEL TIME(MIN.) =   1.33    Tc(MIN.) =   10.80
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     51.00 =    1287.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.80
  RAINFALL INTENSITY(INCH/HR) =   3.16
```

```
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.04
  TOTAL STREAM AREA(ACRES) =       4.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.17

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   635.00
  ELEVATION DATA: UPSTREAM(FEET) =   1295.90  DOWNSTREAM(FEET) =   1285.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.058
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.513
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.52      0.74     0.100    52    9.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.80
  TOTAL AREA(ACRES) =      2.52   PEAK FLOW RATE(CFS) =      7.80

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.06
  RAINFALL INTENSITY(INCH/HR) =   3.51
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.52
  TOTAL STREAM AREA(ACRES) =       2.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.80

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.17   10.80    3.163  0.74( 0.07) 0.10       4.0      30.00
      2        7.80    9.06    3.513  0.74( 0.07) 0.10       2.5      50.00
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       19.17    9.06    3.513  0.74( 0.07) 0.10       5.9      50.00
      2       19.18   10.80    3.163  0.74( 0.07) 0.10       6.6      30.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.18    Tc(MIN.) =    10.80
  EFFECTIVE AREA(ACRES) =       6.56   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     51.00 =    1287.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1281.34  DOWNSTREAM(FEET) =  1275.10
  FLOW LENGTH(FEET) =    92.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.48
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.18
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   10.88
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       19.17    9.15    3.493  0.74( 0.07) 0.10       5.9      50.00
      2       19.18   10.88    3.147  0.74( 0.07) 0.10       6.6      30.00
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.65    7.70    3.872  0.61( 0.12) 0.19       6.7      21.00
      2       25.28   11.31    3.075  0.60( 0.13) 0.21       8.4      60.00
      3       18.27   19.48    2.220  0.56( 0.17) 0.30       9.3      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1338.00 FEET.
```

```
  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       43.59    7.70    3.872  0.65( 0.10) 0.15      11.7      21.00
      2       44.68    9.15    3.493  0.64( 0.10) 0.16      13.3      50.00
      3       44.50   10.88    3.147  0.64( 0.10) 0.16      14.7      30.00
      4       44.01   11.31    3.075  0.64( 0.10) 0.16      14.9      60.00
      5       31.66   19.48    2.220  0.59( 0.13) 0.22      15.9      10.00
    TOTAL AREA(ACRES) =        15.9

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       44.68  Tc(MIN.) =    9.146
  EFFECTIVE AREA(ACRES) =     13.29  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.65  AREA-AVERAGED Ap =  0.15
  TOTAL AREA(ACRES) =       15.9
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1327.00
  ELEVATION DATA: UPSTREAM(FEET) =   1298.30  DOWNSTREAM(FEET) =   1281.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   29.918
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.716
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  URBAN GOOD COVER
  "TURF"                     A        0.85      0.73     1.000    53   29.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.73
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.76
  TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      0.76

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1281.20  DOWNSTREAM(FEET) =   1275.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =    12.00   CHANNEL SLOPE =  0.5083
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.714
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  URBAN POOR COVER
  "TURF"                      A        1.29      0.40     1.000    77
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.95
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.03
  Tc(MIN.) =   29.95
  SUBAREA AREA(ACRES) =     1.29       SUBAREA RUNOFF(CFS) =    1.53
  EFFECTIVE AREA(ACRES) =      2.14     AREA-AVERAGED Fm(INCH/HR) =   0.53
  AREA-AVERAGED Fp(INCH/HR) =   0.53  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       2.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   6.74
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     90.00 =    1339.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.28   29.95    1.714  0.53( 0.53) 1.00       2.1      80.00
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     90.00 =    1339.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       43.59    7.70    3.872  0.65( 0.10) 0.15      11.7      21.00
      2       44.68    9.15    3.493  0.64( 0.10) 0.16      13.3      50.00
      3       44.50   10.88    3.147  0.64( 0.10) 0.16      14.7      30.00
      4       44.01   11.31    3.075  0.64( 0.10) 0.16      14.9      60.00
      5       31.66   19.48    2.220  0.59( 0.13) 0.22      15.9      10.00
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
      1       45.25    7.70    3.872  0.62( 0.12) 0.19      12.3      21.00
      2       46.42    9.15    3.493  0.62( 0.12) 0.20      13.9      50.00
      3       46.33   10.88    3.147  0.61( 0.13) 0.20      15.5      30.00
      4       45.86   11.31    3.075  0.61( 0.13) 0.21      15.7      60.00
      5       33.78   19.48    2.220  0.58( 0.16) 0.28      17.3      10.00
      6       26.29   29.95    1.714  0.57( 0.18) 0.31      18.0      80.00
    TOTAL AREA(ACRES) =        18.0

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       46.42  Tc(MIN.) =    9.146
  EFFECTIVE AREA(ACRES) =     13.95  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       18.0
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.15
  RAINFALL INTENSITY(INCH/HR) =   3.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.62
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      13.95
  TOTAL STREAM AREA(ACRES) =      18.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      46.42

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   652.00
  ELEVATION DATA: UPSTREAM(FEET) =   1296.70  DOWNSTREAM(FEET) =   1286.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   21.745
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.078
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  URBAN GOOD COVER
  "TURF"                     A        0.42      0.73     1.000    53   21.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.73
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.51
```

```
  TOTAL AREA(ACRES) =      0.42   PEAK FLOW RATE(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1283.50  DOWNSTREAM(FEET) =  1275.10
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.12
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.51
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   21.82
  LONGEST FLOWPATH FROM NODE     61.00 TO NODE     90.00 =     697.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.82
  RAINFALL INTENSITY(INCH/HR) =   2.07
  AREA-AVERAGED Fm(INCH/HR) =  0.73
  AREA-AVERAGED Fp(INCH/HR) =  0.73
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.42
  TOTAL STREAM AREA(ACRES) =       0.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.51

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       45.25    7.70    3.872  0.62( 0.12) 0.19      12.3      21.00
      1       46.42    9.15    3.493  0.62( 0.12) 0.20      13.9      50.00
      1       46.33   10.88    3.147  0.61( 0.13) 0.20      15.5      30.00
      1       45.86   11.31    3.075  0.61( 0.13) 0.21      15.7      60.00
      1       33.78   19.48    2.220  0.58( 0.16) 0.28      17.3      10.00
      1       26.29   29.95    1.714  0.57( 0.18) 0.31      18.0      80.00
      2        0.51   21.82    2.073  0.73( 0.73) 1.00       0.4      61.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1       45.67    7.70    3.872  0.62( 0.13) 0.20      12.4      21.00
     2       46.86    9.15    3.493  0.62( 0.13) 0.21      14.1      50.00
     3       46.79   10.88    3.147  0.62( 0.13) 0.21      15.7      30.00
     4       46.32   11.31    3.075  0.62( 0.13) 0.22      16.0      60.00
     5       34.28   19.48    2.220  0.59( 0.17) 0.30      17.6      10.00
     6       32.61   21.82    2.073  0.59( 0.18) 0.30      17.8      61.00
     7       26.67   29.95    1.714  0.58( 0.19) 0.33      18.4      80.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     46.86    Tc(MIN.) =     9.15
  EFFECTIVE AREA(ACRES) =      14.12   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap =  0.21
  TOTAL AREA(ACRES) =       18.4
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       18.4  TC(MIN.) =      9.15
  EFFECTIVE AREA(ACRES) =     14.12  AREA-AVERAGED Fm(INCH/HR)=  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.207
  PEAK FLOW RATE(CFS)   =      46.86

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       45.67    7.70    3.872  0.62( 0.13) 0.20      12.4      21.00
      2       46.86    9.15    3.493  0.62( 0.13) 0.21      14.1      50.00
      3       46.79   10.88    3.147  0.62( 0.13) 0.21      15.7      30.00
      4       46.32   11.31    3.075  0.62( 0.13) 0.22      16.0      60.00
      5       34.28   19.48    2.220  0.59( 0.17) 0.30      17.6      10.00
      6       32.61   21.82    2.073  0.59( 0.18) 0.30      17.8      61.00
      7       26.67   29.95    1.714  0.58( 0.19) 0.33      18.4      80.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************* DESCRIPTION OF STUDY *************************
* CARMAX REDLANDS 10EX 05.11.23                                         *
*                                                                       *
*                                                                       *
 *************************************************************************

  FILE NAME: CM_10EX.DAT
  TIME/DATE OF STUDY: 09:02 05/11/2023
=========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7190

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   172.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.50  DOWNSTREAM(FEET) =   1299.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.967
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.249
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                    A        0.48      0.60     1.000    67    8.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.71
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      0.71

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     20.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1299.00  DOWNSTREAM(FEET) =   1286.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   788.00   CHANNEL SLOPE =  0.0165
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.511
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    A       18.02      0.60     1.000    67
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.56
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   8.44
  Tc(MIN.) =   17.40
  SUBAREA AREA(ACRES) =    18.02       SUBAREA RUNOFF(CFS) =   14.80
  EFFECTIVE AREA(ACRES) =     18.50     AREA-AVERAGED Fm(INCH/HR) =   0.60
  AREA-AVERAGED Fp(INCH/HR) =   0.60  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       18.5         PEAK FLOW RATE(CFS) =      15.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   1.77
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     20.00 =     960.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       18.5  TC(MIN.) =     17.40
  EFFECTIVE AREA(ACRES) =     18.50  AREA-AVERAGED Fm(INCH/HR)=  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      15.20
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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                          Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************* DESCRIPTION OF STUDY *************************
* CARMAX REDLANDS                                                       *
* 100-YR PROPOSED                                                       *
* XO 1/25/23                                                            *
 *************************************************************************

  FILE NAME: CR100P.DAT
  TIME/DATE OF STUDY: 14:20 01/31/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1300

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   398.00
  ELEVATION DATA: UPSTREAM(FEET) =   1300.30  DOWNSTREAM(FEET) =   1291.95

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.765
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.428
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "GRASS"                    A        2.07      0.50     1.000    70   16.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.60
  TOTAL AREA(ACRES) =      2.07   PEAK FLOW RATE(CFS) =      3.60

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1288.95  DOWNSTREAM(FEET) =  1285.20
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.20
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.60
  PIPE TRAVEL TIME(MIN.) =   0.75    Tc(MIN.) =   17.52
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     62.00 =     678.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.52
  RAINFALL INTENSITY(INCH/HR) =   2.37
  AREA-AVERAGED Fm(INCH/HR) =  0.50
  AREA-AVERAGED Fp(INCH/HR) =  0.50
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       2.07
```

```
  TOTAL STREAM AREA(ACRES) =       2.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.60

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   265.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.10  DOWNSTREAM(FEET) =   1293.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.676
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.651
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.28      0.74     0.100    52    5.68
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.39
  TOTAL AREA(ACRES) =      2.28   PEAK FLOW RATE(CFS) =      9.39

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.68
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.651
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.15      0.74     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    4.74
  EFFECTIVE AREA(ACRES) =      3.43   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.4       PEAK FLOW RATE(CFS) =      14.13

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1288.74  DOWNSTREAM(FEET) =  1285.20
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.6 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.85
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.13
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    5.99
  LONGEST FLOWPATH FROM NODE     21.00 TO NODE     62.00 =     450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.99
  RAINFALL INTENSITY(INCH/HR) =   4.50
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.43
  TOTAL STREAM AREA(ACRES) =       3.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      14.13

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.60   17.52    2.365  0.50( 0.50) 1.00       2.1      10.00
      2       14.13    5.99    4.503  0.74( 0.07) 0.10       3.4      21.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.77    5.99    4.503  0.58( 0.15) 0.25       4.1      21.00
      2       10.91   17.52    2.365  0.53( 0.23) 0.44       5.5      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.77    Tc(MIN.) =     5.99
  EFFECTIVE AREA(ACRES) =       4.14   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.58  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     62.00 =     678.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     63.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =  1285.20  DOWNSTREAM(FEET) =  1282.42
  FLOW LENGTH(FEET) =   616.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.09
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.77
  PIPE TRAVEL TIME(MIN.) =   1.69    Tc(MIN.) =    7.68
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     63.00 =    1294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.68
  RAINFALL INTENSITY(INCH/HR) =   3.88
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.58
  AREA-AVERAGED Ap =  0.25
  EFFECTIVE STREAM AREA(ACRES) =       4.14
  TOTAL STREAM AREA(ACRES) =       5.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.77

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     63.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   878.00
  ELEVATION DATA: UPSTREAM(FEET) =   1295.60  DOWNSTREAM(FEET) =   1285.98

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.080
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        3.81      0.74     0.100    52   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.31
  TOTAL AREA(ACRES) =      3.81   PEAK FLOW RATE(CFS) =     10.31

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.28
  RAINFALL INTENSITY(INCH/HR) =   3.08
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.81
  TOTAL STREAM AREA(ACRES) =       3.81
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.31

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.77    7.68    3.880  0.58( 0.15) 0.25       4.1      21.00
      1       10.91   19.45    2.222  0.53( 0.23) 0.44       5.5      10.00
      2       10.31   11.28    3.080  0.74( 0.07) 0.10       3.8      60.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.65    7.68    3.880  0.61( 0.12) 0.19       6.7      21.00
      2       25.28   11.28    3.080  0.60( 0.13) 0.21       8.4      60.00
      3       18.27   19.45    2.222  0.56( 0.17) 0.30       9.3      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      25.65    Tc(MIN.) =     7.68
  EFFECTIVE AREA(ACRES) =       6.73   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =        9.3
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     63.00 =    1294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1282.42  DOWNSTREAM(FEET) =  1275.10
  FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.73
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      25.65
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.70
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1338.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   745.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.60  DOWNSTREAM(FEET) =   1288.48

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.467
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.422
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        4.04      0.74     0.100    52    9.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     12.17
  TOTAL AREA(ACRES) =      4.04   PEAK FLOW RATE(CFS) =     12.17

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     51.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1285.48  DOWNSTREAM(FEET) =  1281.34
  FLOW LENGTH(FEET) =   542.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.80
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.17
  PIPE TRAVEL TIME(MIN.) =   1.33    Tc(MIN.) =   10.80
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     51.00 =    1287.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.80
  RAINFALL INTENSITY(INCH/HR) =   3.16
```

```
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.04
  TOTAL STREAM AREA(ACRES) =       4.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.17

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   635.00
  ELEVATION DATA: UPSTREAM(FEET) =   1295.90  DOWNSTREAM(FEET) =   1285.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.058
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.513
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.52      0.74     0.100    52    9.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.80
  TOTAL AREA(ACRES) =      2.52   PEAK FLOW RATE(CFS) =      7.80

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.06
  RAINFALL INTENSITY(INCH/HR) =   3.51
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.52
  TOTAL STREAM AREA(ACRES) =       2.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.80

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.17   10.80    3.163  0.74( 0.07) 0.10       4.0      30.00
      2        7.80    9.06    3.513  0.74( 0.07) 0.10       2.5      50.00
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       19.17    9.06    3.513  0.74( 0.07) 0.10       5.9      50.00
      2       19.18   10.80    3.163  0.74( 0.07) 0.10       6.6      30.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.18    Tc(MIN.) =    10.80
  EFFECTIVE AREA(ACRES) =       6.56   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     51.00 =    1287.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1281.34  DOWNSTREAM(FEET) =  1275.10
  FLOW LENGTH(FEET) =    92.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.48
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.18
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   10.88
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       19.17    9.15    3.493  0.74( 0.07) 0.10       5.9      50.00
      2       19.18   10.88    3.147  0.74( 0.07) 0.10       6.6      30.00
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.65    7.70    3.872  0.61( 0.12) 0.19       6.7      21.00
      2       25.28   11.31    3.075  0.60( 0.13) 0.21       8.4      60.00
      3       18.27   19.48    2.220  0.56( 0.17) 0.30       9.3      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1338.00 FEET.
```

```
  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       43.59    7.70    3.872  0.65( 0.10) 0.15      11.7      21.00
      2       44.68    9.15    3.493  0.64( 0.10) 0.16      13.3      50.00
      3       44.50   10.88    3.147  0.64( 0.10) 0.16      14.7      30.00
      4       44.01   11.31    3.075  0.64( 0.10) 0.16      14.9      60.00
      5       31.66   19.48    2.220  0.59( 0.13) 0.22      15.9      10.00
    TOTAL AREA(ACRES) =        15.9

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       44.68  Tc(MIN.) =    9.146
  EFFECTIVE AREA(ACRES) =     13.29  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.65  AREA-AVERAGED Ap =  0.15
  TOTAL AREA(ACRES) =       15.9
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1327.00
  ELEVATION DATA: UPSTREAM(FEET) =   1298.30  DOWNSTREAM(FEET) =   1281.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   29.918
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.716
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  URBAN GOOD COVER
  "TURF"                     A        0.85      0.73     1.000    53   29.92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.73
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.76
  TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      0.76

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1281.20  DOWNSTREAM(FEET) =   1275.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =    12.00   CHANNEL SLOPE =  0.5083
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.714
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  URBAN POOR COVER
  "TURF"                      A        1.29      0.40     1.000    77
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.95
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.03
  Tc(MIN.) =   29.95
  SUBAREA AREA(ACRES) =     1.29       SUBAREA RUNOFF(CFS) =    1.53
  EFFECTIVE AREA(ACRES) =      2.14     AREA-AVERAGED Fm(INCH/HR) =   0.53
  AREA-AVERAGED Fp(INCH/HR) =   0.53  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       2.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   6.74
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     90.00 =    1339.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.28   29.95    1.714  0.53( 0.53) 1.00       2.1      80.00
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     90.00 =    1339.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       43.59    7.70    3.872  0.65( 0.10) 0.15      11.7      21.00
      2       44.68    9.15    3.493  0.64( 0.10) 0.16      13.3      50.00
      3       44.50   10.88    3.147  0.64( 0.10) 0.16      14.7      30.00
      4       44.01   11.31    3.075  0.64( 0.10) 0.16      14.9      60.00
      5       31.66   19.48    2.220  0.59( 0.13) 0.22      15.9      10.00
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
      1       45.25    7.70    3.872  0.62( 0.12) 0.19      12.3      21.00
      2       46.42    9.15    3.493  0.62( 0.12) 0.20      13.9      50.00
      3       46.33   10.88    3.147  0.61( 0.13) 0.20      15.5      30.00
      4       45.86   11.31    3.075  0.61( 0.13) 0.21      15.7      60.00
      5       33.78   19.48    2.220  0.58( 0.16) 0.28      17.3      10.00
      6       26.29   29.95    1.714  0.57( 0.18) 0.31      18.0      80.00
    TOTAL AREA(ACRES) =        18.0

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       46.42  Tc(MIN.) =    9.146
  EFFECTIVE AREA(ACRES) =     13.95  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       18.0
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.15
  RAINFALL INTENSITY(INCH/HR) =   3.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.62
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      13.95
  TOTAL STREAM AREA(ACRES) =      18.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      46.42

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   652.00
  ELEVATION DATA: UPSTREAM(FEET) =   1296.70  DOWNSTREAM(FEET) =   1286.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   21.745
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.078
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  URBAN GOOD COVER
  "TURF"                     A        0.42      0.73     1.000    53   21.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.73
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.51
```

```
  TOTAL AREA(ACRES) =      0.42   PEAK FLOW RATE(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1283.50  DOWNSTREAM(FEET) =  1275.10
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.12
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.51
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   21.82
  LONGEST FLOWPATH FROM NODE     61.00 TO NODE     90.00 =     697.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.82
  RAINFALL INTENSITY(INCH/HR) =   2.07
  AREA-AVERAGED Fm(INCH/HR) =  0.73
  AREA-AVERAGED Fp(INCH/HR) =  0.73
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       0.42
  TOTAL STREAM AREA(ACRES) =       0.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.51

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       45.25    7.70    3.872  0.62( 0.12) 0.19      12.3      21.00
      1       46.42    9.15    3.493  0.62( 0.12) 0.20      13.9      50.00
      1       46.33   10.88    3.147  0.61( 0.13) 0.20      15.5      30.00
      1       45.86   11.31    3.075  0.61( 0.13) 0.21      15.7      60.00
      1       33.78   19.48    2.220  0.58( 0.16) 0.28      17.3      10.00
      1       26.29   29.95    1.714  0.57( 0.18) 0.31      18.0      80.00
      2        0.51   21.82    2.073  0.73( 0.73) 1.00       0.4      61.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

1	45.67	7.70	3.872	0.62(0.13)	0.20	12.4	21.00
2	46.86	9.15	3.493	0.62(0.13)	0.21	14.1	50.00
3	46.79	10.88	3.147	0.62(0.13)	0.21	15.7	30.00
4	46.32	11.31	3.075	0.62(0.13)	0.22	16.0	60.00
5	34.28	19.48	2.220	0.59(0.17)	0.30	17.6	10.00
6	32.61	21.82	2.073	0.59(0.18)	0.30	17.8	61.00
7	26.67	29.95	1.714	0.58(0.19)	0.33	18.4	80.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 46.86 Tc(MIN.) = 9.15
EFFECTIVE AREA(ACRES) = 14.12 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.62 AREA-AVERAGED Ap = 0.21
TOTAL AREA(ACRES) = 18.4
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 90.00 = 1379.00 FEET.

