This Page Intentionally Left Blank.

Hydrology and Hydraulics

for

DPC REDLANDS

Redlands, CA

SEPTEMBER 2023 | PRELIMINARY SUBMITTAL

Prepared By:

Kimley»Horn

Contents

Figures

Tables

INTRODUCTION

PROJECT DESCRIPTION AND PURPOSE

This project is proposing to develop an existing vacant 12.80-acre site, to a full build-out condition consisting of mixed residential and commercial land uses. The overall affected drainage area will be a 12.80-acre site. The project consists of 10 residential buildings and 1 commercial buildings, with at-grade and subsurface 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 at the Southwest Corner of Tennessee Street and West Lugonia Avenue.

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 12.80-acre lot. The existing site is 100% pervious. The existing topography drains from the southeast to the northwest corner of the site (elevations ranging from 1294 to 1277). Overland flows continue to sheet flow across Tennessee Street and enters a culvert parallel to Foothill Freeway by a curb cut. Flows discharge into Santa Ana River Reach 5. Refer to the Existing Hydrology Exhibits in **Appendix D.**

PROPOSED SITE (POST-DEVELOPMENT) CONDITIONS

The project site will be delineated into 2 major drainage areas (DA). The DAs will capture on-site storm runoff and convey water to various on-site inlets throughout the site. These flows will be diverted to two onsite proprietary underground infiltration systems that will serve as the water quality facilities. Each infiltration system is outfitted with an orifice downstream. The water captured in the detention system will work in conjunction with proposed infiltration basins which will serve as the water quality infiltration BMPs. They will retain the 100-year storm 24 hour event so the ultimate post construction stormwater flow is no more than the pre-construction stormwater flow. Refer to the Final Water Quality Management Plan for water quality calculations and documentation. The underground infiltration/detention system was delineated based on the proposed grading.

There is no existing stormwater infrastructure for the project to connect to. To bring the stormwater to grade, a proprietary pump is included in the design at the western boundary of the site to bring stormwater to grade. As it is in the existing condition, stormwater will flow offsite across Tennessee Street, entering the culvert parallel to Foothill Freeway by a curb cut. 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, 1-hr storm precipitation depth of 1.16 inches was used in the storm water flow calculations. The 100 year, 24-hr storm event 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 southwest. The project site is incorporated in the Cucamonga Creek Watershed that ultimately discharges into the Santa Ana River.

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 special development.

GROUNDWATER

Groundwater was not encountered during the Geotechnical field investigation prepared by Petra Geosciences Inc. The maximum depth explored was approximately 51.5 feet. The site's historical groundwater is currently unknown but anticipated to be approximately 95 feet below the ground surface. Additional information can be found in the Geotechnical Evaluation Report by Petra Geosciences dated February 15, 2022. (Project Number 21-458).

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 hr 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. Loss rates were calculated using equations found on pages E.7.1 of the Hydrology Manual.

Hydrograph calculations were performed using a computer program developed by AES. AES was used to estimate the 100-year peak flow rates and 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 lag time, maximum watershed loss rates, low lost fraction and an S-graph as specified in the Hydrology Manual. Lag was calculated using the time of concentration calculated from the Rational Method analysis. The maximum watershed loss rate was obtained directly from the rational unit hydrographs that were prepared using the methodology described in Section E of the Hydrology Manual.

The computer program Pond Pack was used to design and model the proposed detention pipe and outlet structure for this project. The stage storage analysis and the hydrographs from AES were imported into PondPack to determine the required detained storage volume to mitigate proposed flows to the predevelopment peak flows. The underground infiltration/detention calculations are included in this report as **Appendix G**.

RESULTS AND CONCLUSIONS

To mitigate the impacts of the onsite post-development peak flows, underground detention systems were designed. Proprietary underground detention system, manufactured by Contech, has been selected for each DMA to store runoff in order to limit the post-development peak flows to the pre-development peak flows. Per San Bernardino water quality design requirements, the two (2) underground detention systems, also have the purpose of allowing storm runoff to infiltrate into the subsurface soils. The analysis performed to size the detention system is summarized above. The analysis performed to size the infiltration system is summarized in the Water Quality Management Report prepared by Kimley-Horn.

Table 1. Rational Method Analysis

Overall:

Analysis	Storm	Total Site Acreage	Peak Flow (cfs)
Existing	100-yr 1-hr	12.8	13.02 (Projected for area)
Proposed	100-yr 1-hr	11.8	50.04

Table 2. Pre Development vs Post Development Summary

Analysis	DMA 1	DMA 2	Total Proposed Prior to Underground Vault and Orifice	Existing	Total Proposed Post Underground Vaults and Orifices
DMA Area (AC)	6.5	5.3	11.8	12.80	11.8
Peak Flows (cfs)	27.71	22.33	50.04	13.02	12.47

The detention system for DMA 1 is designated to attenuate its peak flow to less the pre-development flow of 6.61 cfs. The infiltration/detention tank provides 41,670 cf of storage with 900 linear feet of 96" chambers. The peak flows discharge through a 12" orifice @ max of 5.82 cfs.