==========

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 18.4 TC(MIN.) = 9.15
EFFECTIVE AREA(ACRES) = 14.12 AREA-AVERAGED Fm(INCH/HR)= 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.62 AREA-AVERAGED Ap = 0.207
PEAK FLOW RATE(CFS) = 46.86

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	45.67	7.70	3.872	0.62(0.13)	0.20	12.4	21.00
2	46.86	9.15	3.493	0.62(0.13)	0.21	14.1	50.00
3	46.79	10.88	3.147	0.62(0.13)	0.21	15.7	30.00
4	46.32	11.31	3.075	0.62(0.13)	0.22	16.0	60.00
5	34.28	19.48	2.220	0.59(0.17)	0.30	17.6	10.00
6	32.61	21.82	2.073	0.59(0.18)	0.30	17.8	61.00
7	26.67	29.95	1.714	0.58(0.19)	0.33	18.4	80.00

==========

==========

END OF RATIONAL METHOD ANALYSIS

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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                          Analysis prepared by:

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                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************* DESCRIPTION OF STUDY *************************
* CARMAX REDLANDS PROPOSED 10YR                                         *
* 100-YR PROPOSED                                                       *
* XO 1/25/23                                                            *
 *************************************************************************

  FILE NAME: CR10P.DAT
  TIME/DATE OF STUDY: 09:47 05/11/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7190

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   398.00
  ELEVATION DATA: UPSTREAM(FEET) =   1300.30  DOWNSTREAM(FEET) =   1292.05

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.805
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.543
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "GRASS"                    A        2.07      0.82     1.000    50   16.81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.82
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.35
  TOTAL AREA(ACRES) =      2.07   PEAK FLOW RATE(CFS) =      1.35

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1289.05  DOWNSTREAM(FEET) =  1285.20
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.95
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.35
  PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =   17.75
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     62.00 =     678.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.75
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.82
  AREA-AVERAGED Fp(INCH/HR) =  0.82
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       2.07
```

```
  TOTAL STREAM AREA(ACRES) =       2.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.35

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   265.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.10  DOWNSTREAM(FEET) =   1297.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.372
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.761
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.28      0.98     0.100    32    6.37
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.47
  TOTAL AREA(ACRES) =      2.28   PEAK FLOW RATE(CFS) =      5.47

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.37
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.761
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.15      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    2.76
  EFFECTIVE AREA(ACRES) =      3.43   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.4       PEAK FLOW RATE(CFS) =       8.22

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1288.74  DOWNSTREAM(FEET) =  1285.20
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.8 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.66
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.22
  PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    6.73
  LONGEST FLOWPATH FROM NODE     21.00 TO NODE     62.00 =     450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.73
  RAINFALL INTENSITY(INCH/HR) =   2.67
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.43
  TOTAL STREAM AREA(ACRES) =       3.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.22

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.35   17.75    1.493  0.82( 0.82) 1.00       2.1      10.00
      2        8.22    6.73    2.672  0.98( 0.10) 0.10       3.4      21.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.57    6.73    2.672  0.87( 0.23) 0.27       4.2      21.00
      2        5.80   17.75    1.493  0.84( 0.37) 0.44       5.5      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.57    Tc(MIN.) =     6.73
  EFFECTIVE AREA(ACRES) =       4.21   AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.87  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     62.00 =     678.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     63.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =  1285.20  DOWNSTREAM(FEET) =  1282.42
  FLOW LENGTH(FEET) =   616.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.25
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.57
  PIPE TRAVEL TIME(MIN.) =   1.96    Tc(MIN.) =    8.68
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     63.00 =    1294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.68
  RAINFALL INTENSITY(INCH/HR) =   2.29
  AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.87
  AREA-AVERAGED Ap =  0.27
  EFFECTIVE STREAM AREA(ACRES) =       4.21
  TOTAL STREAM AREA(ACRES) =       5.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.57

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     63.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   878.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.00  DOWNSTREAM(FEET) =   1289.58

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.719
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.021
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        3.81      0.98     0.100    32   10.72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      6.60
  TOTAL AREA(ACRES) =      3.81   PEAK FLOW RATE(CFS) =      6.60

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     63.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.72
  RAINFALL INTENSITY(INCH/HR) =   2.02
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.81
  TOTAL STREAM AREA(ACRES) =       3.81
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        9.57    8.68    2.293  0.87( 0.23) 0.27       4.2      21.00
      1        5.80   19.95    1.392  0.84( 0.37) 0.44       5.5      10.00
      2        6.60   10.72    2.021  0.98( 0.10) 0.10       3.8      60.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       15.67    8.68    2.293  0.89( 0.18) 0.20       7.3      21.00
      2       15.48   10.72    2.021  0.89( 0.18) 0.21       8.3      60.00
      3       10.24   19.95    1.392  0.86( 0.26) 0.30       9.3      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.67    Tc(MIN.) =     8.68
  EFFECTIVE AREA(ACRES) =       7.30   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.89  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        9.3
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     63.00 =    1294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1282.42  DOWNSTREAM(FEET) =  1279.00
  FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.31
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.67
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.73
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1338.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   745.00
  ELEVATION DATA: UPSTREAM(FEET) =   1302.60  DOWNSTREAM(FEET) =   1292.08

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.041
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.102
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        4.04      0.98     0.100    32   10.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.29
  TOTAL AREA(ACRES) =      4.04   PEAK FLOW RATE(CFS) =      7.29

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     51.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1289.20  DOWNSTREAM(FEET) =  1281.34
  FLOW LENGTH(FEET) =   542.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.56
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.29
  PIPE TRAVEL TIME(MIN.) =   1.19    Tc(MIN.) =   11.24
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     51.00 =    1287.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.24
  RAINFALL INTENSITY(INCH/HR) =   1.96
```

```
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.04
  TOTAL STREAM AREA(ACRES) =       4.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.29

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   635.00
  ELEVATION DATA: UPSTREAM(FEET) =   1301.20  DOWNSTREAM(FEET) =   1288.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.800
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.275
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.52      0.98     0.100    32    8.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.94
  TOTAL AREA(ACRES) =      2.52   PEAK FLOW RATE(CFS) =      4.94

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.80
  RAINFALL INTENSITY(INCH/HR) =   2.27
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.52
  TOTAL STREAM AREA(ACRES) =       2.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.94

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        7.29   11.24    1.965  0.97( 0.10) 0.10       4.0      30.00
      2        4.94    8.80    2.275  0.97( 0.10) 0.10       2.5      50.00
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       11.59    8.80    2.275  0.97( 0.10) 0.10       5.7      50.00
      2       11.52   11.24    1.965  0.97( 0.10) 0.10       6.6      30.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.59    Tc(MIN.) =     8.80
  EFFECTIVE AREA(ACRES) =       5.68   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     51.00 =    1287.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1281.34  DOWNSTREAM(FEET) =  1279.00
  FLOW LENGTH(FEET) =    92.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.68
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.59
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    8.94
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       11.59    8.94    2.253  0.97( 0.10) 0.10       5.7      50.00
      2       11.52   11.38    1.950  0.97( 0.10) 0.10       6.6      30.00
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       15.67    8.73    2.286  0.89( 0.18) 0.20       7.3      21.00
      2       15.48   10.76    2.016  0.89( 0.18) 0.21       8.3      60.00
      3       10.24   20.00    1.390  0.86( 0.26) 0.30       9.3      10.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     90.00 =    1338.00 FEET.
```

```
 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       27.16    8.73    2.286  0.91( 0.14) 0.15      12.8      21.00
     2       27.24    8.94    2.253  0.91( 0.14) 0.16      13.1      50.00
     3       27.02   10.76    2.016  0.91( 0.15) 0.16      14.6      60.00
     4       26.66   11.38    1.950  0.91( 0.15) 0.16      14.9      30.00
     5       18.28   20.00    1.390  0.88( 0.19) 0.22      15.9      10.00
   TOTAL AREA(ACRES) =        15.9

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       27.24  Tc(MIN.) =    8.943
 EFFECTIVE AREA(ACRES) =     13.09  AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.91  AREA-AVERAGED Ap =  0.15
 TOTAL AREA(ACRES) =       15.9
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1327.00
 ELEVATION DATA: UPSTREAM(FEET) =   1301.90  DOWNSTREAM(FEET) =   1285.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   29.988
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.090
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 URBAN GOOD COVER
 "TURF"                     A        0.85      0.97     1.000    33   29.99
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      0.09
 TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      0.09

****************************************************************************
 FLOW PROCESS FROM NODE     81.00 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------------
 ** WARNING: Computed Flowrate is less than 0.1 cfs,
              Routing Algorithm is UNAVAILABLE.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        0.09   29.99    1.090  0.97( 0.97) 1.00       0.9      80.00
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     90.00 =    1327.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       27.16    8.73    2.286  0.91( 0.14) 0.15      12.8      21.00
      2       27.24    8.94    2.253  0.91( 0.14) 0.16      13.1      50.00
      3       27.02   10.76    2.016  0.91( 0.15) 0.16      14.6      60.00
      4       26.66   11.38    1.950  0.91( 0.15) 0.16      14.9      30.00
      5       18.28   20.00    1.390  0.88( 0.19) 0.22      15.9      10.00
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       27.25    8.73    2.286  0.92( 0.16) 0.17      13.1      21.00
      2       27.33    8.94    2.253  0.92( 0.16) 0.17      13.3      50.00
      3       27.12   10.76    2.016  0.92( 0.16) 0.18      14.9      60.00
      4       26.75   11.38    1.950  0.92( 0.17) 0.18      15.2      30.00
      5       18.37   20.00    1.390  0.89( 0.22) 0.24      16.4      10.00
      6       13.80   29.99    1.090  0.90( 0.23) 0.26      16.7      80.00
    TOTAL AREA(ACRES) =        16.7

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       27.33  Tc(MIN.) =    8.943
  EFFECTIVE AREA(ACRES) =     13.34  AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.92  AREA-AVERAGED Ap =  0.18
  TOTAL AREA(ACRES) =       16.7
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     90.00 =    1379.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.94
  RAINFALL INTENSITY(INCH/HR) =   2.25
  AREA-AVERAGED Fm(INCH/HR) =  0.16
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.92
  AREA-AVERAGED Ap =  0.17
  EFFECTIVE STREAM AREA(ACRES) =      13.34
  TOTAL STREAM AREA(ACRES) =      16.72
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      27.33

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   652.00
  ELEVATION DATA: UPSTREAM(FEET) =   1300.30  DOWNSTREAM(FEET) =   1286.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   20.388
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.374
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  URBAN GOOD COVER
  "TURF"                     A        0.42      0.97     1.000    33   20.39
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.42   PEAK FLOW RATE(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE     90.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1283.50  DOWNSTREAM(FEET) =  1279.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  6.000
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.88
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.15
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   20.52
  LONGEST FLOWPATH FROM NODE     61.00 TO NODE     90.00 =     697.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
```

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 20.52
RAINFALL INTENSITY(INCH/HR) = 1.37
AREA-AVERAGED Fm(INCH/HR) = 0.97
AREA-AVERAGED Fp(INCH/HR) = 0.97
AREA-AVERAGED Ap = 1.00
EFFECTIVE STREAM AREA(ACRES) = 0.42
TOTAL STREAM AREA(ACRES) = 0.42
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.15

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	27.25	8.73	2.286	0.92(0.16)	0.17	13.1	21.00
1	27.33	8.94	2.253	0.92(0.16)	0.17	13.3	50.00
1	27.12	10.76	2.016	0.92(0.16)	0.18	14.9	60.00
1	26.75	11.38	1.950	0.92(0.17)	0.18	15.2	30.00
1	18.37	20.00	1.390	0.89(0.22)	0.24	16.4	10.00
1	13.80	29.99	1.090	0.90(0.23)	0.26	16.7	80.00
2	0.15	20.52	1.369	0.97(0.97)	1.00	0.4	61.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	27.40	8.73	2.286	0.92(0.17)	0.18	13.3	21.00
2	27.49	8.94	2.253	0.92(0.17)	0.18	13.5	50.00
3	27.27	10.76	2.016	0.92(0.17)	0.19	15.1	60.00
4	26.90	11.38	1.950	0.92(0.18)	0.19	15.4	30.00
5	18.53	20.00	1.390	0.90(0.24)	0.26	16.8	10.00
6	18.29	20.52	1.369	0.90(0.24)	0.26	16.9	61.00
7	13.84	29.99	1.090	0.91(0.25)	0.28	17.1	80.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 27.49 Tc(MIN.) = 8.94
EFFECTIVE AREA(ACRES) = 13.52 AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.92 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 17.1
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 90.00 = 1379.00 FEET.

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END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 17.1 TC(MIN.) = 8.94
EFFECTIVE AREA(ACRES) = 13.52 AREA-AVERAGED Fm(INCH/HR)= 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.92 AREA-AVERAGED Ap = 0.183
PEAK FLOW RATE(CFS) = 27.49

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE

1	27.40	8.73	2.286	0.92(0.17)	0.18	13.3	21.00
2	27.49	8.94	2.253	0.92(0.17)	0.18	13.5	50.00
3	27.27	10.76	2.016	0.92(0.17)	0.19	15.1	60.00
4	26.90	11.38	1.950	0.92(0.18)	0.19	15.4	30.00
5	18.53	20.00	1.390	0.90(0.24)	0.26	16.8	10.00
6	18.29	20.52	1.369	0.90(0.24)	0.26	16.9	61.00
7	13.84	29.99	1.090	0.91(0.25)	0.28	17.1	80.00

END OF RATIONAL METHOD ANALYSIS

APPENDIX F

UNIT HYDROGRAPHS CALCULATIONS

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    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.11
    TOTAL CATCHMENT AREA(ACRES) =   18.50
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.296
    LOW LOSS FRACTION = 0.335
    TIME OF CONCENTRATION(MIN.) = 15.94
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.30
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.77
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.13
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.92
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.68
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.83

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    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     5.64
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.80

********************************************************************************
  TIME     VOLUME       Q    0.       10.0      20.0      30.0      40.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------------
  0.06      0.0000      0.00  Q         .         .         .         .
  0.33      0.0129      1.17  .Q        .         .         .         .
  0.59      0.0387      1.18  .Q        .         .         .         .
  0.86      0.0647      1.19  .Q        .         .         .         .
  1.12      0.0910      1.20  .Q        .         .         .         .
  1.39      0.1176      1.22  .Q        .         .         .         .
  1.65      0.1445      1.23  .Q        .         .         .         .
  1.92      0.1716      1.25  .Q        .         .         .         .
  2.19      0.1991      1.25  .Q        .         .         .         .
  2.45      0.2268      1.27  .Q        .         .         .         .
  2.72      0.2549      1.28  .Q        .         .         .         .
  2.98      0.2832      1.30  .Q        .         .         .         .
  3.25      0.3119      1.31  .Q        .         .         .         .
  3.51      0.3410      1.33  .Q        .         .         .         .
  3.78      0.3704      1.34  .Q        .         .         .         .
  4.05      0.4001      1.37  .Q        .         .         .         .
  4.31      0.4302      1.38  .Q        .         .         .         .
  4.58      0.4608      1.40  .Q        .         .         .         .
  4.84      0.4917      1.41  .Q        .         .         .         .
  5.11      0.5230      1.44  .Q        .         .         .         .
  5.37      0.5548      1.45  .Q        .         .         .         .
  5.64      0.5870      1.48  .Q        .         .         .         .
  5.90      0.6197      1.50  .Q        .         .         .         .
  6.17      0.6529      1.53  .Q        .         .         .         .
```

6.44	0.6866	1.54	.Q	.	.	.	.
6.70	0.7208	1.58	.Q	.	.	.	.
6.97	0.7556	1.59	.Q	.	.	.	.
7.23	0.7909	1.63	.Q	.	.	.	.
7.50	0.8269	1.65	.Q	.	.	.	.
7.76	0.8635	1.69	.Q	.	.	.	.
8.03	0.9007	1.71	.Q	.	.	.	.
8.30	0.9387	1.75	.Q	.	.	.	.
8.56	0.9774	1.77	.Q	.	.	.	.
8.83	1.0169	1.82	.Q	.	.	.	.
9.09	1.0572	1.85	.Q	.	.	.	.
9.36	1.0984	1.90	.Q	.	.	.	.
9.62	1.1405	1.93	.Q	.	.	.	.
9.89	1.1836	1.99	.Q	.	.	.	.
10.16	1.2277	2.03	. Q	.	.	.	.
10.42	1.2730	2.10	. Q	.	.	.	.
10.69	1.3195	2.14	. Q	.	.	.	.
10.95	1.3673	2.22	. Q	.	.	.	.
11.22	1.4165	2.26	. Q	.	.	.	.
11.48	1.4672	2.36	. Q	.	.	.	.
11.75	1.5196	2.41	. Q	.	.	.	.
12.02	1.5738	2.53	. Q	.	.	.	.
12.28	1.6322	2.79	. Q	.	.	.	.
12.55	1.6967	3.08	. Q	.	.	.	.
12.81	1.7652	3.16	. Q	.	.	.	.
13.08	1.8366	3.34	. Q	.	.	.	.
13.34	1.9111	3.45	. Q	.	.	.	.
13.61	1.9894	3.69	. Q	.	.	.	.
13.87	2.0719	3.83	. Q	.	.	.	.
14.14	2.1596	4.16	. Q	.	.	.	.
14.41	2.2533	4.37	. Q	.	.	.	.
14.67	2.3548	4.88	. Q	.	.	.	.
14.94	2.4655	5.20	. Q	.	.	.	.
15.20	2.5897	6.11	. Q	.	.	.	.
15.47	2.7313	6.79	. Q	.	.	.	.
15.73	2.9171	10.14	. Q	.	.	.	.
16.00	3.1702	12.91	. . Q	.	.	.	.
16.27	3.7153	36.75	. .	.	.	Q	.
16.53	4.2116	8.46	. Q .	.	.	.	.
16.80	4.3660	5.61	. Q	.	.	.	.
17.06	4.4780	4.60	. Q	.	.	.	.
17.33	4.5723	3.98	. Q	.	.	.	.
17.59	4.6551	3.56	. Q	.	.	.	.
17.86	4.7298	3.25	. Q	.	.	.	.
18.13	4.7985	3.00	. Q	.	.	.	.
18.39	4.8586	2.47	. Q	.	.	.	.
18.66	4.9110	2.31	. Q	.	.	.	.
18.92	4.9602	2.18	. Q	.	.	.	.
19.19	5.0068	2.06	. Q	.	.	.	.
19.45	5.0509	1.96	.Q	.	.	.	.
19.72	5.0931	1.88	.Q	.	.	.	.

19.98	5.1334	1.80	.Q	.	.	.	.
20.25	5.1721	1.73	.Q	.	.	.	.
20.52	5.2094	1.67	.Q	.	.	.	.
20.78	5.2454	1.61	.Q	.	.	.	.
21.05	5.2801	1.56	.Q	.	.	.	.
21.31	5.3138	1.51	.Q	.	.	.	.
21.58	5.3465	1.47	.Q	.	.	.	.
21.84	5.3783	1.43	.Q	.	.	.	.
22.11	5.4092	1.39	.Q	.	.	.	.
22.38	5.4394	1.35	.Q	.	.	.	.
22.64	5.4688	1.32	.Q	.	.	.	.
22.91	5.4975	1.29	.Q	.	.	.	.
23.17	5.5255	1.26	.Q	.	.	.	.
23.44	5.5530	1.24	.Q	.	.	.	.
23.70	5.5798	1.21	.Q	.	.	.	.
23.97	5.6061	1.19	.Q	.	.	.	.
24.24	5.6320	1.17	.Q	.	.	.	.
24.50	5.6448	0.00	Q	.	.	.	.

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%	1450.5
10%	239.1
20%	63.8
30%	31.9
40%	15.9
50%	15.9
60%	15.9
70%	15.9
80%	15.9
90%	15.9

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==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.83 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         18.50      100.00       67.(AMC II)     0.296       0.665

    TOTAL AREA (Acres) =     18.50

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.296

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.335
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   RATIONAL METHOD CALIBRATION COEFFICIENT = 1.01
   TOTAL CATCHMENT AREA(ACRES) =   18.50
   SOIL-LOSS RATE, Fm,(INCH/HR) =  0.208
   LOW LOSS FRACTION = 0.273
   TIME OF CONCENTRATION(MIN.) =  9.15
   SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
   USER SPECIFIED RAINFALL VALUES ARE USED
   RETURN FREQUENCY(YEARS) = 100
      5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.30
     30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.77
      1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.13
      3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.92
      6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.68
     24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.83

--------------------------------------------------------------------------

   TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     5.60
   TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.85

**************************************************************************
  TIME     VOLUME       Q    0.       12.5      25.0      37.5      50.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.14      0.0073      1.16  Q         .         .         .         .
  0.29      0.0220      1.17  Q         .         .         .         .
  0.45      0.0368      1.17  Q         .         .         .         .
  0.60      0.0517      1.18  Q         .         .         .         .
  0.75      0.0666      1.19  Q         .         .         .         .
  0.90      0.0816      1.20  Q         .         .         .         .
  1.06      0.0967      1.20  Q         .         .         .         .
  1.21      0.1119      1.21  Q         .         .         .         .
  1.36      0.1272      1.22  Q         .         .         .         .
  1.51      0.1426      1.23  Q         .         .         .         .
  1.67      0.1581      1.23  Q         .         .         .         .
  1.82      0.1736      1.24  Q         .         .         .         .
  1.97      0.1893      1.25  Q         .         .         .         .
  2.12      0.2051      1.26  .Q        .         .         .         .
  2.28      0.2209      1.26  .Q        .         .         .         .
  2.43      0.2369      1.27  .Q        .         .         .         .
  2.58      0.2529      1.28  .Q        .         .         .         .
  2.73      0.2691      1.29  .Q        .         .         .         .
  2.89      0.2854      1.29  .Q        .         .         .         .
  3.04      0.3017      1.31  .Q        .         .         .         .
  3.19      0.3182      1.31  .Q        .         .         .         .
  3.34      0.3348      1.32  .Q        .         .         .         .
  3.50      0.3516      1.33  .Q        .         .         .         .
  3.65      0.3684      1.34  .Q        .         .         .         .
```

3.80	0.3853	1.35	.Q	.	.	.	.
3.95	0.4024	1.36	.Q	.	.	.	.
4.11	0.4196	1.37	.Q	.	.	.	.
4.26	0.4369	1.38	.Q	.	.	.	.
4.41	0.4544	1.39	.Q	.	.	.	.
4.56	0.4720	1.40	.Q	.	.	.	.
4.72	0.4897	1.41	.Q	.	.	.	.
4.87	0.5075	1.42	.Q	.	.	.	.
5.02	0.5255	1.43	.Q	.	.	.	.
5.17	0.5437	1.45	.Q	.	.	.	.
5.33	0.5619	1.45	.Q	.	.	.	.
5.48	0.5804	1.47	.Q	.	.	.	.
5.63	0.5990	1.48	.Q	.	.	.	.
5.78	0.6177	1.50	.Q	.	.	.	.
5.94	0.6366	1.50	.Q	.	.	.	.
6.09	0.6556	1.52	.Q	.	.	.	.
6.24	0.6749	1.53	.Q	.	.	.	.
6.39	0.6943	1.55	.Q	.	.	.	.
6.55	0.7139	1.56	.Q	.	.	.	.
6.70	0.7336	1.58	.Q	.	.	.	.
6.85	0.7535	1.59	.Q	.	.	.	.
7.00	0.7737	1.61	.Q	.	.	.	.
7.16	0.7940	1.62	.Q	.	.	.	.
7.31	0.8145	1.64	.Q	.	.	.	.
7.46	0.8352	1.65	.Q	.	.	.	.
7.61	0.8562	1.67	.Q	.	.	.	.
7.77	0.8773	1.68	.Q	.	.	.	.
7.92	0.8987	1.71	.Q	.	.	.	.
8.07	0.9203	1.72	.Q	.	.	.	.
8.22	0.9422	1.75	.Q	.	.	.	.
8.38	0.9643	1.76	.Q	.	.	.	.
8.53	0.9866	1.79	.Q	.	.	.	.
8.68	1.0092	1.80	.Q	.	.	.	.
8.83	1.0321	1.83	.Q	.	.	.	.
8.99	1.0552	1.84	.Q	.	.	.	.
9.14	1.0787	1.87	.Q	.	.	.	.
9.29	1.1024	1.89	.Q	.	.	.	.
9.44	1.1264	1.92	.Q	.	.	.	.
9.60	1.1508	1.94	.Q	.	.	.	.
9.75	1.1754	1.98	.Q	.	.	.	.
9.90	1.2005	1.99	.Q	.	.	.	.
10.05	1.2258	2.03	.Q	.	.	.	.
10.20	1.2516	2.05	.Q	.	.	.	.
10.36	1.2777	2.09	.Q	.	.	.	.
10.51	1.3042	2.12	.Q	.	.	.	.
10.66	1.3312	2.16	.Q	.	.	.	.
10.82	1.3586	2.18	.Q	.	.	.	.
10.97	1.3864	2.23	.Q	.	.	.	.
11.12	1.4147	2.26	.Q	.	.	.	.
11.27	1.4436	2.31	.Q	.	.	.	.
11.43	1.4729	2.34	.Q	.	.	.	.

11.58	1.5028	2.40	.Q . . . .
11.73	1.5333	2.43	.Q . . . .
11.88	1.5644	2.50	. Q . . . .
12.04	1.5961	2.54	. Q . . . .
12.19	1.6307	2.95	. Q . . . .
12.34	1.6682	2.99	. Q . . . .
12.49	1.7064	3.08	. Q . . . .
12.65	1.7455	3.13	. Q . . . .
12.80	1.7856	3.22	. Q . . . .
12.95	1.8265	3.28	. Q . . . .
13.10	1.8686	3.39	. Q . . . .
13.26	1.9117	3.45	. Q . . . .
13.41	1.9560	3.58	. Q . . . .
13.56	2.0016	3.66	. Q . . . .
13.71	2.0487	3.82	. Q . . . .
13.87	2.0974	3.90	. Q . . . .
14.02	2.1478	4.10	. Q . . . .
14.17	2.2001	4.21	. Q . . . .
14.32	2.2547	4.46	. Q . . . .
14.48	2.3118	4.60	. Q . . . .
14.63	2.3717	4.91	. Q . . . .
14.78	2.4348	5.10	. Q . . . .
14.93	2.5019	5.54	. Q . . . .
15.09	2.5734	5.81	. Q . . . .
15.24	2.6508	6.48	. Q . . . .
15.39	2.7352	6.91	. Q . . . .
15.54	2.8359	9.06	. Q . . . .
15.70	2.9556	9.93	. Q . . . .
15.85	3.1037	13.57	. Q . . .
16.00	3.3060	18.53	. . Q . . .
16.15	3.7180	46.86	. . . . Q .
16.31	4.0846	11.31	. Q. . . .
16.46	4.2062	7.97	. Q . . . .
16.61	4.2950	6.12	. Q . . . .
16.76	4.3670	5.31	. Q . . . .
16.92	4.4303	4.75	. Q . . . .
17.07	4.4875	4.33	. Q . . . .
17.22	4.5400	4.00	. Q . . . .
17.37	4.5887	3.73	. Q . . . .
17.52	4.6344	3.52	. Q . . . .
17.68	4.6776	3.33	. Q . . . .
17.83	4.7186	3.17	. Q . . . .
17.98	4.7577	3.04	. Q . . . .
18.14	4.7938	2.69	. Q . . . .
18.29	4.8263	2.47	.Q . . . .
18.44	4.8568	2.37	.Q . . . .
18.59	4.8861	2.29	.Q . . . .
18.74	4.9144	2.21	.Q . . . .
18.90	4.9418	2.14	.Q . . . .
19.05	4.9684	2.07	.Q . . . .
19.20	4.9941	2.01	.Q . . . .

19.36	5.0191	1.96	.Q	.	.	.	.
19.51	5.0435	1.91	.Q	.	.	.	.
19.66	5.0672	1.86	.Q	.	.	.	.
19.81	5.0904	1.81	.Q	.	.	.	.
19.97	5.1130	1.77	.Q	.	.	.	.
20.12	5.1351	1.73	.Q	.	.	.	.
20.27	5.1567	1.70	.Q	.	.	.	.
20.42	5.1778	1.66	.Q	.	.	.	.
20.58	5.1986	1.63	.Q	.	.	.	.
20.73	5.2189	1.60	.Q	.	.	.	.
20.88	5.2388	1.57	.Q	.	.	.	.
21.03	5.2584	1.54	.Q	.	.	.	.
21.18	5.2777	1.51	.Q	.	.	.	.
21.34	5.2966	1.49	.Q	.	.	.	.
21.49	5.3151	1.46	.Q	.	.	.	.
21.64	5.3334	1.44	.Q	.	.	.	.
21.80	5.3514	1.42	.Q	.	.	.	.
21.95	5.3691	1.40	.Q	.	.	.	.
22.10	5.3866	1.37	.Q	.	.	.	.
22.25	5.4038	1.35	.Q	.	.	.	.
22.40	5.4207	1.34	.Q	.	.	.	.
22.56	5.4374	1.32	.Q	.	.	.	.
22.71	5.4539	1.30	.Q	.	.	.	.
22.86	5.4702	1.28	.Q	.	.	.	.
23.02	5.4863	1.27	.Q	.	.	.	.
23.17	5.5021	1.25	.Q	.	.	.	.
23.32	5.5178	1.24	Q	.	.	.	.
23.47	5.5333	1.22	Q	.	.	.	.
23.62	5.5486	1.21	Q	.	.	.	.
23.78	5.5637	1.19	Q	.	.	.	.
23.93	5.5786	1.18	Q	.	.	.	.
24.08	5.5934	1.17	Q	.	.	.	.
24.23	5.6007	0.00	Q	.	.	.	.

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%	1445.7
10%	146.4
20%	45.8
30%	18.3
40%	9.1
50%	9.1
60%	9.1
70%	9.1
80%	9.1

90%	9.1

```
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.83 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         18.50       28.00       32.(AMC II)     0.742       0.727

    TOTAL AREA (Acres) =     18.50

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.208

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.273
==========================================================================
```

APPENDIX G

INFILTRATION/DETENTION CALCULATIONS

Basin Volume Calculations
Project: Carmax Redlands
Basin Description:

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic
1,275.150	29,320.49	N/A	N/A	0.00	N/A	
1,276.150	30,719.24	1.000	30019.87	30019.87	30017.15	
1,277.150	32,130.99	1.000	31425.12	61444.98	31422.47	
1,278.150	33,567.87	1.000	32849.43	94294.41	32846.81	
1,279.150	35,029.88	1.000	34298.88	128593.29	34296.28	
1,280.150	36,517.03	1.000	35773.45	164366.74	35770.88	
1,281.150	38,029.30	1.000	37273.17	201639.91	37270.61	

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Element Details

ID	26	End	75.000 hours
Label	Minimum Drain Time - 1	Pond Node	PO-1
Start	0.000 hours	Outlet Structure	Composite Outlet Structure - 1
Increment	0.500 hours		

Notes

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: User Notifications Scenario: Base

Label: Minimum Drain Time - 1

User Notifications

Message Id	67
Scenario	Base
Element Type	Composite Outlet Structure
Element Id	25
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure Composite Outlet Structure - 1. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	17
Scenario	Base
Element Type	Composite Outlet Structure
Element Id	25
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information
Message Id	40
Scenario	Base
Element Type	Minimum Drain Time
Element Id	26
Label	Minimum Drain Time - 1
Time	(N/A)
Message	Mass balance for routing volumes vary by more than 0.5 %. (0.6 % of Outflow Volume))
Source	Warning

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Elevation

Label: Minimum Drain Time - 1 (OUT)

Time vs. Elevation (ft)

Output Time increment = 0.500 hours

Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	1,279.37	1,278.91	1,278.59	1,278.39	1,278.27
2.500	1,278.20	1,278.16	1,278.13	1,278.10	1,278.07
5.000	1,278.04	1,278.02	1,277.99	1,277.96	1,277.93
7.500	1,277.90	1,277.88	1,277.85	1,277.82	1,277.79
10.000	1,277.76	1,277.74	1,277.71	1,277.68	1,277.65
12.500	1,277.62	1,277.60	1,277.57	1,277.54	1,277.51
15.000	1,277.48	1,277.46	1,277.43	1,277.40	1,277.37
17.500	1,277.34	1,277.32	1,277.29	1,277.26	1,277.23
20.000	1,277.20	1,277.18	1,277.15	1,277.12	1,277.09
22.500	1,277.06	1,277.03	1,277.00	1,276.97	0.00
25.000	0.00	0.00	0.00	0.00	0.00
27.500	0.00	0.00	0.00	0.00	0.00
30.000	0.00	0.00	0.00	0.00	0.00
32.500	0.00	0.00	0.00	0.00	0.00
35.000	0.00	0.00	0.00	0.00	0.00
37.500	0.00	0.00	0.00	0.00	0.00
40.000	0.00	0.00	0.00	0.00	0.00
42.500	0.00	0.00	0.00	0.00	0.00
45.000	0.00	0.00	0.00	0.00	0.00
47.500	0.00	0.00	0.00	0.00	0.00
50.000	0.00	0.00	0.00	0.00	0.00
52.500	0.00	0.00	0.00	0.00	0.00
55.000	0.00	0.00	0.00	0.00	0.00
57.500	0.00	0.00	0.00	0.00	0.00
60.000	0.00	0.00	0.00	0.00	0.00
62.500	0.00	0.00	0.00	0.00	0.00
65.000	0.00	0.00	0.00	0.00	0.00
67.500	0.00	0.00	0.00	0.00	0.00
70.000	0.00	0.00	0.00	0.00	0.00
72.500	0.00	0.00	0.00	0.00	0.00
75.000	0.00	(N/A)	(N/A)	(N/A)	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Time vs. Volume

Label: Minimum Drain Time - 1 (OUT)

Time vs. Volume (ft³)

Output Time increment = 0.500 hours

Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	136,449.00	120,494.00	109,436.00	102,412.00	98,308.00
2.500	95,909.00	94,507.00	93,532.00	92,614.00	91,696.00
5.000	90,778.00	89,860.00	88,942.00	88,024.00	87,106.00
7.500	86,188.00	85,270.00	84,352.00	83,434.00	82,516.00
10.000	81,598.00	80,680.00	79,762.00	78,844.00	77,926.00
12.500	77,008.00	76,090.00	75,172.00	74,254.00	73,336.00
15.000	72,418.00	71,500.00	70,582.00	69,664.00	68,746.00
17.500	67,828.00	66,910.00	65,992.00	65,074.00	64,156.00
20.000	63,238.00	62,320.00	61,402.00	60,484.00	59,566.00
22.500	58,648.00	57,730.00	56,812.00	55,894.00	0.00
25.000	0.00	0.00	0.00	0.00	0.00
27.500	0.00	0.00	0.00	0.00	0.00
30.000	0.00	0.00	0.00	0.00	0.00
32.500	0.00	0.00	0.00	0.00	0.00
35.000	0.00	0.00	0.00	0.00	0.00
37.500	0.00	0.00	0.00	0.00	0.00
40.000	0.00	0.00	0.00	0.00	0.00
42.500	0.00	0.00	0.00	0.00	0.00
45.000	0.00	0.00	0.00	0.00	0.00
47.500	0.00	0.00	0.00	0.00	0.00
50.000	0.00	0.00	0.00	0.00	0.00
52.500	0.00	0.00	0.00	0.00	0.00
55.000	0.00	0.00	0.00	0.00	0.00
57.500	0.00	0.00	0.00	0.00	0.00
60.000	0.00	0.00	0.00	0.00	0.00
62.500	0.00	0.00	0.00	0.00	0.00
65.000	0.00	0.00	0.00	0.00	0.00
67.500	0.00	0.00	0.00	0.00	0.00
70.000	0.00	0.00	0.00	0.00	0.00
72.500	0.00	0.00	0.00	0.00	0.00
75.000	0.00	(N/A)	(N/A)	(N/A)	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation vs. Volume Curve

Label: PO-1

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft^3)
1,275.15	0.00
1,276.15	30,017.15
1,277.15	61,439.62
1,278.15	94,286.43
1,279.15	128,582.71
1,280.15	164,353.59
1,281.15	201,624.20

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	1,275.15 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	1,281.15 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	TW	1,278.15	1,281.15
Tailwater Settings	Tailwater			(N/A)	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Outlet Input Data

Label: Composite Outlet Structure - 1

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	1,278.15 ft
Diameter	18.0 in
Orifice Area	1.8 ft²
Orifice Coefficient	0.600
Weir Length	4.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	True

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
1,275.15	0.00	(N/A)	0.00
1,275.65	0.00	(N/A)	0.00
1,276.15	0.00	(N/A)	0.00
1,276.65	0.00	(N/A)	0.00
1,277.15	0.00	(N/A)	0.00
1,277.65	0.00	(N/A)	0.00
1,278.15	0.00	(N/A)	0.00
1,278.65	5.00	(N/A)	0.00
1,279.15	8.51	(N/A)	0.00
1,279.65	10.42	(N/A)	0.00
1,280.15	12.03	(N/A)	0.00
1,280.65	13.45	(N/A)	0.00
1,281.15	14.73	(N/A)	0.00

Computation Messages
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
Weir: H =0ft
Weir: H =0.5ft
Orifice: H =1.00; Riser orifice equation controlling.
Orifice: H =1.50; Riser orifice equation controlling.
Orifice: H =2.00; Riser orifice equation controlling.

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
Orifice: H =2.50; Riser orifice equation controlling.
Orifice: H =3.00; Riser orifice equation controlling.

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Composite Rating Curve

Label: Composite Outlet Structure - 1

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
1,275.15	0.00	(N/A)	0.00
1,275.65	0.00	(N/A)	0.00
1,276.15	0.00	(N/A)	0.00
1,276.65	0.00	(N/A)	0.00
1,277.15	0.00	(N/A)	0.00
1,277.65	0.00	(N/A)	0.00
1,278.15	0.00	(N/A)	0.00
1,278.65	5.00	(N/A)	0.00
1,279.15	8.51	(N/A)	0.00
1,279.65	10.42	(N/A)	0.00
1,280.15	12.03	(N/A)	0.00
1,280.65	13.45	(N/A)	0.00
1,281.15	14.73	(N/A)	0.00

Contributing Structures
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
Riser - 1
Riser - 1
Riser - 1
Riser - 1
Riser - 1
Riser - 1
Riser - 1

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Elevation-Volume-Flow Table (Pond)

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.51 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	1,279.37 ft
Volume (Initial)	136,448.73 ft³
Flow (Initial Outlet)	9.35 ft³/s
Flow (Initial Infiltration)	0.51 ft³/s
Flow (Initial, Total)	9.86 ft³/s
Time Increment	0.500 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
1,275.15	0.00	0.00	0.000	0.00	0.00	0.00
1,275.65	0.00	15,008.58	0.000	0.51	0.51	17.19
1,276.15	0.00	30,017.15	0.000	0.51	0.51	33.86
1,276.65	0.00	45,728.39	0.000	0.51	0.51	51.32
1,277.15	0.00	61,439.62	0.000	0.51	0.51	68.78
1,277.65	0.00	77,863.03	0.000	0.51	0.51	87.02
1,278.15	0.00	94,286.43	0.000	0.51	0.51	105.27
1,278.65	5.00	111,434.57	0.000	0.51	5.51	129.32
1,279.15	8.51	128,582.71	0.000	0.51	9.02	151.89
1,279.65	10.42	146,468.15	0.000	0.51	10.93	173.67
1,280.15	12.03	164,353.59	0.000	0.51	12.54	195.15
1,280.65	13.45	182,988.90	0.000	0.51	13.96	217.28
1,281.15	14.73	201,624.20	0.000	0.51	15.24	239.27

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Level Pool Pond Routing Summary

Label: Minimum Drain Time - 1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.51 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	1,279.37 ft
Volume (Initial)	136,448.73 ft³
Flow (Initial Outlet)	9.35 ft³/s
Flow (Initial Infiltration)	0.51 ft³/s
Flow (Initial, Total)	9.86 ft³/s
Time Increment	0.500 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.00 ft³/s	Time to Peak (Flow, In)	0.000 hours
Infiltration (Peak)	0.51 ft³/s	Time to Peak (Infiltration)	0.000 hours
Flow (Peak Outlet)	9.35 ft³/s	Time to Peak (Flow, Outlet)	0.000 hours

Elevation (Water Surface, Peak)	1,278.91 ft
Volume (Peak)	120,494.31 ft³

Mass Balance (ft³)	
Volume (Initial)	136,448.73 ft³
Volume (Total Inflow)	0.00 ft³
Volume (Total Infiltration)	44,982.00 ft³
Volume (Total Outlet Outflow)	36,032.22 ft³
Volume (Retained)	54,975.50 ft³
Volume (Unrouted)	-459.00 ft³
Error (Mass Balance)	0.6 %

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Pond Routed Hydrograph (total out)

Label: Minimum Drain Time - 1

Peak Discharge	9.35 ft³/s
Time to Peak	0.000 hours
Hydrograph Volume	36,032.22 ft³

HYDROGRAPH ORDINATES (ft³/s)

Output Time Increment = 0.500 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	9.35	6.85	4.42	2.37	1.17
2.500	0.47	0.06	0.00	(N/A)	(N/A)

Minimum Drain Time Detailed Report: Minimum Drain Time - 1

Subsection: Pond Infiltration Hydrograph

Label: Minimum Drain Time - 1

Peak Discharge	0.00 ft³/s
Time to Peak	24.500 hours
Hydrograph Volume	0.00 ft³

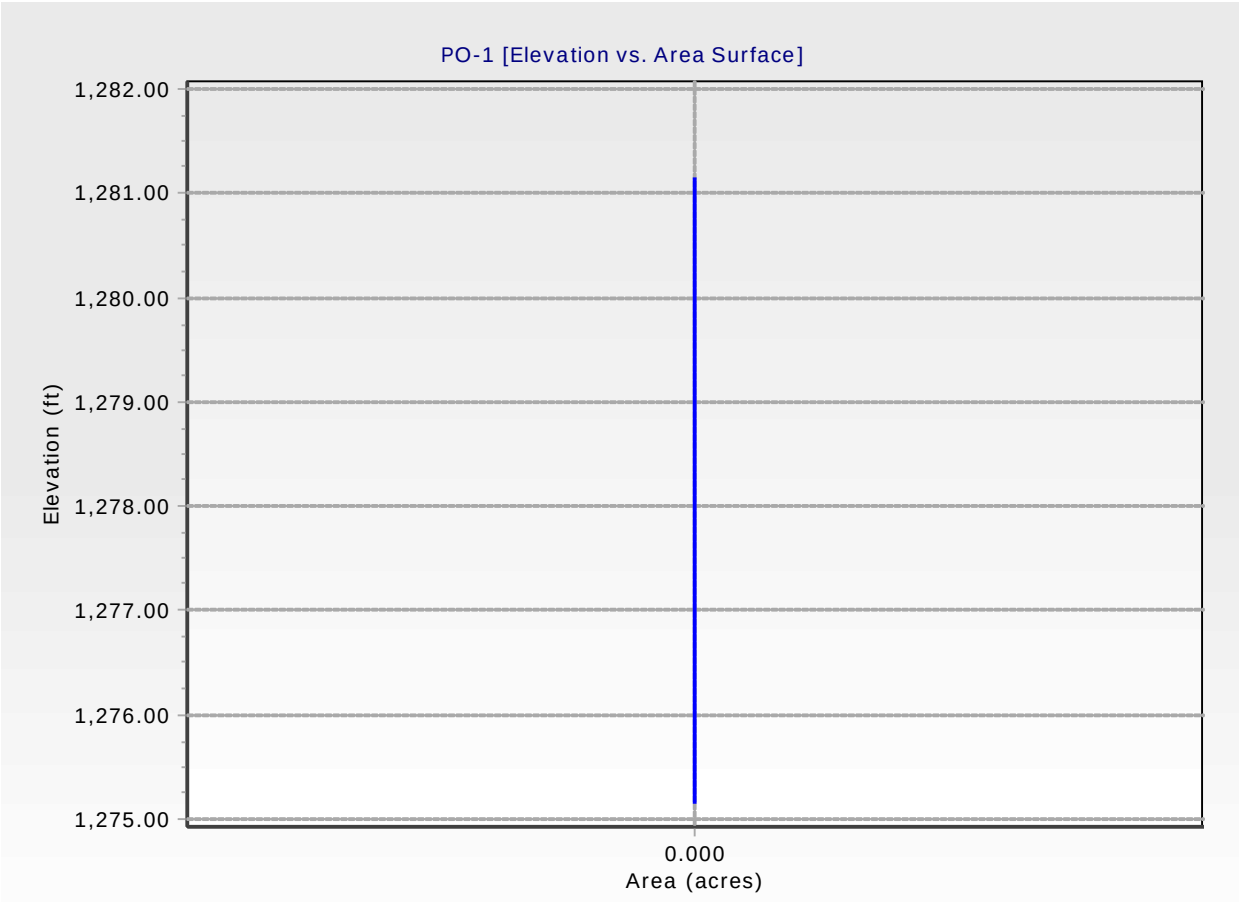
HYDROGRAPH ORDINATES (ft³/s)

Output Time Increment = 0.500 hours

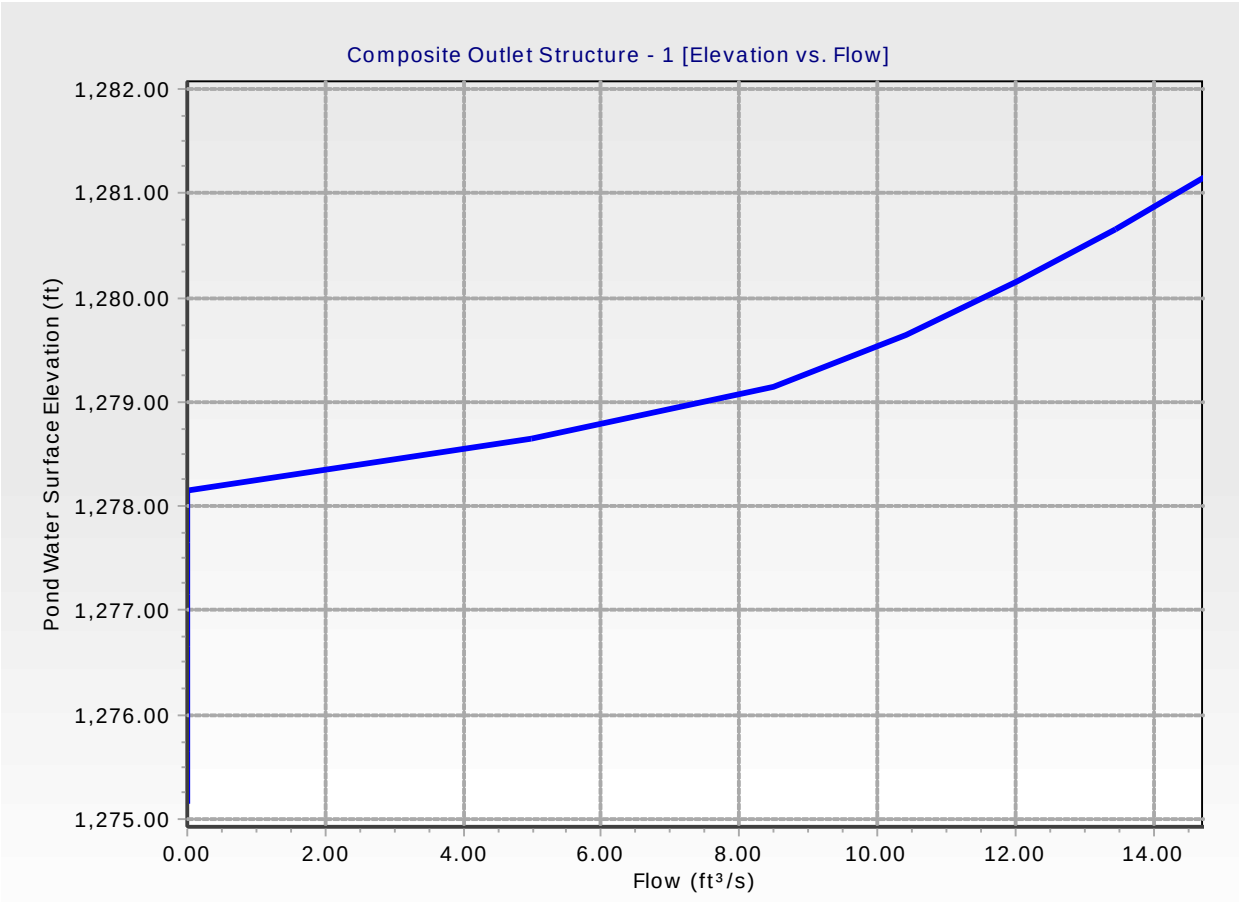
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.00	0.00	(N/A)	(N/A)	(N/A)

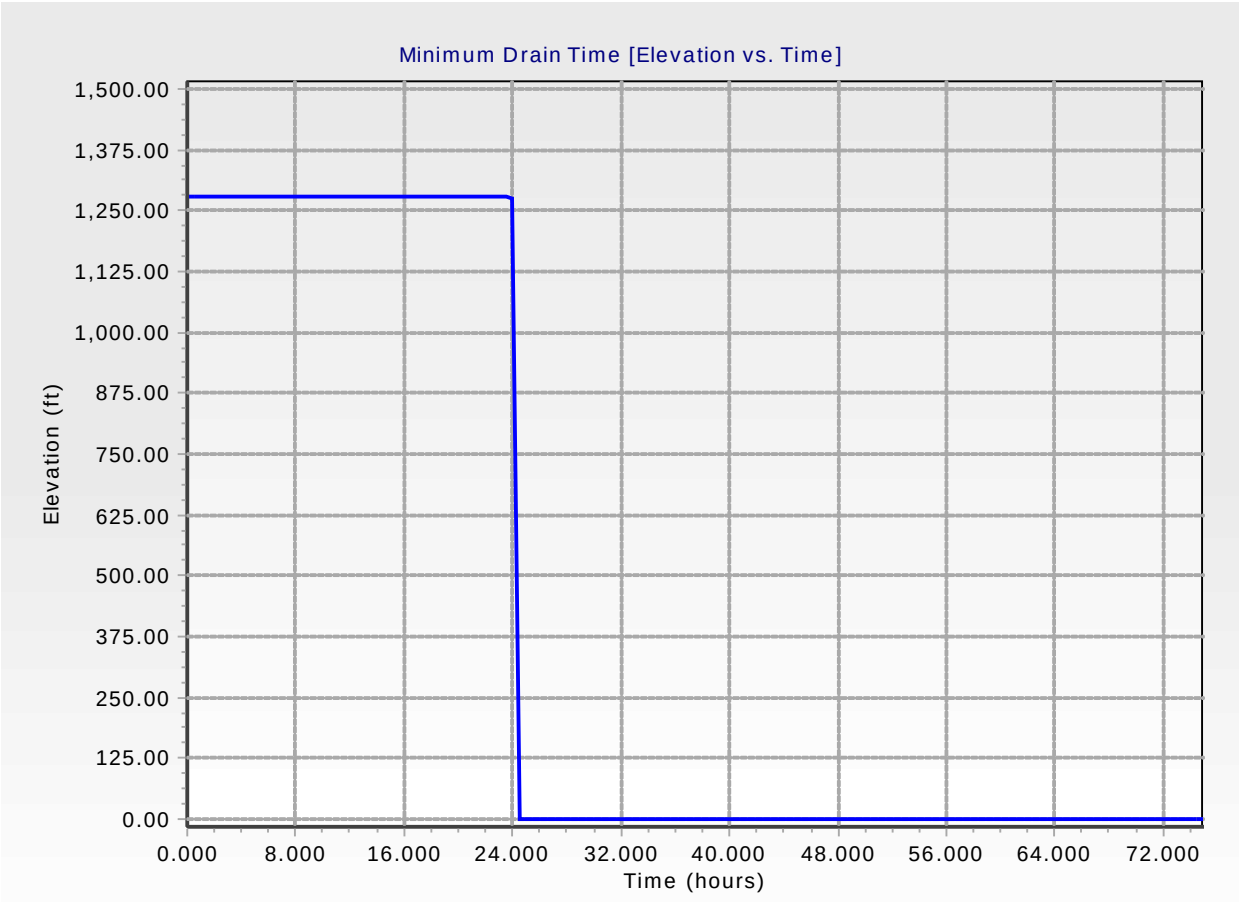
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



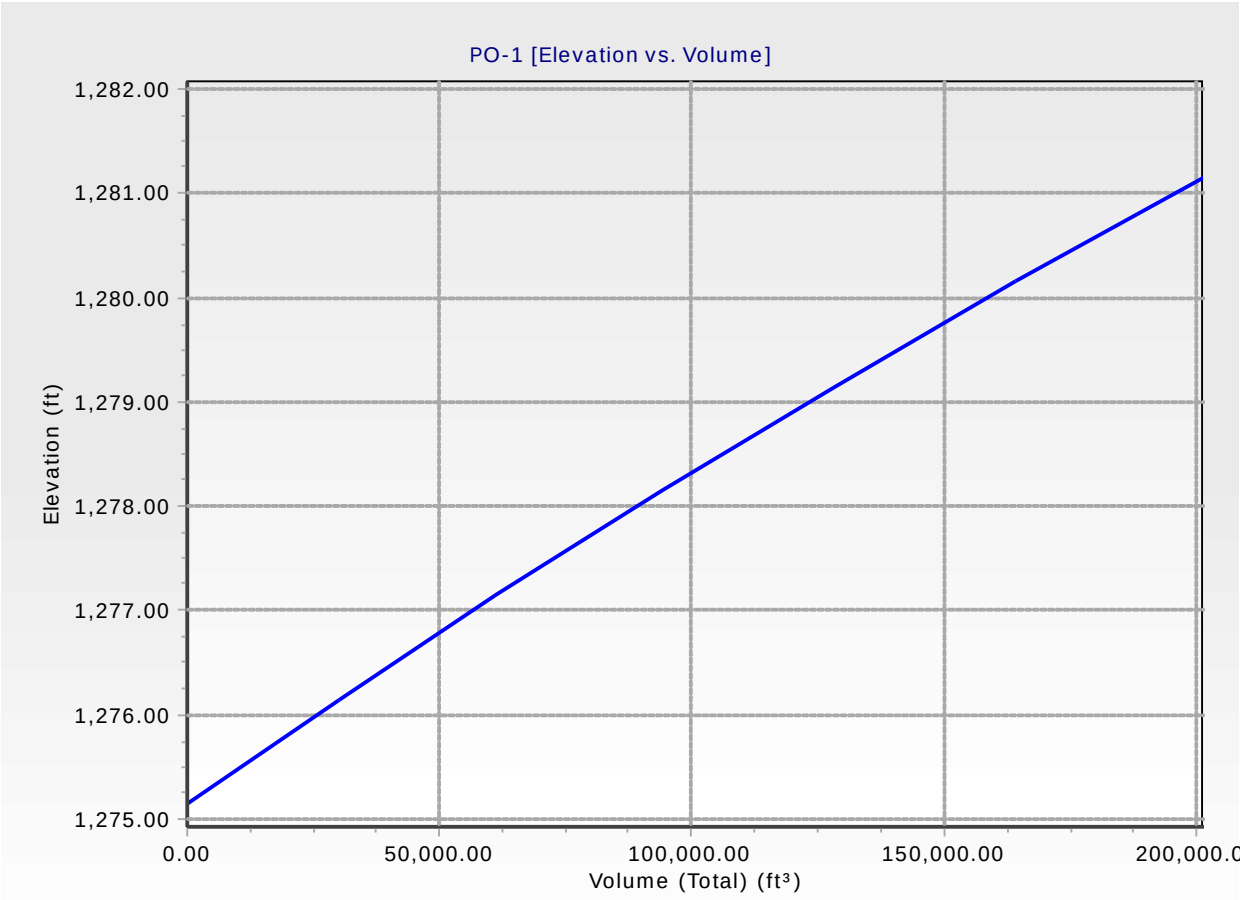
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



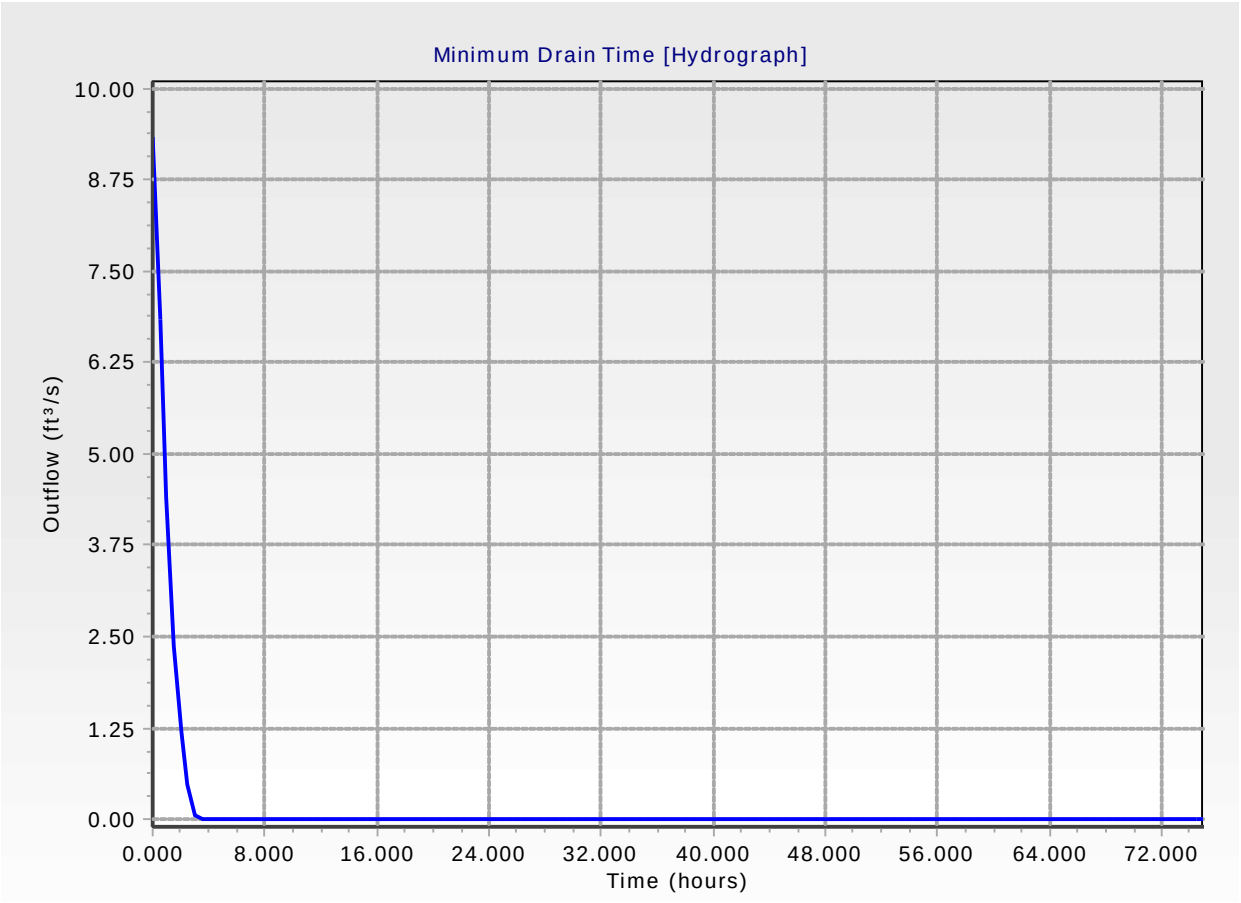
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



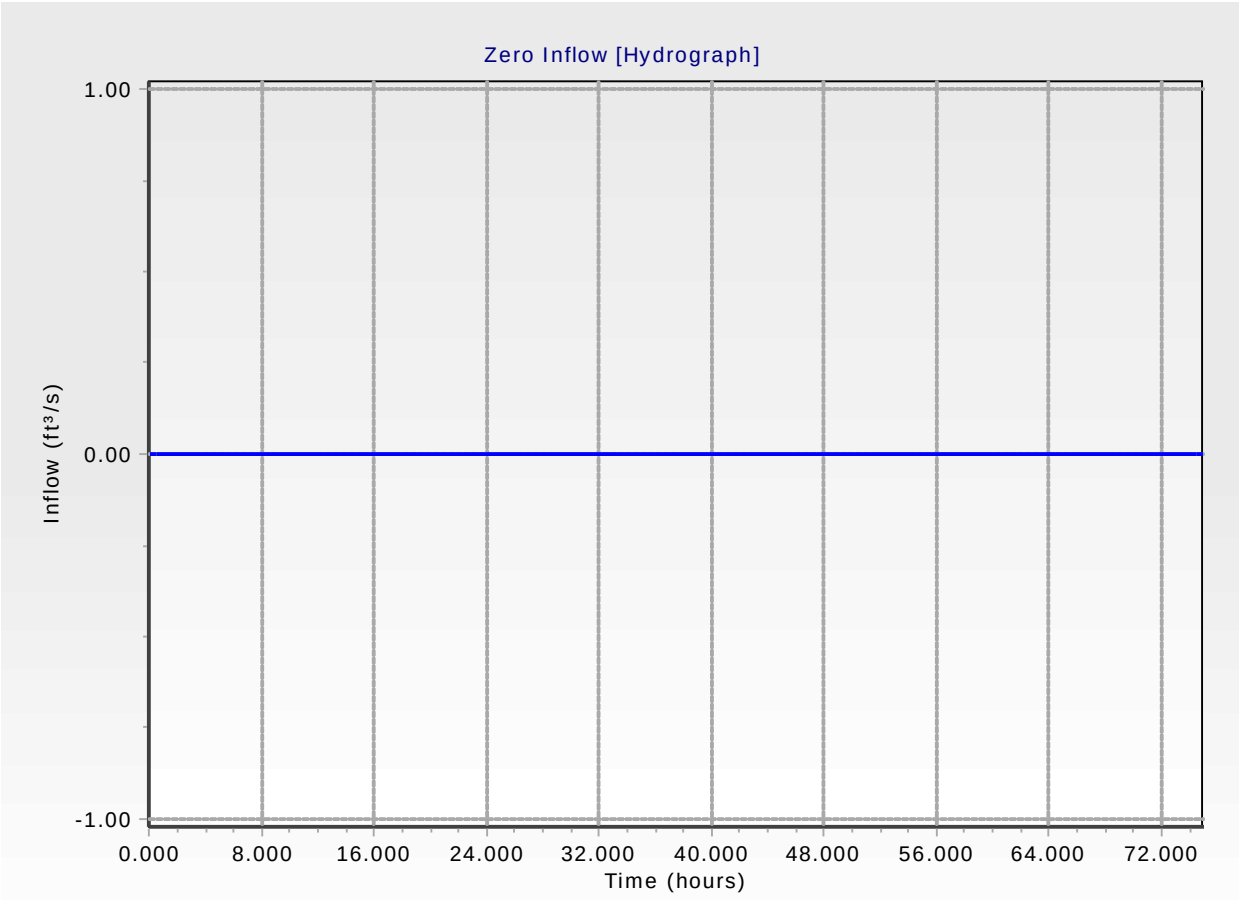
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



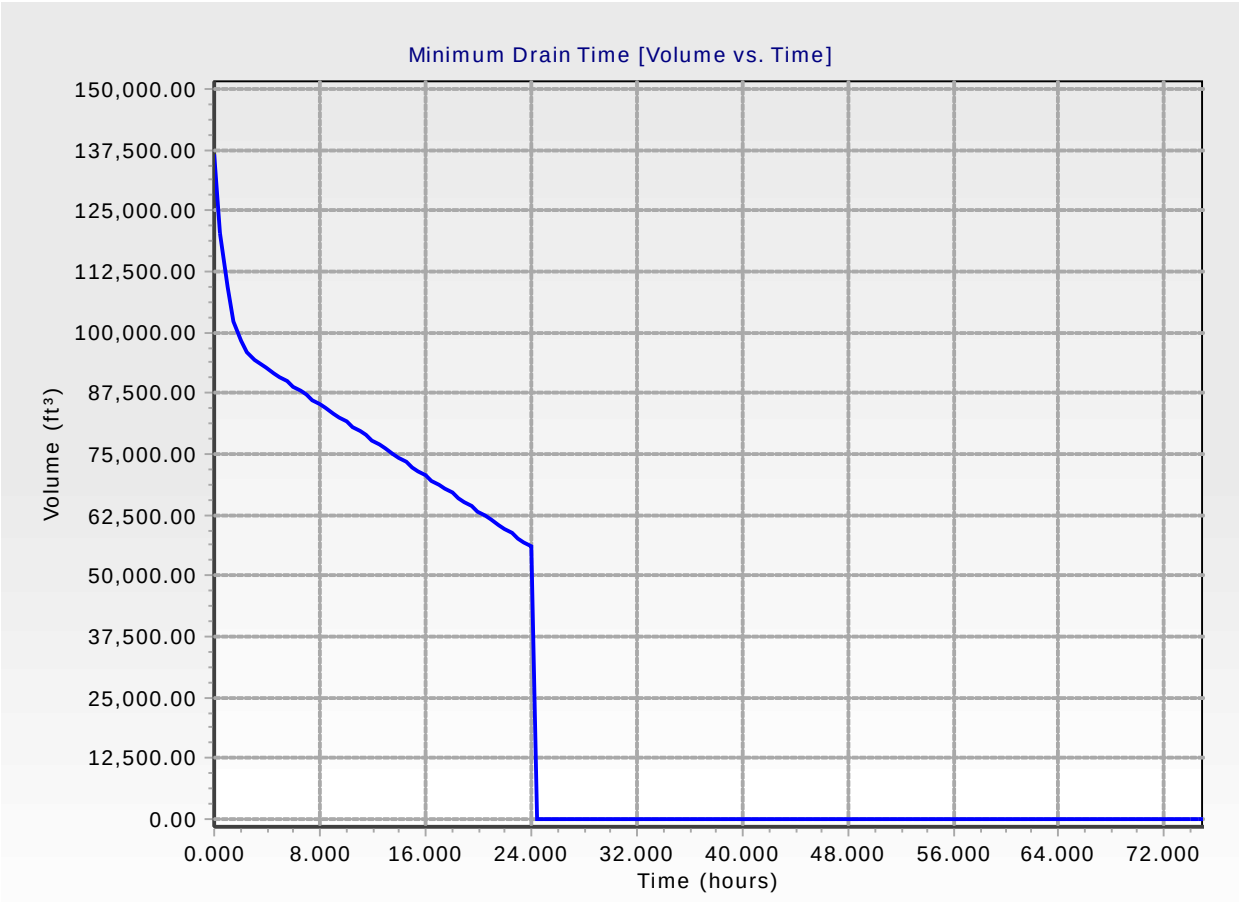
Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Minimum Drain Time Detailed Report: Minimum Drain Time - 1



Project Summary	
Title	Carmax Redlands
Engineer	KHA
Company	
Date	2/1/2023

Notes	100-yr Basin Routing

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Subsection: User Notifications

User Notifications

Message Id	67
Scenario	Base
Element Type	Composite Outlet Structure
Element Id	25
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure Composite Outlet Structure - 1. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	17
Scenario	Base
Element Type	Composite Outlet Structure
Element Id	25
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
CM-1	Base	0	239,663.00	15.890	46.86

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
O-3	Base	0	103,591.00	16.100	9.36

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
PO-1 (IN)	Base	0	239,725.00	15.900	44.49	(N/A)	(N/A)
PO-1 (OUT)	Base	0	103,591.00	16.100	9.36	1,279.37	136,577.00

Subsection: Read Hydrograph
Scenario: Base
Label: CM-1

Peak Discharge	46.86 ft³/s
Time to Peak	15.890 hours
Hydrograph Volume	239,662.80 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.150 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.140	1.16	1.17	1.17	1.18	1.19
0.890	1.20	1.20	1.21	1.22	1.23
1.640	1.23	1.24	1.25	1.26	1.26
2.390	1.27	1.28	1.29	1.29	1.31
3.140	1.31	1.32	1.33	1.34	1.35
3.890	1.36	1.37	1.38	1.39	1.40
4.640	1.41	1.42	1.43	1.45	1.45
5.390	1.47	1.48	1.50	1.50	1.52
6.140	1.53	1.55	1.56	1.58	1.59
6.890	1.61	1.62	1.64	1.65	1.67
7.640	1.68	1.71	1.72	1.75	1.76
8.390	1.79	1.80	1.83	1.84	1.87
9.140	1.89	1.92	1.94	1.98	1.99
9.890	2.03	2.05	2.09	2.12	2.16
10.640	2.18	2.23	2.26	2.31	2.34
11.390	2.40	2.43	2.50	2.54	2.95
12.140	2.99	3.08	3.13	3.22	3.28
12.890	3.39	3.45	3.58	3.66	3.82
13.640	3.90	4.10	4.21	4.46	4.60
14.390	4.91	5.10	5.54	5.81	6.48
15.140	6.91	9.06	9.93	13.57	18.53
15.890	46.86	11.31	7.97	6.12	5.31
16.640	4.75	4.33	4.00	3.73	3.52
17.390	3.33	3.17	3.04	2.69	2.47
18.140	2.37	2.29	2.21	2.14	2.07
18.890	2.01	1.96	1.91	1.86	1.81
19.640	1.77	1.73	1.70	1.66	1.63
20.390	1.60	1.57	1.54	1.51	1.49
21.140	1.46	1.44	1.42	1.40	1.37
21.890	1.35	1.34	1.32	1.30	1.28
22.640	1.27	1.25	1.24	1.22	1.21
23.390	1.19	1.18	1.17	0.00	(N/A)

Summary for Hydrograph Addition at 'O-3'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	103,590.75	16.100	9.36
Flow (In)	O-3	103,590.75	16.100	9.36

Subsection: Time vs. Elevation