The detention system for DMA 2 is designated to attenuate its peak flow to less than the pre-development flow of 5.39 cfs. The infiltration/detention tank provides 32,615 cf of storage with 690 linear feet of 96" chambers. The surface run-off discharges through a 12" orifice @ max of 5.38 cfs.

With the infiltration systems also functioning as detention systems, the proposed development will not have an impact on the City of Redlands master stormwater drainage. The proposed peak flows leaving the site will be 11.2 cfs.

Table 3. Infiltration and Detention System Selection

DMA No.	Selected Detention System	Selected Infiltration System[1]	Peak Storage Volume Provided (CF)	Peak Flow With Mitigation (CFS)
DMA 1	Infiltration Vault (RV-1)	Infiltration Vault (RV-1)	41,670	5.82
DMA 2	Infiltration Vault (RV-2)	Infiltration Vault (RV-2)	32,615	5.38

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 drain pipes utilizing Flowmaster, a software program developed by Bentley. The software utilizes Manning's equation to determine acceptable friction slopes for design. An allowable friction slope of 0.50% was used to keep the hydraulic grades below ground surface. Pipe sizing calculations will also performed for the storm drain system within the public streets and the allowable friction slope was set at the lowest slope of each respective size.

Inlet sizing calculations will be provided below to show the max allowable CFS of each type of inlet. The drop inlets are designed to have a maximum ponding depth of 6 inches and will drain without inundating the adjacent finish floor in the event of onsite storm drain failure. The freeboard at each inlet in a sump condition will be illustrated in the inlet calculations located in **Appendix G**. Each inlet on the project will be adequately sized, refer to Hydrology Exhibit in **Appendix D** to see flow per inlet. Calculations will be performed to show that each building is situated 1 ft above the 100 year 1 hour storm event and will not inundate.