Scenario: Base
Label: PO-1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	1,275.15	1,275.15	1,275.15	1,275.15	1,275.16
0.250	1,275.17	1,275.17	1,275.18	1,275.19	1,275.19
0.500	1,275.20	1,275.21	1,275.21	1,275.22	1,275.23
0.750	1,275.23	1,275.24	1,275.25	1,275.25	1,275.26
1.000	1,275.27	1,275.27	1,275.28	1,275.29	1,275.29
1.250	1,275.30	1,275.31	1,275.31	1,275.32	1,275.32
1.500	1,275.33	1,275.34	1,275.34	1,275.35	1,275.36
1.750	1,275.36	1,275.37	1,275.37	1,275.38	1,275.39
2.000	1,275.39	1,275.40	1,275.40	1,275.41	1,275.42
2.250	1,275.42	1,275.43	1,275.43	1,275.44	1,275.45
2.500	1,275.45	1,275.46	1,275.46	1,275.47	1,275.47
2.750	1,275.48	1,275.49	1,275.49	1,275.50	1,275.50
3.000	1,275.51	1,275.51	1,275.52	1,275.53	1,275.53
3.250	1,275.54	1,275.54	1,275.55	1,275.55	1,275.56
3.500	1,275.56	1,275.57	1,275.58	1,275.58	1,275.59
3.750	1,275.59	1,275.60	1,275.60	1,275.61	1,275.61
4.000	1,275.62	1,275.62	1,275.63	1,275.63	1,275.64
4.250	1,275.64	1,275.65	1,275.66	1,275.66	1,275.67
4.500	1,275.67	1,275.68	1,275.68	1,275.69	1,275.69
4.750	1,275.70	1,275.70	1,275.71	1,275.71	1,275.72
5.000	1,275.73	1,275.73	1,275.74	1,275.74	1,275.75
5.250	1,275.75	1,275.76	1,275.77	1,275.77	1,275.78
5.500	1,275.78	1,275.79	1,275.79	1,275.80	1,275.81
5.750	1,275.81	1,275.82	1,275.82	1,275.83	1,275.84
6.000	1,275.84	1,275.85	1,275.85	1,275.86	1,275.87
6.250	1,275.87	1,275.88	1,275.88	1,275.89	1,275.90
6.500	1,275.90	1,275.91	1,275.92	1,275.92	1,275.93
6.750	1,275.94	1,275.94	1,275.95	1,275.96	1,275.96
7.000	1,275.97	1,275.98	1,275.98	1,275.99	1,276.00
7.250	1,276.00	1,276.01	1,276.02	1,276.02	1,276.03
7.500	1,276.04	1,276.04	1,276.05	1,276.06	1,276.06
7.750	1,276.07	1,276.08	1,276.09	1,276.09	1,276.10
8.000	1,276.11	1,276.12	1,276.12	1,276.13	1,276.14
8.250	1,276.15	1,276.15	1,276.16	1,276.17	1,276.17
8.500	1,276.18	1,276.19	1,276.20	1,276.20	1,276.21
8.750	1,276.22	1,276.23	1,276.23	1,276.24	1,276.25
9.000	1,276.26	1,276.27	1,276.27	1,276.28	1,276.29
9.250	1,276.30	1,276.31	1,276.31	1,276.32	1,276.33
9.500	1,276.34	1,276.35	1,276.35	1,276.36	1,276.37
9.750	1,276.38	1,276.39	1,276.40	1,276.41	1,276.41
10.000	1,276.42	1,276.43	1,276.44	1,276.45	1,276.46
10.250	1,276.47	1,276.48	1,276.49	1,276.50	1,276.51
10.500	1,276.51	1,276.52	1,276.53	1,276.54	1,276.55

Subsection: Time vs. Elevation
Scenario: Base
Label: PO-1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.750	1,276.56	1,276.57	1,276.58	1,276.59	1,276.60
11.000	1,276.61	1,276.62	1,276.63	1,276.64	1,276.65
11.250	1,276.66	1,276.67	1,276.69	1,276.70	1,276.71
11.500	1,276.72	1,276.73	1,276.74	1,276.75	1,276.76
11.750	1,276.77	1,276.79	1,276.80	1,276.81	1,276.82
12.000	1,276.84	1,276.85	1,276.86	1,276.88	1,276.89
12.250	1,276.91	1,276.92	1,276.94	1,276.95	1,276.97
12.500	1,276.98	1,277.00	1,277.01	1,277.03	1,277.04
12.750	1,277.06	1,277.08	1,277.09	1,277.11	1,277.12
13.000	1,277.14	1,277.16	1,277.17	1,277.19	1,277.21
13.250	1,277.22	1,277.24	1,277.26	1,277.28	1,277.29
13.500	1,277.31	1,277.33	1,277.35	1,277.37	1,277.39
13.750	1,277.41	1,277.42	1,277.44	1,277.46	1,277.48
14.000	1,277.51	1,277.53	1,277.55	1,277.57	1,277.59
14.250	1,277.61	1,277.64	1,277.66	1,277.68	1,277.71
14.500	1,277.73	1,277.76	1,277.78	1,277.81	1,277.84
14.750	1,277.87	1,277.89	1,277.92	1,277.95	1,277.98
15.000	1,278.02	1,278.05	1,278.08	1,278.12	1,278.16
15.250	1,278.19	1,278.23	1,278.28	1,278.32	1,278.35
15.500	1,278.40	1,278.44	1,278.49	1,278.55	1,278.61
15.750	1,278.68	1,278.78	1,278.92	1,279.10	1,279.25
16.000	1,279.34	1,279.37	1,279.37	1,279.37	1,279.36
16.250	1,279.35	1,279.34	1,279.32	1,279.30	1,279.28
16.500	1,279.26	1,279.24	1,279.22	1,279.20	1,279.17
16.750	1,279.15	1,279.13	1,279.10	1,279.08	1,279.06
17.000	1,279.03	1,279.01	1,278.99	1,278.97	1,278.95
17.250	1,278.93	1,278.91	1,278.89	1,278.87	1,278.85
17.500	1,278.83	1,278.81	1,278.79	1,278.77	1,278.76
17.750	1,278.74	1,278.72	1,278.71	1,278.69	1,278.67
18.000	1,278.66	1,278.64	1,278.62	1,278.61	1,278.60
18.250	1,278.58	1,278.57	1,278.56	1,278.55	1,278.53
18.500	1,278.52	1,278.51	1,278.50	1,278.49	1,278.48
18.750	1,278.47	1,278.47	1,278.46	1,278.45	1,278.44
19.000	1,278.43	1,278.43	1,278.42	1,278.41	1,278.41
19.250	1,278.40	1,278.40	1,278.39	1,278.38	1,278.38
19.500	1,278.37	1,278.37	1,278.36	1,278.36	1,278.36
19.750	1,278.35	1,278.35	1,278.34	1,278.34	1,278.34
20.000	1,278.33	1,278.33	1,278.33	1,278.32	1,278.32
20.250	1,278.32	1,278.31	1,278.31	1,278.31	1,278.31
20.500	1,278.30	1,278.30	1,278.30	1,278.30	1,278.29
20.750	1,278.29	1,278.29	1,278.29	1,278.29	1,278.28
21.000	1,278.28	1,278.28	1,278.28	1,278.28	1,278.28
21.250	1,278.27	1,278.27	1,278.27	1,278.27	1,278.27

Subsection: Time vs. Elevation
Scenario: Base
Label: PO-1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
21.500	1,278.27	1,278.27	1,278.26	1,278.26	1,278.26
21.750	1,278.26	1,278.26	1,278.26	1,278.26	1,278.26
22.000	1,278.25	1,278.25	1,278.25	1,278.25	1,278.25
22.250	1,278.25	1,278.25	1,278.25	1,278.25	1,278.25
22.500	1,278.24	1,278.24	1,278.24	1,278.24	1,278.24
22.750	1,278.24	1,278.24	1,278.24	1,278.24	1,278.24
23.000	1,278.24	1,278.24	1,278.23	1,278.23	1,278.23
23.250	1,278.23	1,278.23	1,278.23	1,278.23	1,278.23
23.500	1,278.23	1,278.23	1,278.23	1,278.23	1,278.23
23.750	1,278.22	1,278.22	1,278.22	1,278.21	1,278.20
24.000	1,278.20	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time vs. Volume
Scenario: Base
Label: PO-1

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.00	0.00	0.00	104.00	312.00
0.250	519.00	726.00	931.00	1,136.00	1,339.00
0.500	1,541.00	1,743.00	1,944.00	2,144.00	2,344.00
0.750	2,543.00	2,741.00	2,939.00	3,136.00	3,332.00
1.000	3,527.00	3,721.00	3,914.00	4,107.00	4,299.00
1.250	4,490.00	4,681.00	4,871.00	5,061.00	5,250.00
1.500	5,438.00	5,626.00	5,812.00	5,998.00	6,182.00
1.750	6,366.00	6,550.00	6,733.00	6,915.00	7,097.00
2.000	7,279.00	7,460.00	7,640.00	7,819.00	7,998.00
2.250	8,175.00	8,352.00	8,528.00	8,704.00	8,879.00
2.500	9,054.00	9,228.00	9,402.00	9,575.00	9,748.00
2.750	9,920.00	10,091.00	10,261.00	10,431.00	10,601.00
3.000	10,771.00	10,940.00	11,109.00	11,276.00	11,443.00
3.250	11,609.00	11,775.00	11,941.00	12,106.00	12,270.00
3.500	12,435.00	12,599.00	12,762.00	12,925.00	13,088.00
3.750	13,250.00	13,412.00	13,573.00	13,735.00	13,895.00
4.000	14,056.00	14,216.00	14,375.00	14,534.00	14,693.00
4.250	14,852.00	15,010.00	15,168.00	15,327.00	15,486.00
4.500	15,646.00	15,807.00	15,968.00	16,130.00	16,292.00
4.750	16,455.00	16,619.00	16,783.00	16,948.00	17,113.00
5.000	17,280.00	17,448.00	17,616.00	17,785.00	17,955.00
5.250	18,124.00	18,294.00	18,465.00	18,638.00	18,811.00
5.500	18,985.00	19,159.00	19,335.00	19,511.00	19,689.00
5.750	19,867.00	20,045.00	20,224.00	20,403.00	20,583.00
6.000	20,764.00	20,947.00	21,129.00	21,313.00	21,497.00
6.250	21,683.00	21,870.00	22,057.00	22,246.00	22,434.00
6.500	22,624.00	22,815.00	23,007.00	23,201.00	23,394.00
6.750	23,588.00	23,784.00	23,980.00	24,178.00	24,376.00
7.000	24,575.00	24,775.00	24,975.00	25,177.00	25,380.00
7.250	25,584.00	25,788.00	25,994.00	26,200.00	26,407.00
7.500	26,615.00	26,824.00	27,034.00	27,245.00	27,457.00
7.750	27,670.00	27,886.00	28,102.00	28,319.00	28,537.00
8.000	28,756.00	28,977.00	29,199.00	29,423.00	29,647.00
8.250	29,872.00	30,098.00	30,326.00	30,556.00	30,787.00
8.500	31,018.00	31,251.00	31,484.00	31,719.00	31,956.00
8.750	32,194.00	32,433.00	32,672.00	32,913.00	33,155.00
9.000	33,399.00	33,645.00	33,892.00	34,140.00	34,390.00
9.250	34,641.00	34,894.00	35,149.00	35,405.00	35,662.00
9.500	35,921.00	36,183.00	36,446.00	36,711.00	36,977.00
9.750	37,243.00	37,511.00	37,782.00	38,055.00	38,329.00
10.000	38,605.00	38,882.00	39,161.00	39,442.00	39,725.00
10.250	40,011.00	40,299.00	40,588.00	40,879.00	41,173.00
10.500	41,469.00	41,767.00	42,066.00	42,367.00	42,669.00

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.750	42,975.00	43,284.00	43,595.00	43,907.00	44,222.00
11.000	44,539.00	44,859.00	45,182.00	45,507.00	45,834.00
11.250	46,163.00	46,495.00	46,831.00	47,170.00	47,511.00
11.500	47,854.00	48,200.00	48,548.00	48,901.00	49,258.00
11.750	49,618.00	49,980.00	50,347.00	50,729.00	51,137.00
12.000	51,566.00	52,007.00	52,450.00	52,896.00	53,347.00
12.250	53,802.00	54,263.00	54,728.00	55,195.00	55,666.00
12.500	56,142.00	56,622.00	57,108.00	57,599.00	58,093.00
12.750	58,590.00	59,094.00	59,604.00	60,120.00	60,641.00
13.000	61,165.00	61,694.00	62,228.00	62,771.00	63,321.00
13.250	63,877.00	64,437.00	65,003.00	65,577.00	66,161.00
13.500	66,753.00	67,352.00	67,956.00	68,566.00	69,184.00
13.750	69,815.00	70,457.00	71,108.00	71,765.00	72,430.00
14.000	73,106.00	73,798.00	74,504.00	75,221.00	75,946.00
14.250	76,681.00	77,430.00	78,198.00	78,983.00	79,783.00
14.500	80,595.00	81,419.00	82,264.00	83,135.00	84,031.00
14.750	84,948.00	85,881.00	86,832.00	87,815.00	88,837.00
15.000	89,898.00	90,991.00	92,109.00	93,264.00	94,500.00
15.250	95,826.00	97,201.00	98,588.00	99,954.00	101,317.00
15.500	102,759.00	104,340.00	106,061.00	107,952.00	110,037.00
15.750	112,450.00	115,883.00	120,862.00	126,953.00	132,266.00
16.000	135,351.00	136,457.00	136,577.00	136,496.00	136,228.00
16.250	135,819.00	135,307.00	134,702.00	134,036.00	133,334.00
16.500	132,599.00	131,838.00	131,059.00	130,262.00	129,452.00
16.750	128,633.00	127,811.00	126,997.00	126,194.00	125,400.00
17.000	124,617.00	123,847.00	123,089.00	122,345.00	121,615.00
17.250	120,900.00	120,198.00	119,511.00	118,838.00	118,178.00
17.500	117,534.00	116,903.00	116,287.00	115,685.00	115,096.00
17.750	114,513.00	113,930.00	113,349.00	112,773.00	112,204.00
18.000	111,644.00	111,098.00	110,572.00	110,068.00	109,584.00
18.250	109,120.00	108,675.00	108,249.00	107,839.00	107,446.00
18.500	107,068.00	106,706.00	106,358.00	106,024.00	105,703.00
18.750	105,394.00	105,098.00	104,813.00	104,539.00	104,275.00
19.000	104,023.00	103,780.00	103,547.00	103,323.00	103,108.00
19.250	102,900.00	102,700.00	102,508.00	102,322.00	102,143.00
19.500	101,971.00	101,804.00	101,644.00	101,489.00	101,341.00
19.750	101,197.00	101,058.00	100,925.00	100,797.00	100,673.00
20.000	100,553.00	100,438.00	100,326.00	100,218.00	100,113.00
20.250	100,012.00	99,915.00	99,820.00	99,729.00	99,641.00
20.500	99,555.00	99,472.00	99,392.00	99,314.00	99,238.00
20.750	99,164.00	99,093.00	99,023.00	98,955.00	98,890.00
21.000	98,827.00	98,765.00	98,705.00	98,647.00	98,590.00
21.250	98,534.00	98,480.00	98,428.00	98,378.00	98,329.00

Subsection: Time vs. Volume
Scenario: Base
Label: PO-1

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
21.500	98,281.00	98,234.00	98,189.00	98,144.00	98,100.00
21.750	98,056.00	98,014.00	97,972.00	97,931.00	97,892.00
22.000	97,854.00	97,817.00	97,782.00	97,746.00	97,712.00
22.250	97,678.00	97,645.00	97,612.00	97,580.00	97,548.00
22.500	97,517.00	97,486.00	97,457.00	97,428.00	97,400.00
22.750	97,372.00	97,344.00	97,318.00	97,291.00	97,266.00
23.000	97,241.00	97,216.00	97,191.00	97,167.00	97,143.00
23.250	97,120.00	97,097.00	97,074.00	97,051.00	97,029.00
23.500	97,007.00	96,985.00	96,964.00	96,944.00	96,917.00
23.750	96,851.00	96,719.00	96,533.00	96,328.00	96,135.00
24.000	95,951.00	(N/A)	(N/A)	(N/A)	(N/A)

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft^3)
1,275.15	0.00
1,276.15	30,017.15
1,277.15	61,439.62
1,278.15	94,286.43
1,279.15	128,582.71
1,280.15	164,353.59
1,281.15	201,624.20

Requested Pond Water Surface Elevations	
Minimum (Headwater)	1,275.15 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	1,281.15 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	TW	1,278.15	1,281.15
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	1,278.15 ft
Diameter	18.0 in
Orifice Area	1.8 ft²
Orifice Coefficient	0.600
Weir Length	4.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	True

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
1,275.15	0.00	(N/A)	0.00
1,275.65	0.00	(N/A)	0.00
1,276.15	0.00	(N/A)	0.00
1,276.65	0.00	(N/A)	0.00
1,277.15	0.00	(N/A)	0.00
1,277.65	0.00	(N/A)	0.00
1,278.15	0.00	(N/A)	0.00
1,278.65	5.00	(N/A)	0.00
1,279.15	8.51	(N/A)	0.00
1,279.65	10.42	(N/A)	0.00
1,280.15	12.03	(N/A)	0.00
1,280.65	13.45	(N/A)	0.00
1,281.15	14.73	(N/A)	0.00

Computation Messages
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
HW & TW < Inv.El.=1278.150
Weir: H =0ft
Weir: H =0.5ft
Orifice: H =1.00; Riser orifice equation controlling.
Orifice: H =1.50; Riser orifice equation controlling.
Orifice: H =2.00; Riser orifice equation controlling.
Orifice: H =2.50; Riser orifice equation controlling.

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
Orifice: H =3.00; Riser orifice equation controlling.

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Scenario: Base

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
1,275.15	0.00	(N/A)	0.00
1,275.65	0.00	(N/A)	0.00
1,276.15	0.00	(N/A)	0.00
1,276.65	0.00	(N/A)	0.00
1,277.15	0.00	(N/A)	0.00
1,277.65	0.00	(N/A)	0.00
1,278.15	0.00	(N/A)	0.00
1,278.65	5.00	(N/A)	0.00
1,279.15	8.51	(N/A)	0.00
1,279.65	10.42	(N/A)	0.00
1,280.15	12.03	(N/A)	0.00
1,280.65	13.45	(N/A)	0.00
1,281.15	14.73	(N/A)	0.00

Contributing Structures
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
Riser - 1
Riser - 1
Riser - 1
Riser - 1
Riser - 1
Riser - 1
Riser - 1

Subsection: Diverted Hydrograph
Scenario: Base
Label: Outlet-1

Peak Discharge	9.36 ft³/s
Time to Peak	16.100 hours
Hydrograph Volume	103,590.75 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
15.150	0.00	0.06	0.45	0.85	1.25
15.400	1.65	2.05	2.47	2.93	3.43
15.650	3.98	4.59	5.21	5.91	6.93
15.900	8.17	8.90	9.23	9.35	9.36
16.150	9.35	9.32	9.28	9.22	9.16
16.400	9.09	9.01	8.93	8.85	8.77
16.650	8.68	8.60	8.51	8.35	8.18
16.900	8.02	7.85	7.69	7.54	7.38
17.150	7.23	7.08	6.93	6.79	6.65
17.400	6.51	6.38	6.25	6.12	5.99
17.650	5.87	5.75	5.63	5.51	5.39
17.900	5.27	5.16	5.04	4.90	4.75
18.150	4.60	4.46	4.32	4.19	4.07
18.400	3.95	3.84	3.73	3.62	3.52
18.650	3.42	3.33	3.24	3.15	3.07
18.900	2.99	2.91	2.84	2.77	2.70
19.150	2.63	2.57	2.51	2.45	2.40
19.400	2.34	2.29	2.24	2.19	2.14
19.650	2.10	2.06	2.01	1.97	1.93
19.900	1.90	1.86	1.83	1.79	1.76
20.150	1.73	1.70	1.67	1.64	1.61
20.400	1.59	1.56	1.54	1.51	1.49
20.650	1.47	1.44	1.42	1.40	1.38
20.900	1.36	1.34	1.32	1.31	1.29
21.150	1.27	1.25	1.24	1.22	1.21
21.400	1.19	1.18	1.16	1.15	1.14
21.650	1.12	1.11	1.10	1.09	1.07
21.900	1.06	1.05	1.04	1.03	1.02
22.150	1.01	1.00	0.99	0.98	0.97
22.400	0.96	0.95	0.94	0.93	0.92
22.650	0.92	0.91	0.90	0.89	0.88
22.900	0.88	0.87	0.86	0.85	0.85
23.150	0.84	0.83	0.83	0.82	0.81
23.400	0.81	0.80	0.79	0.79	0.78
23.650	0.77	0.77	0.75	0.71	0.65
23.900	0.60	0.54	0.49	(N/A)	(N/A)

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: Base
Label: PO-1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.51 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	1,275.15 ft
Volume (Initial)	0.00 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
1,275.15	0.00	0.00	0.000	0.00	0.00	0.00
1,275.65	0.00	15,008.58	0.000	0.51	0.51	167.27
1,276.15	0.00	30,017.15	0.000	0.51	0.51	334.03
1,276.65	0.00	45,728.39	0.000	0.51	0.51	508.60
1,277.15	0.00	61,439.62	0.000	0.51	0.51	683.17
1,277.65	0.00	77,863.03	0.000	0.51	0.51	865.65
1,278.15	0.00	94,286.43	0.000	0.51	0.51	1,048.14
1,278.65	5.00	111,434.57	0.000	0.51	5.51	1,243.67
1,279.15	8.51	128,582.71	0.000	0.51	9.02	1,437.71
1,279.65	10.42	146,468.15	0.000	0.51	10.93	1,638.35
1,280.15	12.03	164,353.59	0.000	0.51	12.54	1,838.69
1,280.65	13.45	182,988.90	0.000	0.51	13.96	2,047.17
1,281.15	14.73	201,624.20	0.000	0.51	15.24	2,255.51

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)

Scenario: Base

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.51 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	1,275.15 ft
Volume (Initial)	0.00 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	44.49 ft³/s	Time to Peak (Flow, In)	15.900 hours
Infiltration (Peak)	0.51 ft³/s	Time to Peak (Infiltration)	4.300 hours
Flow (Peak Outlet)	9.36 ft³/s	Time to Peak (Flow, Outlet)	16.100 hours

Elevation (Water Surface, Peak)	1,279.37 ft
Volume (Peak)	136,576.95 ft³

Mass Balance (ft³)	
Volume (Initial)	0.00 ft³
Volume (Total Inflow)	239,725.00 ft³
Volume (Total Infiltration)	40,276.00 ft³
Volume (Total Outlet Outflow)	103,591.00 ft³
Volume (Retained)	95,776.00 ft³
Volume (Unrouted)	-83.00 ft³
Error (Mass Balance)	0.0 %

Peak Discharge	0.51 ft³/s
Time to Peak	10.900 hours
Hydrograph Volume	40,184.09 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.100	0.00	0.00	0.01	0.02	0.02
0.350	0.03	0.04	0.05	0.05	0.06
0.600	0.07	0.07	0.08	0.09	0.09
0.850	0.10	0.11	0.11	0.12	0.13
1.100	0.13	0.14	0.15	0.15	0.16
1.350	0.17	0.17	0.18	0.18	0.19
1.600	0.20	0.20	0.21	0.22	0.22
1.850	0.23	0.23	0.24	0.25	0.25
2.100	0.26	0.27	0.27	0.28	0.28
2.350	0.29	0.30	0.30	0.31	0.31
2.600	0.32	0.33	0.33	0.34	0.34
2.850	0.35	0.35	0.36	0.37	0.37
3.100	0.38	0.38	0.39	0.39	0.40
3.350	0.41	0.41	0.42	0.42	0.43
3.600	0.43	0.44	0.44	0.45	0.46
3.850	0.46	0.47	0.47	0.48	0.48
4.100	0.49	0.49	0.50	0.50	0.51
4.350	0.51	0.51	0.51	0.51	0.51
4.600	0.51	0.51	0.51	0.51	0.51
4.850	0.51	0.51	0.51	0.51	0.51
5.100	0.51	0.51	0.51	0.51	0.51
5.350	0.51	0.51	0.51	0.51	0.51
5.600	0.51	0.51	0.51	0.51	0.51
5.850	0.51	0.51	0.51	0.51	0.51
6.100	0.51	0.51	0.51	0.51	0.51
6.350	0.51	0.51	0.51	0.51	0.51
6.600	0.51	0.51	0.51	0.51	0.51
6.850	0.51	0.51	0.51	0.51	0.51
7.100	0.51	0.51	0.51	0.51	0.51
7.350	0.51	0.51	0.51	0.51	0.51
7.600	0.51	0.51	0.51	0.51	0.51
7.850	0.51	0.51	0.51	0.51	0.51
8.100	0.51	0.51	0.51	0.51	0.51
8.350	0.51	0.51	0.51	0.51	0.51
8.600	0.51	0.51	0.51	0.51	0.51
8.850	0.51	0.51	0.51	0.51	0.51
9.100	0.51	0.51	0.51	0.51	0.51
9.350	0.51	0.51	0.51	0.51	0.51
9.600	0.51	0.51	0.51	0.51	0.51

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
9.850	0.51	0.51	0.51	0.51	0.51
10.100	0.51	0.51	0.51	0.51	0.51
10.350	0.51	0.51	0.51	0.51	0.51
10.600	0.51	0.51	0.51	0.51	0.51
10.850	0.51	0.51	0.51	0.51	0.51
11.100	0.51	0.51	0.51	0.51	0.51
11.350	0.51	0.51	0.51	0.51	0.51
11.600	0.51	0.51	0.51	0.51	0.51
11.850	0.51	0.51	0.51	0.51	0.51
12.100	0.51	0.51	0.51	0.51	0.51
12.350	0.51	0.51	0.51	0.51	0.51
12.600	0.51	0.51	0.51	0.51	0.51
12.850	0.51	0.51	0.51	0.51	0.51
13.100	0.51	0.51	0.51	0.51	0.51
13.350	0.51	0.51	0.51	0.51	0.51
13.600	0.51	0.51	0.51	0.51	0.51
13.850	0.51	0.51	0.51	0.51	0.51
14.100	0.51	0.51	0.51	0.51	0.51
14.350	0.51	0.51	0.51	0.51	0.51
14.600	0.51	0.51	0.51	0.51	0.51
14.850	0.51	0.51	0.51	0.51	0.51
15.100	0.51	0.51	0.51	0.51	0.51
15.350	0.51	0.51	0.51	0.51	0.51
15.600	0.51	0.51	0.51	0.51	0.51
15.850	0.51	0.51	0.51	0.51	0.51
16.100	0.51	0.51	0.51	0.51	0.51
16.350	0.51	0.51	0.51	0.51	0.51
16.600	0.51	0.51	0.51	0.51	0.51
16.850	0.51	0.51	0.51	0.51	0.51
17.100	0.51	0.51	0.51	0.51	0.51
17.350	0.51	0.51	0.51	0.51	0.51
17.600	0.51	0.51	0.51	0.51	0.51
17.850	0.51	0.51	0.51	0.51	0.51
18.100	0.51	0.51	0.51	0.51	0.51
18.350	0.51	0.51	0.51	0.51	0.51
18.600	0.51	0.51	0.51	0.51	0.51
18.850	0.51	0.51	0.51	0.51	0.51
19.100	0.51	0.51	0.51	0.51	0.51
19.350	0.51	0.51	0.51	0.51	0.51
19.600	0.51	0.51	0.51	0.51	0.51
19.850	0.51	0.51	0.51	0.51	0.51
20.100	0.51	0.51	0.51	0.51	0.51
20.350	0.51	0.51	0.51	0.51	0.51
20.600	0.51	0.51	0.51	0.51	0.51

Subsection: Pond Infiltration Hydrograph
Scenario: Base
Label: PO-1 (INF)

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.850	0.51	0.51	0.51	0.51	0.51
21.100	0.51	0.51	0.51	0.51	0.51
21.350	0.51	0.51	0.51	0.51	0.51
21.600	0.51	0.51	0.51	0.51	0.51
21.850	0.51	0.51	0.51	0.51	0.51
22.100	0.51	0.51	0.51	0.51	0.51
22.350	0.51	0.51	0.51	0.51	0.51
22.600	0.51	0.51	0.51	0.51	0.51
22.850	0.51	0.51	0.51	0.51	0.51
23.100	0.51	0.51	0.51	0.51	0.51
23.350	0.51	0.51	0.51	0.51	0.51
23.600	0.51	0.51	0.51	0.51	0.51
23.850	0.51	0.51	0.51	0.51	(N/A)

Subsection: Pond Routed Hydrograph (total out) Scenario: Base
Label: PO-1 (OUT)

Peak Discharge	9.36 ft³/s
Time to Peak	16.100 hours
Hydrograph Volume	103,590.75 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
15.150	0.00	0.06	0.45	0.85	1.25
15.400	1.65	2.05	2.47	2.93	3.43
15.650	3.98	4.59	5.21	5.91	6.93
15.900	8.17	8.90	9.23	9.35	9.36
16.150	9.35	9.32	9.28	9.22	9.16
16.400	9.09	9.01	8.93	8.85	8.77
16.650	8.68	8.60	8.51	8.35	8.18
16.900	8.02	7.85	7.69	7.54	7.38
17.150	7.23	7.08	6.93	6.79	6.65
17.400	6.51	6.38	6.25	6.12	5.99
17.650	5.87	5.75	5.63	5.51	5.39
17.900	5.27	5.16	5.04	4.90	4.75
18.150	4.60	4.46	4.32	4.19	4.07
18.400	3.95	3.84	3.73	3.62	3.52
18.650	3.42	3.33	3.24	3.15	3.07
18.900	2.99	2.91	2.84	2.77	2.70
19.150	2.63	2.57	2.51	2.45	2.40
19.400	2.34	2.29	2.24	2.19	2.14
19.650	2.10	2.06	2.01	1.97	1.93
19.900	1.90	1.86	1.83	1.79	1.76
20.150	1.73	1.70	1.67	1.64	1.61
20.400	1.59	1.56	1.54	1.51	1.49
20.650	1.47	1.44	1.42	1.40	1.38
20.900	1.36	1.34	1.32	1.31	1.29
21.150	1.27	1.25	1.24	1.22	1.21
21.400	1.19	1.18	1.16	1.15	1.14
21.650	1.12	1.11	1.10	1.09	1.07
21.900	1.06	1.05	1.04	1.03	1.02
22.150	1.01	1.00	0.99	0.98	0.97
22.400	0.96	0.95	0.94	0.93	0.92
22.650	0.92	0.91	0.90	0.89	0.88
22.900	0.88	0.87	0.86	0.85	0.85
23.150	0.84	0.83	0.83	0.82	0.81
23.400	0.81	0.80	0.79	0.79	0.78
23.650	0.77	0.77	0.75	0.71	0.65
23.900	0.60	0.54	0.49	(N/A)	(N/A)

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	239,662.80	15.890	46.86
Flow (In)	PO-1	239,725.44	15.900	44.49

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APPENDIX H

HYDROLOGY MANUAL REFERENCE MATERIAL

Curve (1) 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
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, 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	71	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	25	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)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (Continued)					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87

Notes:

1. All curve numbers are for Antecedent Moisture Condition (AMC) II.
2. Quality of cover definitions:

   Poor-Heavily grazed, regularly burned areas, or areas of high burn potential. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.

   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.
3. See Figure C-2 for definition of cover types.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (2 of 2)

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

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

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

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

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER
FOR
DEVELOPED AREAS

Figure C-4

Residential Landscaping (Lawn, Shrubs, etc.) - The pervious portions of commercial establishments, single and multiple family dwellings, trailer parks and schools where the predominant land cover is lawn, shrubbery and trees.

Row Crops - Lettuce, tomatoes, beets, tulips or any field crop planted in rows far enough apart that most of the soil surface is exposed to rainfall impact throughout the growing season. At plowing, planting and harvest times it is equivalent to fallow.

Small Grain - Wheat, oats, barley, flax, etc. planted in rows close enough that the soil surface is not exposed except during planting and shortly thereafter.

Legumes - Alfalfa, sweetclover, timothy, etc. and combinations are either planted in close rows or broadcast.

Fallow - Fallow land is land plowed but not yet seeded or tilled.

Woodland - grass - Areas with an open cover of broadleaf or coniferous trees usually live oak and pines, with the intervening ground space occupied by annual grasses or weeds. The trees may occur singly or in small clumps. Canopy density, the amount of ground surface shaded at high noon, is from 20 to 50 percent.

Woodland - Areas on which coniferous or broadleaf trees predominate. The canopy density is at least 50 percent. Open areas may have a cover of annual or perennial grasses or of brush. Herbaceous plant cover under the trees is usually sparse because of leaf or needle litter accumulation.

Chaparral - Land on which the principal vegetation consists of evergreen shrubs with broad, hard, stiff leaves such as manzonita, ceanothus and scrub oak. The brush cover is usually dense or moderately dense. Diffusely branched evergreen shrubs with fine needle-like leaves, such as chamise and redchank, with dense high growth are also included in this soil cover.

Annual Grass - Land on which the principal vegetation consists of annual grasses and weeds such as annual bromes, wild barley, soft chess, ryegrass and filaree.

Irrigated Pasture - Irrigated land planted to perennial grasses and legumes for production of forage and which is cultivated only to establish or renew the stand of plants. Dry land pasture is considered as annual grass.

Meadow - Land areas with seasonally high water table, locally called cienegas. Principal vegetation consists of sod-forming grasses interspersed with other plants.

Orchard (Deciduous) - Land planted to such deciduous trees as apples, apricots, pears, walnuts, and almonds.

Orchard (Evergreen) - Land planted to evergreen trees which include citrus and avocados and coniferous plantings.

Turf - Golf courses, parks and similar lands where the predominant cover is irrigated mowed close-grown turf grass. Parks in which trees are dense may be classified as woodland.

APPENDIX I

GEOTECHNICAL REPORT

Geotechnical Engineering Report

CarMax Redlands
Redlands, San Bernardino County, California
October 6, 2022
Terracon Project No. 60225109

Prepared for:
CenterPoint Integrated Solutions, LLC
Lakewood, Colorado

Prepared by:
Terracon Consultants, Inc.
Laguna Hills, California

Draft

October 6, 2022

CenterPoint Integrated Solutions, LLC
1626 Cole Boulevard, Suite 125
Lakewood, Colorado 80401

Attn: Ms. Katharine Ayerst
P: (561) 699-7166
E: kayerst@centerpoint-is.com

Re: Geotechnical Engineering Report
CarMax Redlands
New York Street
Redlands, San Bernardino County, California
Terracon Project No. 60225109

Dear Ms. Ayerst:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P60225109 dated August 3, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork, the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Smriti Dhital, P.E.*
Senior Staff Engineer
*Registered in North Carolina

Keith Askew, P.E., G.E.
Department Manager

Draft

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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon GeoReport logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS (Boring Logs and Laboratory Data)
SUPPORTING INFORMATION (General Notes and Unified Soil Classification System)

Draft

Geotechnical Engineering Report

CarMax Redlands

New York Street

Redlands, San Bernardino County, California

Terracon Project No. 60225109

October 6, 2022

Draft

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed CarMax facility, which includes a single-story building with associated parking and drive areas to be located at New York Street in Redlands, San Bernardino County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Infiltration design and considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per CBC
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of twenty test borings to depths ranging from approximately 6½ to 51½ feet below existing site grades. Four of these borings were used for percolation testing (B-1, B-3, B-4, and B-7). Our scope also included laboratory testing on samples retrieved from the borings, and preparation of this report.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project site is located west of New York Street and south of Lugonia Avenue in Redlands, San Bernardino County, California and is approximately 18.6-acres in size. Approximate coordinates for the center of the site are 34.0669°N, 117.1972°W
Existing Improvements	The site is currently undeveloped. There is an existing Home Depot bordering the northwest side of the site and an automobile dealership bordering the south side of the site. To the west of the property is Interstate 210 (I-210) with a slope (ascending from outside the site boundary to the freeway) varying in height from 15 to 20 feet, and an inclination on the order of 2:1 (horizontal:vertical). A drainage channel is also present outside of the western property boundary and adjacent/parallel to the I-210 toe of slope. The drainage channel and the slope are not part of the property and are separated by a fence; improvements to the channel or slope are not proposed. A sewer line extends east to west on the southern portion of the site and north to south on the western portion along the fence line.
Current Ground Cover	Exposed soil and vegetation.
Existing Topography (from Google Earth)	Majority of the site is relatively flat and has an approximate elevation ranging between 1297 feet and 1291 feet. To the west of the property is Interstate 210 (I-210) with a slope (ascending from outside the site boundary to the freeway) varying in height from 15 to 20 feet, and an inclination on the order of 2:1 (horizontal:vertical). A drainage channel is also present outside of the western property boundary and adjacent/parallel to the I-210 toe of slope.

PROJECT DESCRIPTION

Item	Description
Proposed Structure	According to the updated site plan dated September 2, 2022, the project will consist of developing a CarMax facility. The facility will include a 936 square-foot (SF) carwash building, staging and sales display areas of approximately 11.63 acres, and employee parking with light poles across the site.
Building Construction	Structural steel framing, metal studs with masonry veneer and load bearing reinforced CMU.
Maximum Loads	Buildings ■ Columns: 120 kips maximum ■ Walls: 4 kips per linear foot (klf) maximum ■ Slabs (assumed): 150 pounds per square foot (psf)
Finished Floor Elevation	Assumed within one foot of existing grade.
Grading/Slopes	Minimal cut/fill – assumed to be less than one foot (excluding remedial grading). Modifications to the existing slope and the drainage facility west of the property are not planned for the project.

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Item	Description
Infiltration Systems	Based on our experience given the footprint of the site, a shallow infiltration system is anticipated.
Pavements	New pavements will be constructed and geotechnical recommendations for pavements are included in this project.
Traffic Loading[1]	Both rigid (concrete) and flexible (asphalt) pavement sections are to be considered. Anticipated traffic is as follows based on a design life of 20-years: ■ Light Duty Paving – 7,500 ESAL's (Traffic Index ~ 5) ■ Heavy Duty Paving – 75,000 ESAL's (Traffic Index ~ 6.5)

[1]Based on our local experience flexible pavement thickness design will be performed in accordance with Caltrans Methodology.

GEOTECHNICAL CHARACTERIZATION

Site Geology

The site is located on a broad terrace plain of the Santa Ana River in the San Bernardino Valley. The San Bernardino Valley in this area is bounded on the north by the San Bernardino Mountains, from which the Santa Ana River emanates.

The site is mapped as younger alluvial valley deposits of Holocene age. The Holocene-age alluvium was encountered in our exploratory borings and consists of interbeded sands with silts, silty sand and gravel lenses.

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The general characterization of the subsurface soil is as follows:

In general, the subsurface soil was characterized as loose to dense sand with varying amount of silt and loose to dense gravel with varying amount of silt and sand.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

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Groundwater

Groundwater was not observed in the borings while drilling, or for the short duration the boring remained open. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

According to data collected from the Water Data Library for the State of California from a nearby well, located approximately 0.5 mile northeast of the site in State Well Number 01S03W21H007S, historic groundwater levels between January 1, 2012 and June 04, 2019 were recorded at greater than 100 feet bgs.[1]

SEISMIC CONSIDERATIONS

The 2019 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that “In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites.” Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

[1] *Groundwater elevation was obtained from the Water Data Library for the State of California Well ID01S03W21H007S (http://wdl.water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=37361).*

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Description	Value
2019 California Building Code Site Classification (CBC) [1]	D [2]
Site Latitude (°N)	34.0669
Site Longitude (°W)	117.1972
S_s Spectral Acceleration for a 0.2-Second Period	1.795
S_1 Spectral Acceleration for a 1-Second Period	0.716
F_a Site Coefficient for a 0.2-Second Period	1.0
F_v Site Coefficient for a 1-Second Period	1.7

1. Seismic site classification in general accordance with the *2019 California Building Code*.
2. The 2019 California Building Code (CBC) utilizes a site soil profile extending to a depth of 100 feet for seismic site classification. The current scope does not include the 100-foot soil profile determination. Borings were extended to a maximum depth of 50½ feet, and this seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

Typically, a site-specific ground motion study may generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in the seismically active southern California area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the San Andreas Fault (San Bernardino segment), which is considered to have the most significant effect at the site from a design standpoint, has a maximum earthquake magnitude of 8.2 and is located approximately 7.6 kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the design peak ground acceleration (PGA_M) at the project site is 0.83g. Based on the USGS Unified Hazard Tool, the project site has a de-aggregated modal magnitude of 7.9. The site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas as potential liquefaction hazard zones. These are

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areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

Based on review of the County of San Bernardino Land use plan, the site is not located within a liquefaction risk zone. Other geologic hazards related to liquefaction, such as lateral spreading, are therefore also considered low; however, the site is subject to dry sand seismic settlement due to the potential for seismic shaking. To determine the magnitude of dry sand seismic settlement, we utilized the software "LiquefyPro" by CivilTech Software. The analysis was based on the soil data from the soil borings, a Peak Ground Acceleration (PGA) of 0.83g, and the deaggregated magnitude of 7.41 for the project site. Calculations assumed the groundwater was greater than the depth of our analysis based on the available data. Settlement analysis used the Tokimatsu M-correction method, and the fines percentage were corrected for liquefaction using the Stark/Olson method.

Based on calculation results, seismically induced total settlement of dry sands is estimated to be less than 1½ inches. Differential seismic dry sand settlement is anticipated to be less than 1 inch.

CORROSIVITY

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary									
Boring	Sample Depth (ft)	Soil Description	Soluble Sulfate (%)	Sulfides (ppm)	Chlorides (ppm)	Red-Ox Potential (mV)	Electrical Resistivity (Ω-cm)	Total Salts (ppm)	pH
B-4	0-5	Silty Sand	0.01	--	80	726	13580	301	7.61

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

STORMWATER MANAGEMENT

Four in-situ percolation tests were performed to approximate depths of 5 and 10 feet bgs. A 2-inch-thick layer of gravel was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A 3-inch diameter perforated pipe was installed on top of the gravel layer in each boring. Gravel was used to backfill between the perforated pipes and the boring

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sidewall. At the beginning of the test, the pipes were refilled with water and readings were taken at standardized time intervals. Percolation rates are provided in the following table:

TEST RESULTS			
Test Location (depth, feet bgs)	**Soil Classification**	**Average of the Last Three Measured Percolation Rate (in/hr.)**	**Correlated Infiltration Rate[1] (in/hr.)**
B-1 (0 to 10 ft)	Poorly graded sand	178.5	4.9
B-3 (0 to 5 ft)	Poorly graded sand with silt	219	4.7
B-4 (0 to 5 ft)	Silty Sand	73.5	1.5
B-7 (0 to 5 ft)	Silty Sand	225.8	4.6

1. If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. The infiltration rates were correlated using the Porchet method.

The permeability tests were performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Infiltration testing should be performed after construction to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of on-site soils. The actual infiltration rate may vary from the values reported here.

GEOTECHNICAL OVERVIEW

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

We assume the existing sewer line will be left in place. If so, special care should be taken while performing any earthwork or placement of new pavement above the sewer line.

Due to the presence of loose subgrade soils we recommend remedial grading consisting of the removal and replacement of the upper existing soils within the footprint of the building pads. Conventional shallow foundations may be used for the proposed sales and carwash buildings, and should bear on engineered fill placed as recommended in the Earthwork section of this report.

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Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained. Exposed ground, extending at least 10 feet from the perimeter, should be sloped a minimum of 5% away from the building to provide positive drainage away from the structure. Grades around the structure should be periodically inspected and adjusted as part of the structure's maintenance program.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results** section), engineering analyses, and our current understanding of the proposed project.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

The following recommendations include site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing topsoil and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

We assume the existing sewer line will be left in place. If so, special care should be taken while performing any earthwork or placement of new pavement above the sewerline. Although evidence of underground facilities such as septic tanks, cesspools, or basements was not observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

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Subgrade Preparation

Due to the relatively loose condition of the near surface soils, we recommend the subsurface soils within the proposed building pads be removed to a minimum depth of 4 feet below existing site grades, or 2 feet below bottom of proposed foundations, whichever is greater. Deeper removals may be required if loose soils are still encountered at a depth of 4 feet bgs. Grading for the proposed structures should incorporate the limits of the footings plus 3 feet beyond the outside edge of perimeter footings. Bottoms of excavations should be probed to determine if it is firm and unyielding. Localized deeper removals may be needed where soft soils at encountered at the excavation bottom. Compacted engineered fill should then be placed to design finish grade elevations.

Subgrade soils beneath exterior slabs and pavements should be removed to a depth of 1 foot below the proposed pavement section, including bottom of proposed aggregate base materials. Compacted engineered fill should then be placed to design elevations.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than 6 inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

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- general site grading
- foundation areas
- interior floor slab areas
- foundation backfill
- pavement areas
- exterior slab areas

Imported soils for use as fill material within proposed building and structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	Percent Finer by Weight (ASTM C 136)
3”	100
No. 4 Sieve	50-100
No. 200 Sieve	10-40

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum expansion index* ..... 20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
On-site soils and low volume change imported fill:			
Beneath foundations:	90	0%	+3%
Beneath interior slabs:	90	0%	+3%

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Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
Fill greater than 5 feet in depth	95	0%	+3%
Miscellaneous backfill and behind retain walls:	90	0%	+3%
Beneath pavements:	95	0%	+3%
Utility Trenches*:	90	0%	+3%
Bottom of excavation receiving fill:	90	0%	+3%
Aggregate base (beneath pavements):	95	0%	+3%

* Upper 12 inches should be compacted to 95% within pavement and structural areas. Low-volume change imported soils should be used in structural areas.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Roof drainage should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems and landscaped irrigation should not be installed within 5 feet of foundation walls.

Utility Trenches

It is anticipated that the on-site soils and fill materials will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 should be used for bedding and shading of utilities, unless allowed or specified otherwise by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances. Imported low volume change soils should be used for trench backfill in structural areas.

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Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Exterior Slab Design and Construction

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill;
- controlling moisture-density during placement of backfill;
- using designs which allow vertical movement between the exterior features and adjoining structural elements;
- placing effective control joints on relatively close centers

Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

Construction Observation and Testing

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill. This testing frequency criteria may be adjusted during construction as specified by the Geotechnical Engineer of record.

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In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

Provided the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Shallow Foundation Design Recommendations

DESCRIPTION	RECOMENDATION
Foundation Type	Spread footing foundations
Bearing Material	Engineered fill extended to minimum depth of 4 feet below the ground surface or 2 feet below the foundation.
Allowable Bearing Pressure	2,000 psf
Minimum Dimensions	Columns: 24 inches
Minimum Embedment Depth Below Finished Grade	18 inches
Total Estimated Settlement	1 inch
Estimated Differential Settlement	½ inch across 40 feet

Finished grade is defined as the lowest adjacent grade within five feet of the foundation for perimeter (or exterior) footings. The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

Foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

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FLOOR SLABS

DESCRIPTION	RECOMMENDATION
Interior floor system	Slab-on-grade concrete
Floor slab support	Engineered fill extending to a minimum depth of 2 feet below the corresponding footing, or 4 feet below the existing ground surface.
Subbase	Minimum 4-inches of Aggregate Base
Modulus of subgrade reaction	200 pounds per square inch per inch (psi/in) (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

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Pavement Design Parameters

R-value testing conducted on a near-surface soil (0 to 5 feet) sample resulted in an R-value of 50 which was used to calculate the asphalt concrete pavement sections and the Portland cement concrete pavement sections. Additional R-value testing should be completed prior to pavement construction to verify the design R-value.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic indices assumed in the table below. As more specific traffic information becomes available, we should be contacted to reevaluate the pavement calculations.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

	Recommended Pavement Section Thickness (inches) [1]	
	Light (Automobile) Parking Assumed Traffic Index (TI) = 5	**Heavy Duty (Driveways and Delivery Areas) Assumed TI = 6.5**
Section I Portland Cement Concrete (600 psi Flexural Strength)	5.0-inches PCC over 4-inches Class II Aggregate Base	5-inches PCC over 4-inches Class II Aggregate Base
Section II Asphaltic Concrete	3-inches AC over 5-inches Class II Aggregate Base	4-inches AC over 4-inches Class II Aggregate Base

1. All materials should meet the Caltrans Standard Specifications for Highway Construction.

These pavement sections are considered minimal sections based upon the expected traffic and the existing subgrade conditions. The project civil engineer should confirm minimum sections are in accordance with requirements from local agencies and jurisdictions. The pavement sections are expected to be functional with periodic maintenance and overlays if good drainage is provided and maintained.

All materials should meet the Caltrans Standard Specifications for Highway Construction. Aggregate base materials should meet the gradation and quality requirement of Class 2 Aggregate Base (¾ inch maximum) in Caltrans Standard Specifications, latest edition, Sections 25 through 29.

All concrete for rigid pavements should have a minimum flexural strength of 600 psi (4,250 psi Compressive Strength) and be placed with a maximum slump of four inches. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

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Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Pavement Construction Considerations

Materials and construction of pavements for the project should be in accordance with the requirements and specifications of the State of California Department of Transportation, or other approved local governing specifications.

Base course or pavement materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of paved areas to minimize lateral moisture transmission into the subgrade.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in

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the geographic vicinity and at the time these services have been performed. No warranty or guarantee, express or implied, is made. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

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ATTACHMENTS

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EXPLORATION AND TESTING PROCEDURES

Field Exploration

Borings	Boring Depth (feet)	Location
B-02, B-05, B-06, B-08, B-09 and B-10	21.5 to 51.5	Proposed carwash and service building
B-01, B-03, B-04 and B-07	6.5 to 11.5	Pavement and Percolation boring
B-11 to B-20	6.5 to 21.5	Pavement borings

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from Google Earth Pro. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted drill rig using continuous hollow stem flight augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling were collected during drilling in general accordance with the appropriate ASTM methods using Standard Penetration Testing (SPT) and sampling using either standard split-spoon method or Modified California Samplers. A sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a geotechnical engineer. In addition, we observed and recorded groundwater levels (or absence thereof) during drilling and sampling. The building borings (B-02, B-05, B-06, B-08 to B-10) were backfilled with cement grout. Pavement borings (B-01, B-03, B-04, B-07, B-11 to B-20) were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

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Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D7263 Standard Test Methods for Laboratory Determination of Dry Density (Unit Weight) of Soil Specimens
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM C136 Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
- ASTM D2844-01 Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils
- Corrosivity Testing included pH, chlorides, sulfates, sulfides, Redox potential, and electrical lab resistivity

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

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SITE LOCATION AND EXPLORATION PLANS

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SITE LOCATION

CarMax- Redlands, CA ■ Redlands, CA
October 6, 2022 ■ Terracon Project No. 60225109

Terracon GeoReport

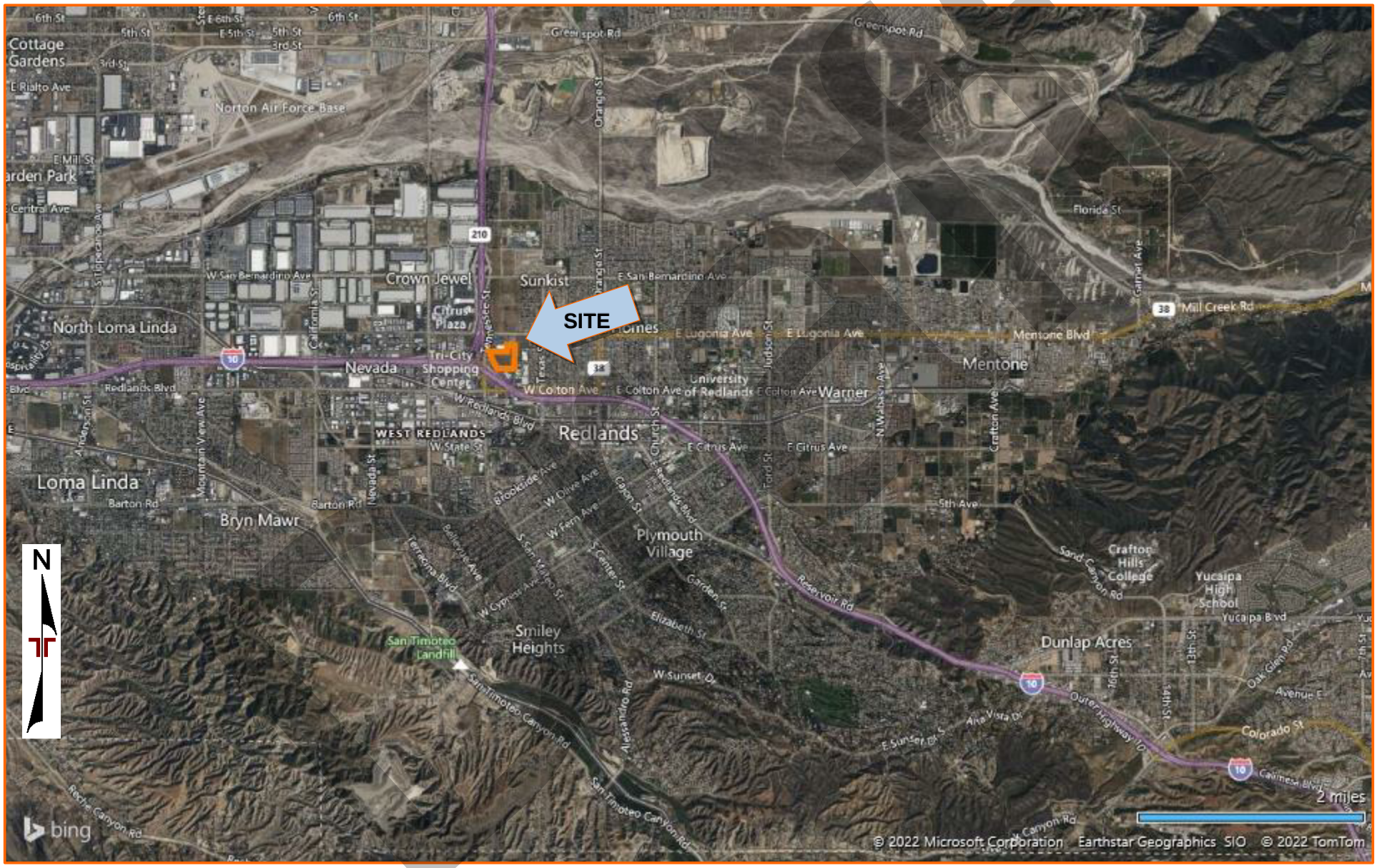

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: .

EXPLORATION PLAN

CarMax- Redlands, CA ■ Redlands, CA

October 6, 2022 ■ Terracon Project No. 60225109

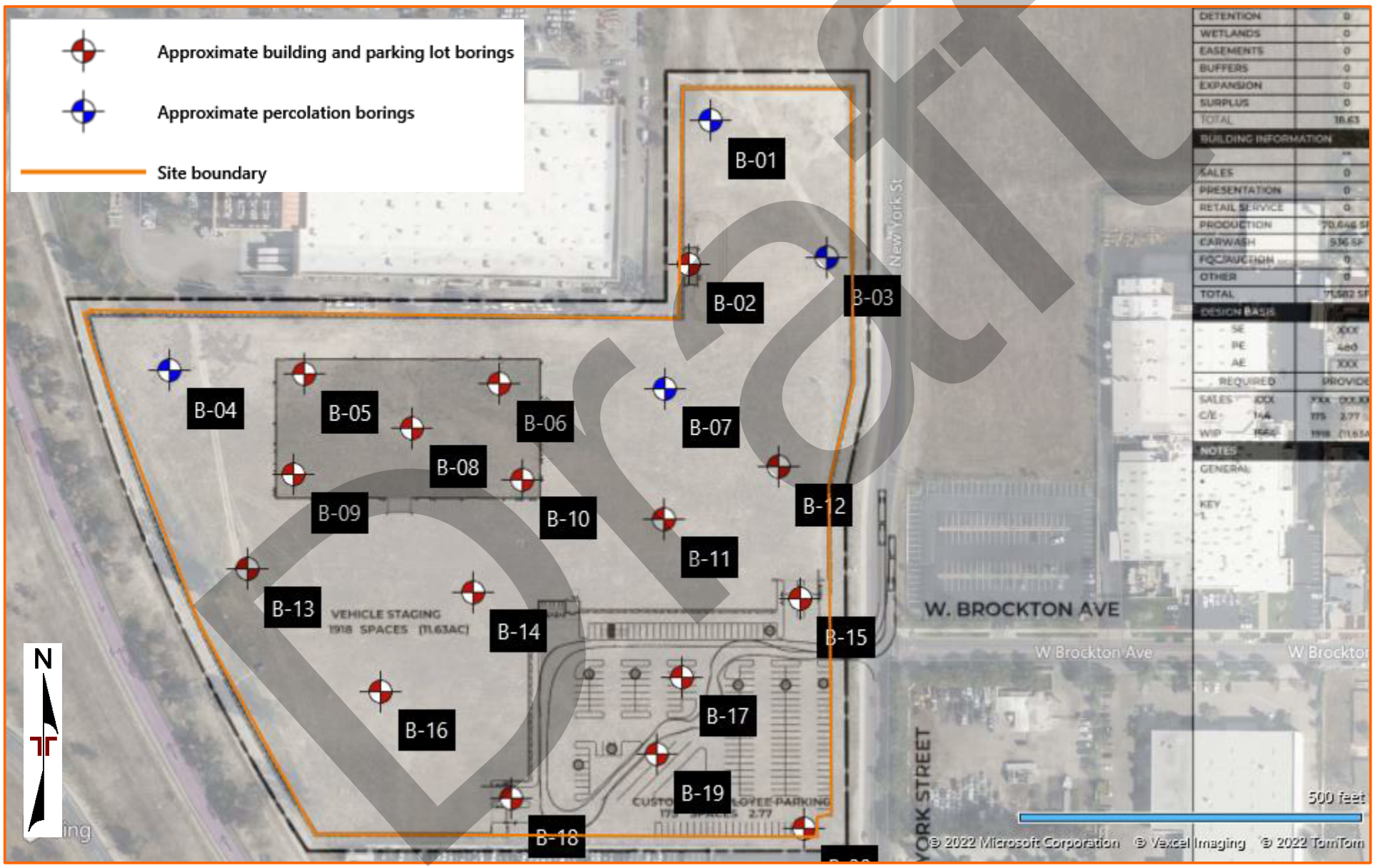

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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SITE PLAN PROVIDED BY THE CLIENT

EXPLORATION RESULTS

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BORING LOG NO. B-1

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0686° Longitude: -117.1964°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), trace gravel, light brown medium dense				1-6-7 N=13				
	5.0 **POORLY GRADED SAND (SP)**, trace silt, light brown, medium dense	5			3-5-9 N=14				4
	dense	10			14-16-18 N=34				
	11.5 ***Boring Terminated at 11.5 Feet***				5-17-20 N=37				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-2

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0680° Longitude: -117.1965°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light gray medium dense				8-7-15	1.4	109		
	5.0 **POORLY GRADED SAND (SP)**, trace silt and gravel, light gray with brown, medium dense	5			7-11-18	2.3	104		
					5-9-21	2.7			
		10			9-13-13				
	light greenish gray and brown	15			5-11-18 N=29				
	light gray with brown, dense	20			8-17-22 N=39				
	21.5 ***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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BORING LOG NO. B-3

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0681° Longitude: -117.1958°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), light brown								
	loose				3-3-4 N=7				
	medium dense	5			3-5-6 N=11				5
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-4

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0676° Longitude: -117.1990°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), brown								
	medium dense				5-5-5 N=10				
	loose	5			3-4-3 N=7				20
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-5

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0676° Longitude: -117.1983°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown								
		medium dense				5-10-12	1.8			
			5			7-10-16	1.5	108		
7.5		**POORLY GRADED SAND (SP)**, light gray, medium dense				7-14-19	1.6			
			10			7-14-20	1.6			
15.0		**SILTY SAND (SM)**, light gray, medium dense	15			5-6-6 N=12				
			20			3-6-7 N=13				
21.5		***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-6

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0676° Longitude: -117.1974°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown loose				5-5-7	2.3	103		
5.0		**SILTY GRAVEL (GM)**, brown and gray, loose	5			5-7-8				
7.5		**POORLY GRADED SAND WITH GRAVEL (SP)**, trace silt, light gray, medium dense				7-8-12	3.7	107		
			10			7-4-19				3
15.0		**POORLY GRADED SAND (SP)**, light gray, medium dense	15			4-8-10 N=18				
			20			5-11-15 N=26				
21.5		***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-7

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0675° Longitude: -117.1966°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown								
		soft				2-2-2 N=4				
			5			2-1-2 N=3				21
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-8

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0674° Longitude: -117.1978°

DEPTH	GRAPHIC LOG	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0		**SILTY SAND (SM)**, light brown and gray, medium dense	5-8-11	2.5	103	
5			6-6-12			
7.5		**POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)**, trace silt and gravel, light gray, medium dense	3-15-16	1.8	100	
10			8-14-18			5
15.0		**SILTY SAND (SM)**, trace gravel, light gray, loose	4-4-4 N=8			31
20		medium dense	4-6-6 N=12			
25						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-8

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0674° Longitude: -117.1978°

DEPTH	GRAPHIC LOG	DESCRIPTION	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), trace gravel, light gray, loose *(continued)* light gray and brown			5-10-10 N=20				
30					4-5-12 N=17				
35.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, light grayish brown, dense			7-14-18 N=32				6
40		light gray, medium dense			9-9-12 N=21				7
45		gray			7-11-16 N=27				8
50									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-8

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 34.0674° Longitude: -117.1978° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), light grayish brown, dense *(continued)* 51.5 dense				12-20-20 N=40				
	Boring Terminated at 51.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-9

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0672° Longitude: -117.1984°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
POORLY GRADED SAND (SP), trace silt, light gray									
loose					4-4-8				3
trace silt and gravel, light gray, medium dense		5			7-9-11	1.6	99		
white and black, loose					4-7-8	1.9	105		
10.0		10							
WELL GRADED SAND WITH SILT (SP-SM), gray, medium dense					8-12-18				6
15.0		15							
POORLY GRADED SAND (SP), trace silt, light brownish gray, medium dense					5-8-6 N=14				
brownish gray, loose		20			3-3-6 N=9				
21.5									
Boring Terminated at 21.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-10

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0672° Longitude: -117.1973°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
SILTY SAND (SM), trace gravel, brown loose					4-5-5				
5.0		5							
POORLY GRADED SAND WITH GRAVEL (SP), trace silt, light gray, loose					3-6-7	1.9	111		
7.5									
POORLY GRADED SAND (SP), trace silt, light gray, medium dense					6-4-14				
		10			5-14-22	1.2	108		
loose		15			3-3-5 N=8				
medium dense		20			5-6-6 N=12				1
21.5									
Boring Terminated at 21.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-11

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0670° Longitude: -117.1966°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown loose				2-2-3 N=5				
	5.0	**POORLY GRADED SAND (SP)**, trace silt, light gray, loose	5			3-4-4 N=8				
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-12

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0672° Longitude: -117.1960°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND (SP), light brown loose	5			2-3-4 3-4-5				4
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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BORING LOG NO. B-13

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0668° Longitude: -117.1986°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light brown loose	5			3-2-4 N=6 3-4-4 N=8				
	6.5								
	Boring Terminated at 6.5 Feet								

Draft

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-14

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0667° Longitude: -117.1975°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light brown, loose				2-3-4 N=7			NP	
	5.0	5							
	POORLY GRADED SAND (SP), trace silt, light gray, medium dense				3-5-6 N=11				
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-14-2022 | Boring Completed: 09-14-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-15

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0667° Longitude: -117.1959°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY GRAVEL WITH SAND (GM), gray medium dense				4-5-5 N=10				
	5.0	5							
	POORLY GRADED SAND WITH SILT (SP-SM), gray with brown, loose				3-4-5 N=9				6
	6.5								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-16

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0663° Longitude: -117.1979°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), trace silt, light brown								
		medium dense				4-5-5 N=10				
		gray, loose	5			3-3-5 N=8				
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-17

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0664° Longitude: -117.1965°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown								
		loose				5-5-9	1.4	110		
			5			5-6-7	2.5	114		
7.5										
		POORLY GRADED SAND (SP), trace silt, gray and white, medium dense				7-8-16	1.0			
10.0			10							
		SILTY SAND (SM), brown, medium dense				7-10-11				
		loose	15			2-3-5 N=8				
			20							
		medium dense				4-5-5 N=10				
21.5										
		Boring Terminated at 21.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

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BORING LOG NO. B-18

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0659° Longitude: -117.1973°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), light brown loose				2-2-2 N=4				
	5.0		5							
		POORLY GRADED SAND (SP), trace silt, gray, medium dense				3-4-6 N=10				
	6.5	***Boring Terminated at 6.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

Draft

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

BORING LOG NO. B-19

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0661° Longitude: -117.1966°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), light brown loose				4-6-7	1.1	106		
	5.0 **POORLY GRADED SAND (SP)**, trace silt, grayish brown, loose	5			4-5-7	2.4	105		4
	7.5 **POORLY GRADED SAND WITH GRAVEL (SP)**, trace silt, grayish brown, medium dense				5-7-25	1.5	118		
	10.0 **POORLY GRADED SAND (SP)**, trace silt, gray, medium dense	10			6-9-11				
	loose	15			4-4-5 N=9				
	medium dense	20			4-6-8 N=14				
	21.5 ***Boring Terminated at 21.5 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

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BORING LOG NO. B-20

PROJECT: CarMax- Redlands

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

SITE: New York St
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0658° Longitude: -117.1959°

DEPTH	GRAPHIC LOG		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), trace silt, gray							
		loose			4-7-9	0.9			
5		medium dense			6-9-15				
		trace cobbles			8-15-33	1.9	123		
10		light gray and brown			14-23-24				
15		trace silt, gray, dense			8-18-18 N=36				
20		trace silt and gravel, gray, medium dense			7-11-14 N=25				
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-15-2022 | Boring Completed: 09-15-2022

Drill Rig: CME-75 | Driller: 2R

Project No.: 60225109

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

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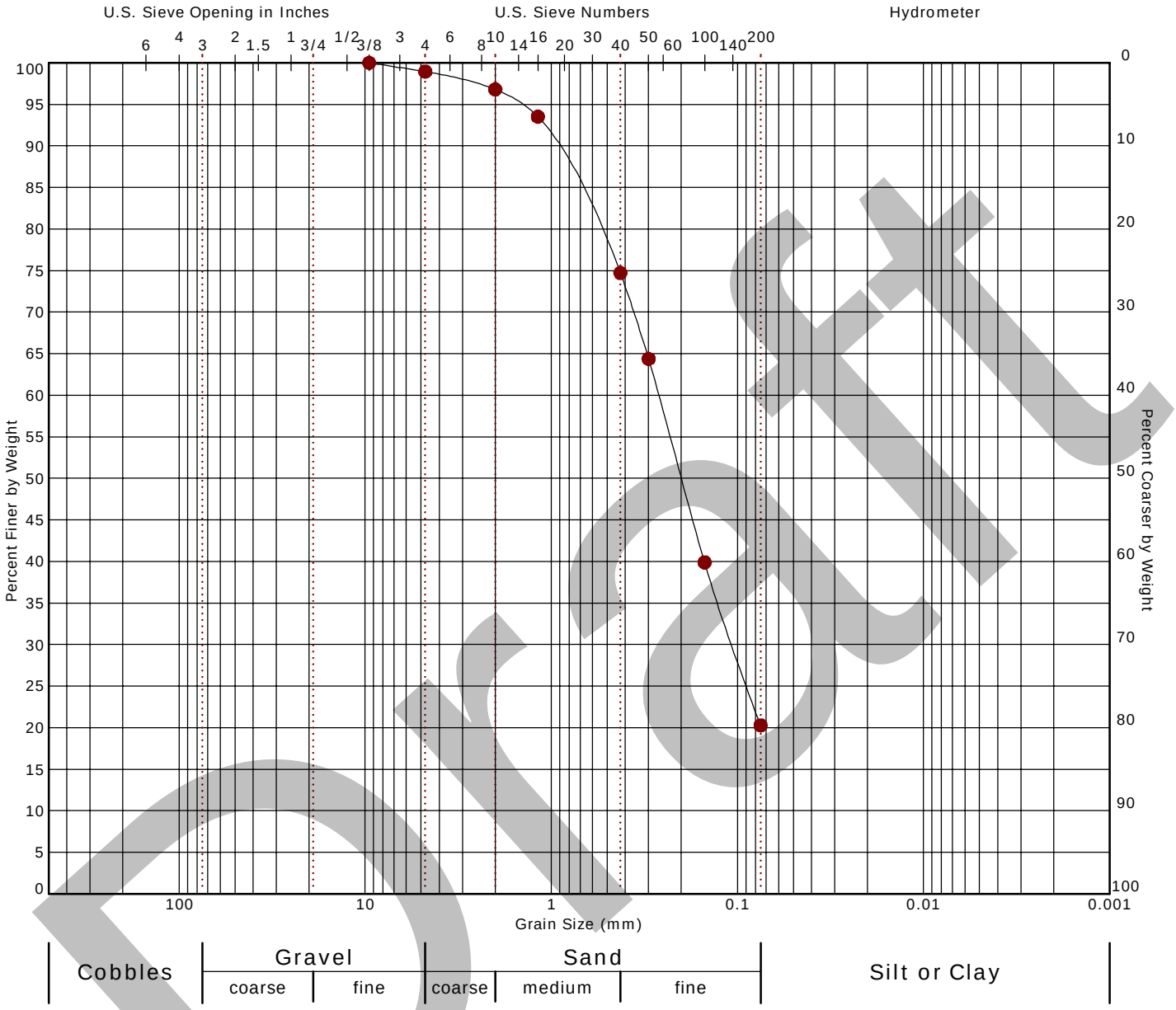
CarMax- Redlands
New York St | Redlands, CA
Terracon Project No. 60225109

Terracon
23041 Avenida De La Carlota
Ste 350
Laguna Hills, CA

Grain Size Distribution

ASTM D422 / ASTM C136



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Boring ID	Depth (Ft)	Description		LL	PL	PI	Cc	Cu
B-4	5 - 6.5	Silty sand						

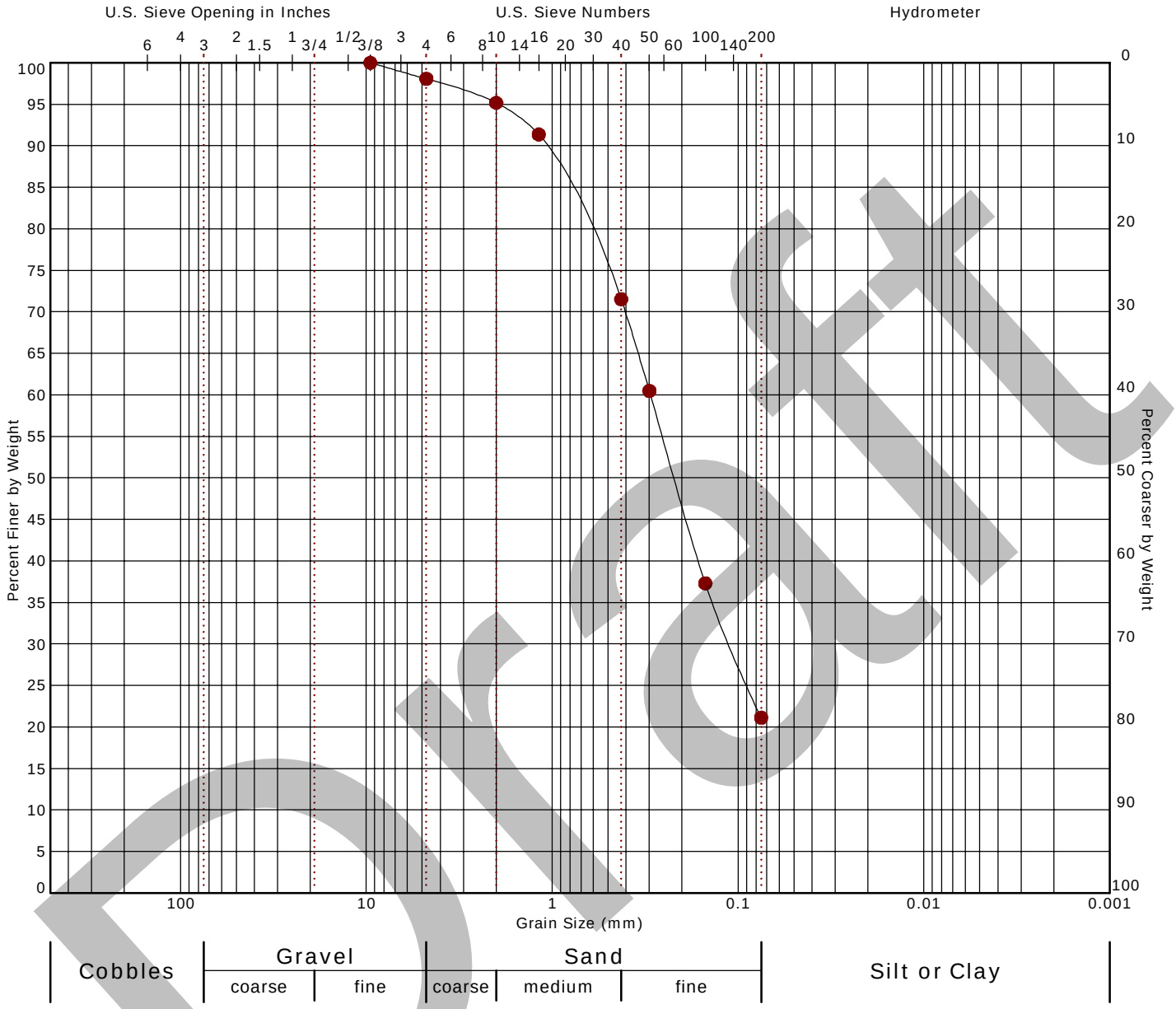
Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
B-4	5 - 6.5	9.5	0.265	0.106		0.0	1.1	78.7	20.3		

CarMax- Redlands
New York St | Redlands, CA
Terracon Project No. 60225109

Terracon
23041 Avenida De La Carlota
Ste 350
Laguna Hills, CA

Grain Size Distribution

ASTM D422 / ASTM C136



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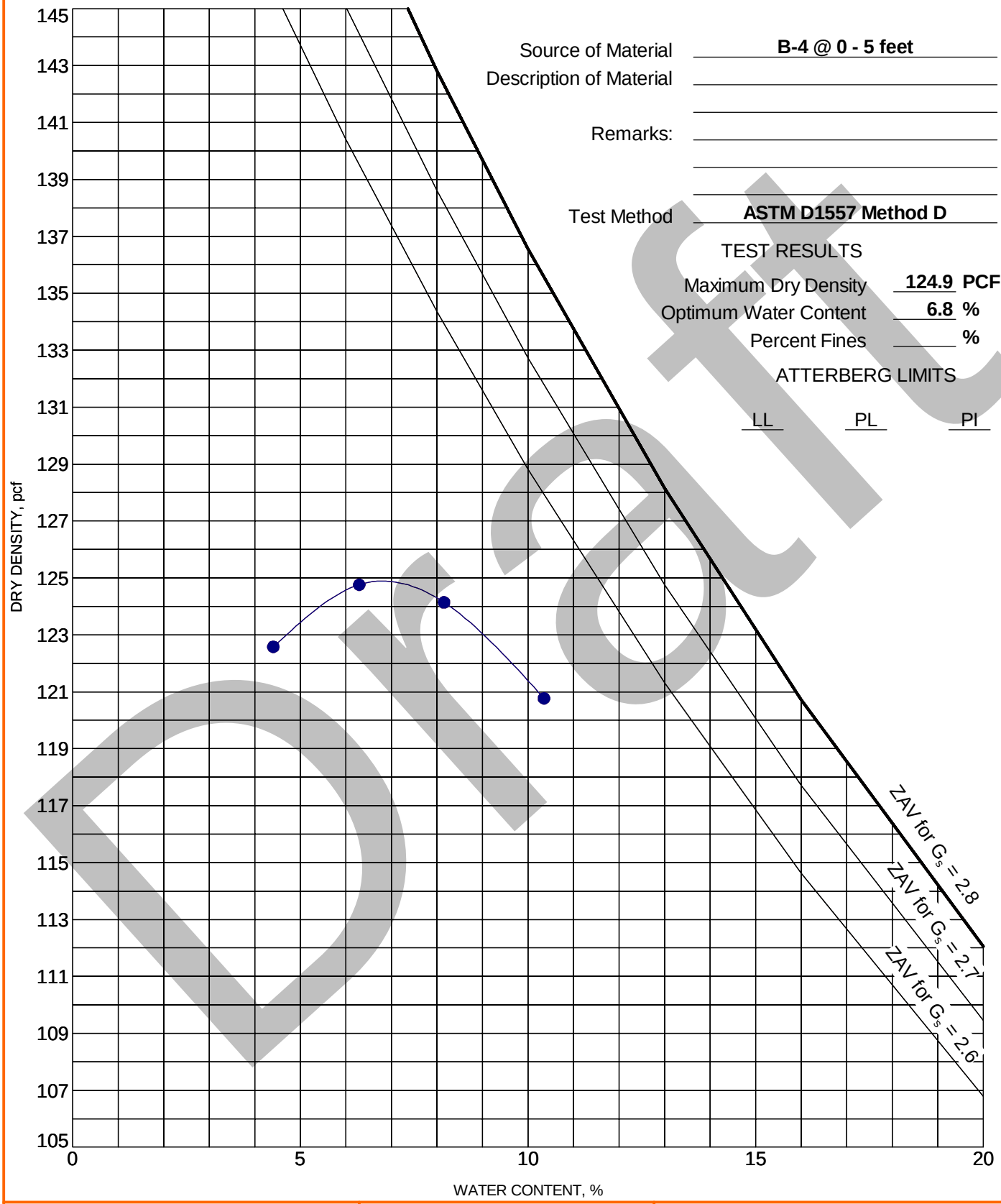
Boring ID	Depth (Ft)	Description		LL	PL	PI	Cc	Cu
B-7	5 - 6.5	Silty sand						

Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
B-7	5 - 6.5	9.5	0.296	0.11		0.0	1.9	77.0	21.1		

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-4 @ 0 - 5 feet**

Description of Material:

Remarks:

Test Method: **ASTM D1557 Method D**

TEST RESULTS

Maximum Dry Density	**124.9**	**PCF**
Optimum Water Content	**6.8**	**%**
Percent Fines		**%**

ATTERBERG LIMITS

LL	PL	PI

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LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/3/22

PROJECT: CarMax- Redlands

SITE: New York St
Redlands, CA

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

PROJECT NUMBER: 60225109

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

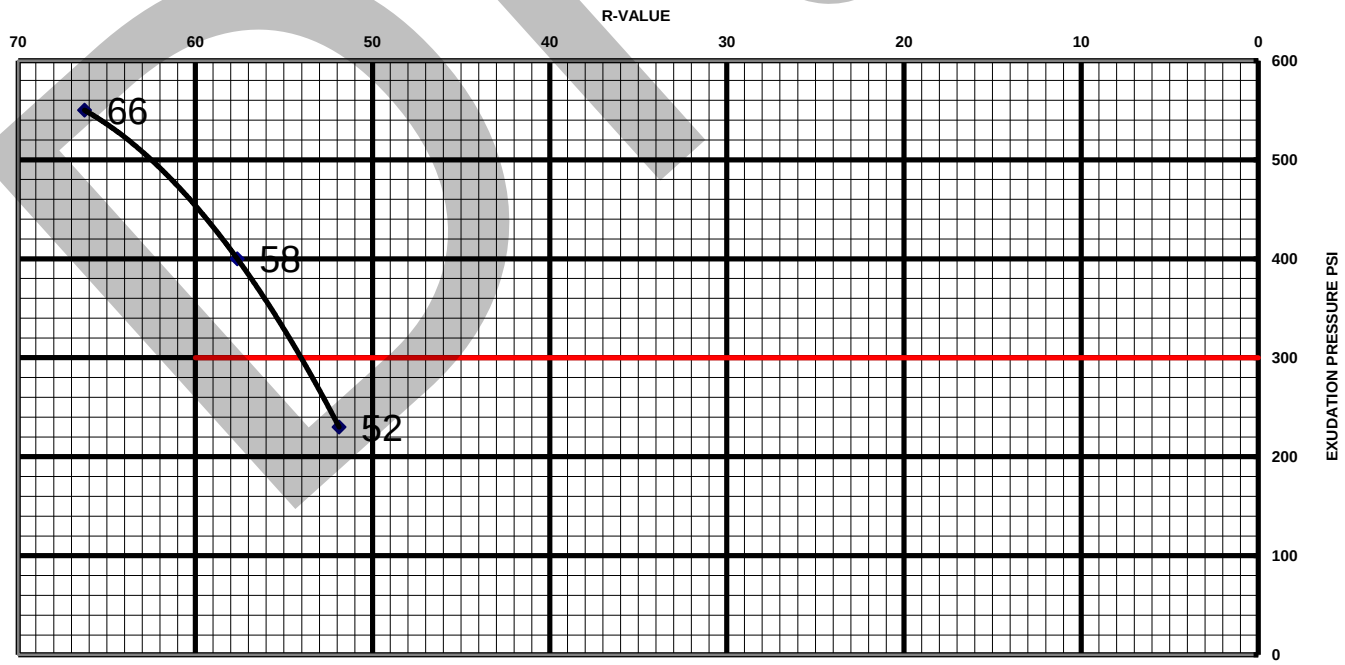
Job No. 60225109
Date. 9/30/2022

LABORATORY RECORD OF TESTS MADE ON BASE, SUBBASE, AND BASEMENT SOILS

CLIENT: **CenterPoint Integrated Solutions, LLC**
PROJECT **Carmax-Redlands**
LOCATION: **Redlands, CA**
R-VALUE # : **B3A**
T.I. :

	A	B	C	D
COMPACTOR AIR PRESSURE P.S.I.	350	350	350	
INITIAL MOISTURE %	1.1	1.1	1.1	
WATER ADDED, ML	80	77	75	
WATER ADDED %	7.7	7.4	7.2	
MOISTURE AT COMPACTION %	8.8	8.5	8.3	
HEIGHT OF BRIQUETTE	2.50	2.47	2.48	
WET WEIGHT OF BRIQUETTE	1052	1049	1054	
DENSITY LB. PER CU.FT.	117.2	118.6	118.9	
STABILOMETER PH AT 1000 LBS.	33	27	20	
2000 LBS.	50	43	33	
DISPLACEMENT	5.10	5.00	4.90	
R-VALUE	52	58	66	
EXUDATION PRESSURE	230	400	550	
THICK. INDICATED BY STAB.	0.00	0.00	0.00	
EXPANSION PRESSURE	0	0	0	
THICK. INDICATED BY E.P.	0.00	0.00	0.00	

EXUDATION CHART



R-Value: **54**

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750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Terracon GeoReport

Client
CenterPoint Integrated Sp;itopms. LLC

Project
CarMax
Redlands, CA

Sample Submitted By: Terracon (60) **Date Received:** 9/28/2022 **Lab No.: 22-0683**

Results of Corrosion Analysis

Sample Number	B-4A
Sample Location	B-4
Sample Depth (ft.)	--
pH Analysis, ASTM G 51	7.61
Water Soluble Sulfate (SO4), ASTM C 1580 (percent %)	0.01
Sulfides, AWWA 4500-S D, (mg/kg)	Nil
Chlorides, ASTM D 512, (mg/kg)	80
Red-Ox, ASTM G 200, (mV)	+726
Total Salts, AWWA 2540, (mg/kg)	301
Resistivity, ASTM G 57, (ohm-cm)	13580

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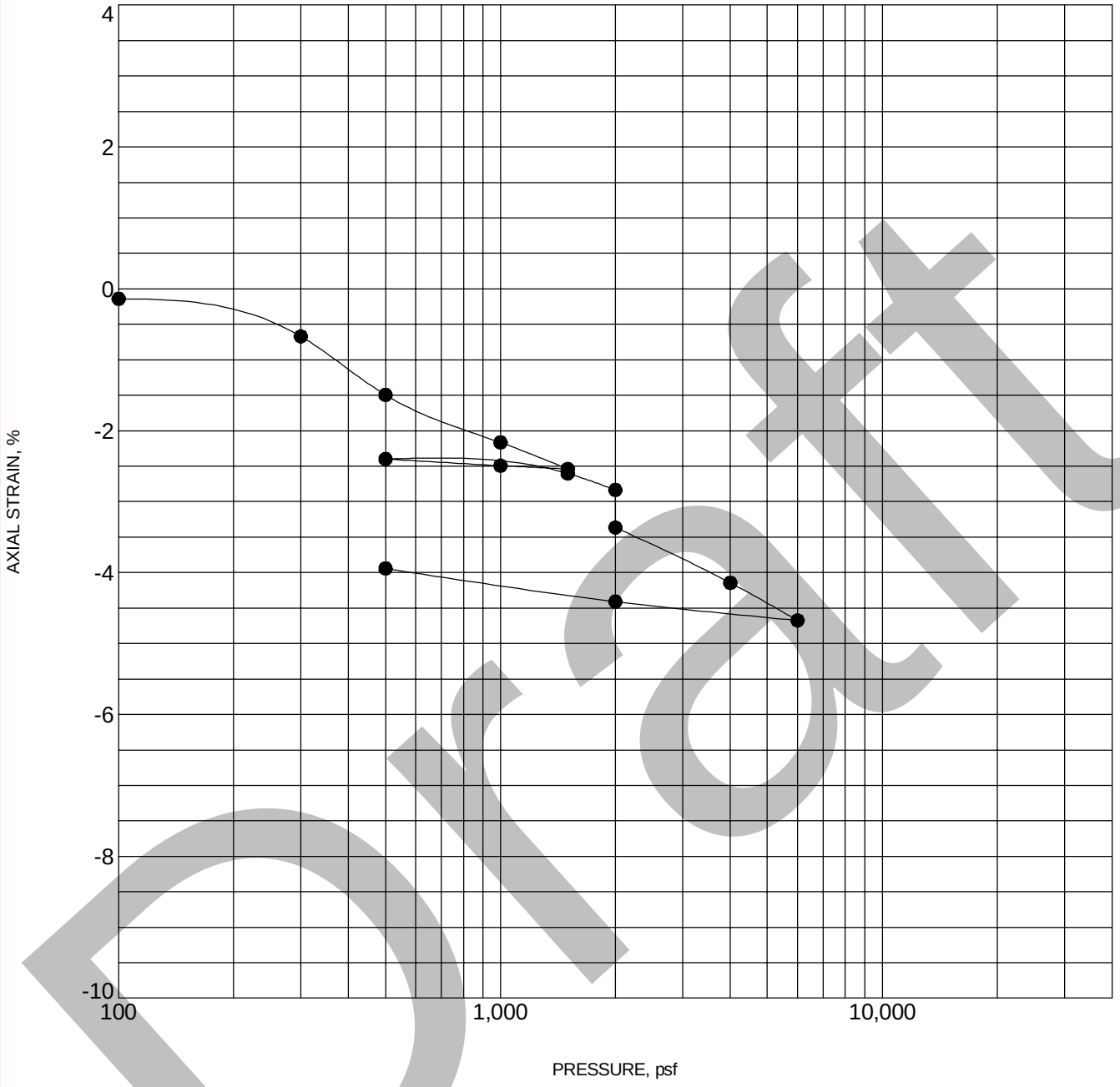
Analyzed By:
Nathan Campo
Engineering Technician II

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-8	5 - 6.5 ft	Silty sand	91	9.5

NOTES:

PROJECT: CarMax- Redlands

PROJECT NUMBER: 60225109

SITE: New York St
Redlands, CA

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

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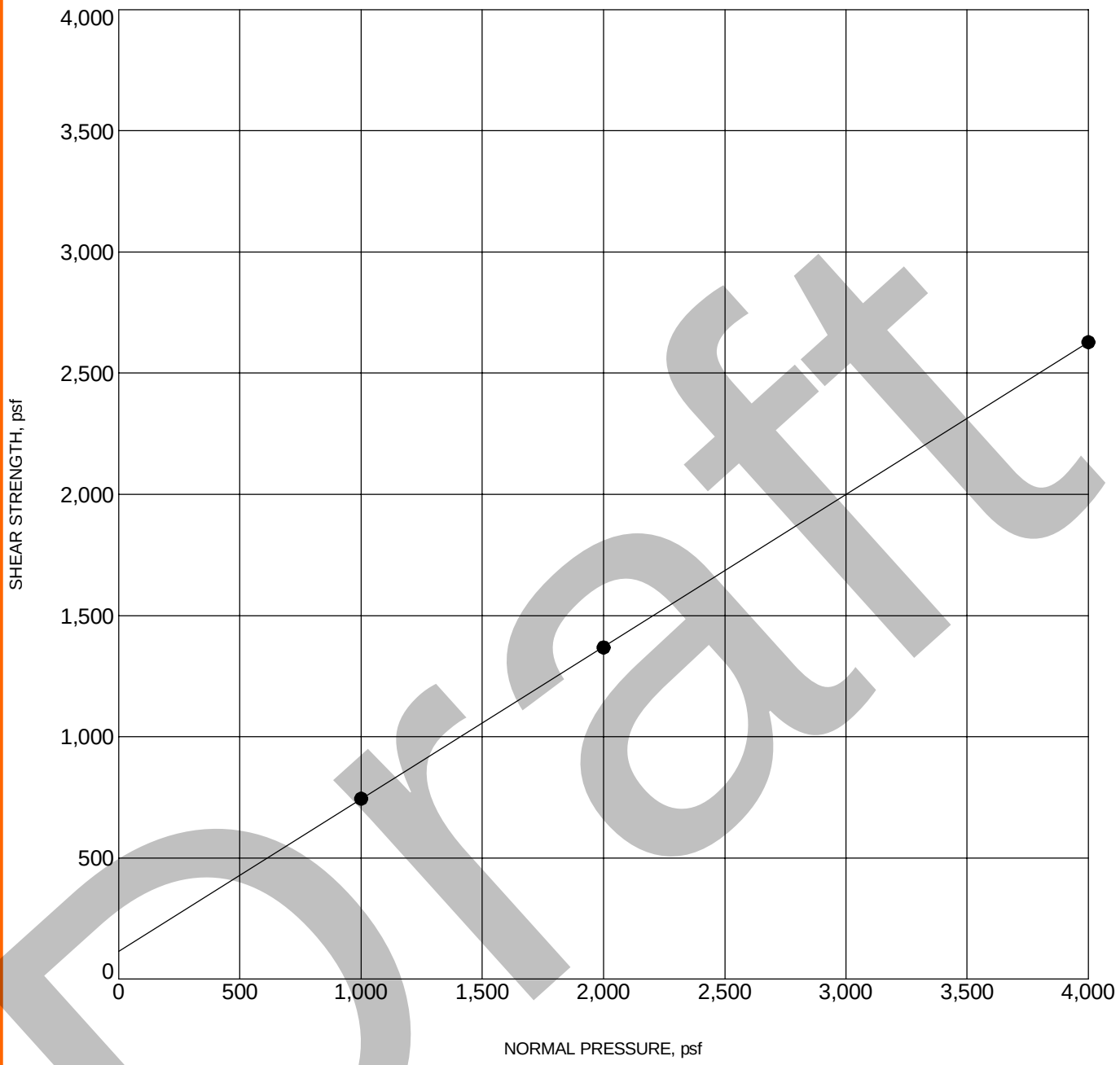
DIRECT SHEAR TEST ASTM D3080



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Specimen Identification		Classification	γ_d, pcf	WC,%	c, psf	$\phi°$
● B-10	2.5ft	Silty sand (SM)	105	0	114	32

PROJECT: CarMax- Redlands

SITE: New York St
Redlands, CA

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

PROJECT NUMBER: 60225109

CLIENT: CenterPoint Integrated Solutions, LLC
Lakewood, CO

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_DIRECT_SHEAR 60225109 CARMAX- REDLANDS.GPJ TERRACON_DATATEMPLATE.GDT 10/4/22

SUPPORTING INFORMATION

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UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

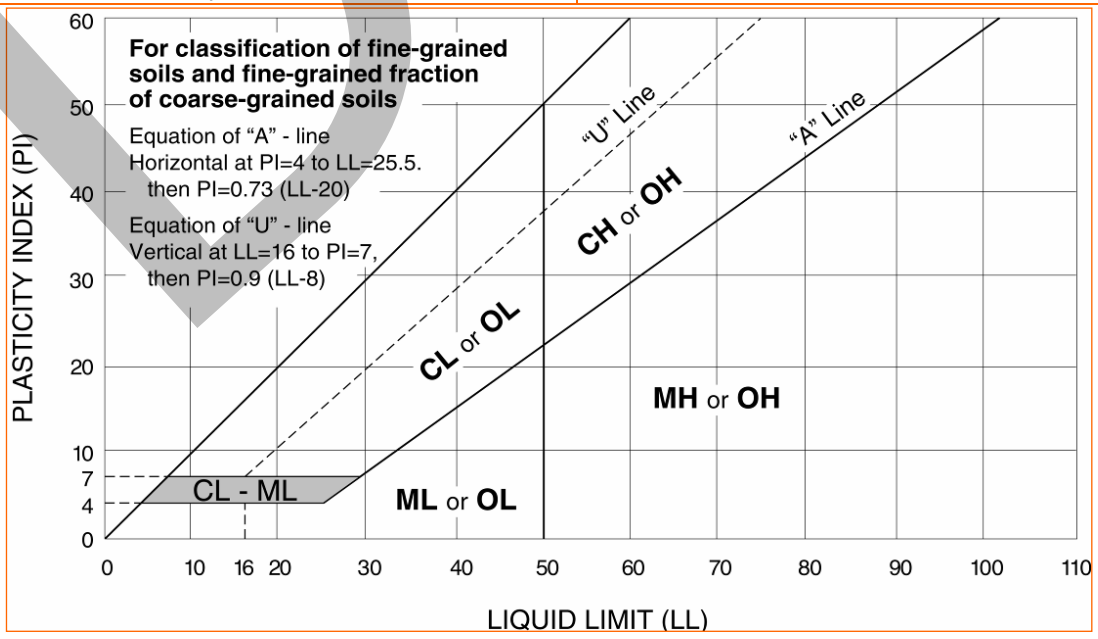
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



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GENERAL NOTES

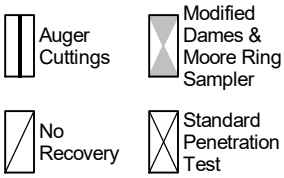
DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

CarMax- Redlands ■ Redlands, CA

Terracon Project No. 60225109

Terracon GeoReport

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
UC	**Unconfined Compressive Strength**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

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