APPENDIX A

NOAA ATLAS 14

NOAA Atlas 14, Volume 6, Version 2
Location name: Redlands, California, USA*
Latitude: 34.072°, Longitude: -117.1983°
Elevation: 1287.05 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	**0.098** (0.081-0.118)	**0.126** (0.105-0.153)	**0.164** (0.136-0.200)	**0.196** (0.161-0.241)	**0.240** (0.190-0.305)	**0.274** (0.213-0.356)	**0.310** (0.235-0.413)	**0.347** (0.256-0.476)	**0.399** (0.282-0.571)	**0.440** (0.300-0.652)
10-min	**0.140** (0.116-0.170)	**0.181** (0.150-0.220)	**0.235** (0.195-0.287)	**0.281** (0.231-0.345)	**0.344** (0.273-0.437)	**0.393** (0.305-0.511)	**0.444** (0.337-0.592)	**0.498** (0.366-0.682)	**0.572** (0.404-0.818)	**0.631** (0.430-0.935)
15-min	**0.169** (0.141-0.205)	**0.219** (0.182-0.266)	**0.285** (0.236-0.347)	**0.340** (0.279-0.417)	**0.416** (0.330-0.528)	**0.475** (0.369-0.617)	**0.537** (0.407-0.715)	**0.602** (0.443-0.825)	**0.691** (0.488-0.989)	**0.763** (0.520-1.13)
30-min	**0.251** (0.209-0.305)	**0.325** (0.270-0.395)	**0.423** (0.351-0.516)	**0.505** (0.415-0.620)	**0.618** (0.490-0.785)	**0.706** (0.549-0.918)	**0.798** (0.605-1.06)	**0.894** (0.659-1.23)	**1.03** (0.725-1.47)	**1.13** (0.772-1.68)
60-min	**0.365** (0.304-0.444)	**0.472** (0.393-0.574)	**0.615** (0.510-0.750)	**0.733** (0.603-0.901)	**0.898** (0.713-1.14)	**1.03** (0.798-1.33)	**1.16** (0.879-1.55)	**1.30** (0.957-1.78)	**1.49** (1.05-2.14)	**1.65** (1.12-2.44)
2-hr	**0.520** (0.433-0.632)	**0.668** (0.555-0.812)	**0.863** (0.716-1.05)	**1.02** (0.842-1.26)	**1.25** (0.991-1.59)	**1.42** (1.10-1.85)	**1.60** (1.21-2.13)	**1.78** (1.31-2.45)	**2.04** (1.44-2.92)	**2.24** (1.53-3.32)
3-hr	**0.640** (0.533-0.777)	**0.820** (0.681-0.996)	**1.06** (0.876-1.29)	**1.25** (1.03-1.54)	**1.52** (1.21-1.93)	**1.73** (1.34-2.25)	**1.94** (1.47-2.59)	**2.16** (1.59-2.97)	**2.47** (1.74-3.53)	**2.71** (1.84-4.01)
6-hr	**0.899** (0.748-1.09)	**1.15** (0.955-1.40)	**1.48** (1.23-1.80)	**1.75** (1.44-2.15)	**2.12** (1.68-2.69)	**2.40** (1.87-3.12)	**2.69** (2.04-3.59)	**2.99** (2.20-4.10)	**3.40** (2.40-4.87)	**3.72** (2.54-5.51)
12-hr	**1.20** (0.998-1.46)	**1.54** (1.28-1.87)	**1.98** (1.64-2.42)	**2.34** (1.93-2.88)	**2.84** (2.25-3.61)	**3.21** (2.50-4.17)	**3.59** (2.72-4.79)	**3.99** (2.94-5.47)	**4.52** (3.19-6.47)	**4.93** (3.36-7.31)
24-hr	**1.61** (1.42-1.85)	**2.08** (1.84-2.40)	**2.69** (2.37-3.11)	**3.19** (2.79-3.71)	**3.86** (3.27-4.64)	**4.37** (3.63-5.37)	**4.89** (3.96-6.16)	**5.42** (4.27-7.01)	**6.14** (4.64-8.27)	**6.69** (4.89-9.33)
2-day	**1.99** (1.76-2.29)	**2.60** (2.30-3.00)	**3.41** (3.01-3.95)	**4.08** (3.57-4.75)	**4.98** (4.22-6.00)	**5.67** (4.71-6.98)	**6.38** (5.17-8.04)	**7.11** (5.61-9.21)	**8.10** (6.13-10.9)	**8.88** (6.49-12.4)
3-day	**2.15** (1.90-2.48)	**2.86** (2.53-3.30)	**3.80** (3.35-4.39)	**4.57** (4.00-5.33)	**5.65** (4.78-6.80)	**6.48** (5.38-7.97)	**7.35** (5.95-9.25)	**8.25** (6.50-10.7)	**9.49** (7.18-12.8)	**10.5** (7.66-14.6)
4-day	**2.32** (2.05-2.67)	**3.11** (2.75-3.58)	**4.16** (3.67-4.81)	**5.04** (4.41-5.87)	**6.26** (5.30-7.54)	**7.22** (5.99-8.87)	**8.21** (6.65-10.3)	**9.25** (7.30-12.0)	**10.7** (8.10-14.4)	**11.9** (8.67-16.5)
7-day	**2.68** (2.38-3.09)	**3.62** (3.20-4.18)	**4.88** (4.31-5.65)	**5.94** (5.19-6.92)	**7.40** (6.27-8.92)	**8.56** (7.10-10.5)	**9.76** (7.90-12.3)	**11.0** (8.68-14.3)	**12.8** (9.66-17.2)	**14.2** (10.4-19.8)
10-day	**2.91** (2.57-3.35)	**3.94** (3.49-4.55)	**5.34** (4.71-6.18)	**6.51** (5.69-7.59)	**8.13** (6.89-9.80)	**9.42** (7.81-11.6)	**10.7** (8.71-13.5)	**12.2** (9.58-15.7)	**14.1** (10.7-19.0)	**15.7** (11.5-21.8)
20-day	**3.59** (3.18-4.14)	**4.91** (4.35-5.67)	**6.70** (5.91-7.76)	**8.20** (7.18-9.57)	**10.3** (8.73-12.4)	**12.0** (9.94-14.7)	**13.7** (11.1-17.3)	**15.6** (12.3-20.1)	**18.1** (13.7-24.4)	**20.2** (14.8-28.1)
30-day	**4.22** (3.74-4.87)	**5.79** (5.12-6.68)	**7.92** (6.99-9.16)	**9.71** (8.50-11.3)	**12.2** (10.4-14.7)	**14.2** (11.8-17.5)	**16.3** (13.2-20.6)	**18.6** (14.6-24.0)	**21.7** (16.4-29.2)	**24.2** (17.7-33.7)
45-day	**5.05** (4.47-5.82)	**6.91** (6.11-7.98)	**9.45** (8.33-10.9)	**11.6** (10.1-13.5)	**14.6** (12.4-17.6)	**17.0** (14.1-20.9)	**19.5** (15.8-24.6)	**22.2** (17.5-28.7)	**26.0** (19.7-35.0)	**29.0** (21.2-40.4)
60-day	**5.91** (5.23-6.81)	**8.05** (7.12-9.29)	**11.0** (9.67-12.7)	**13.4** (11.7-15.7)	**16.9** (14.3-20.4)	**19.7** (16.3-24.2)	**22.6** (18.3-28.5)	**25.7** (20.3-33.3)	**30.0** (22.7-40.5)	**33.6** (24.6-46.8)

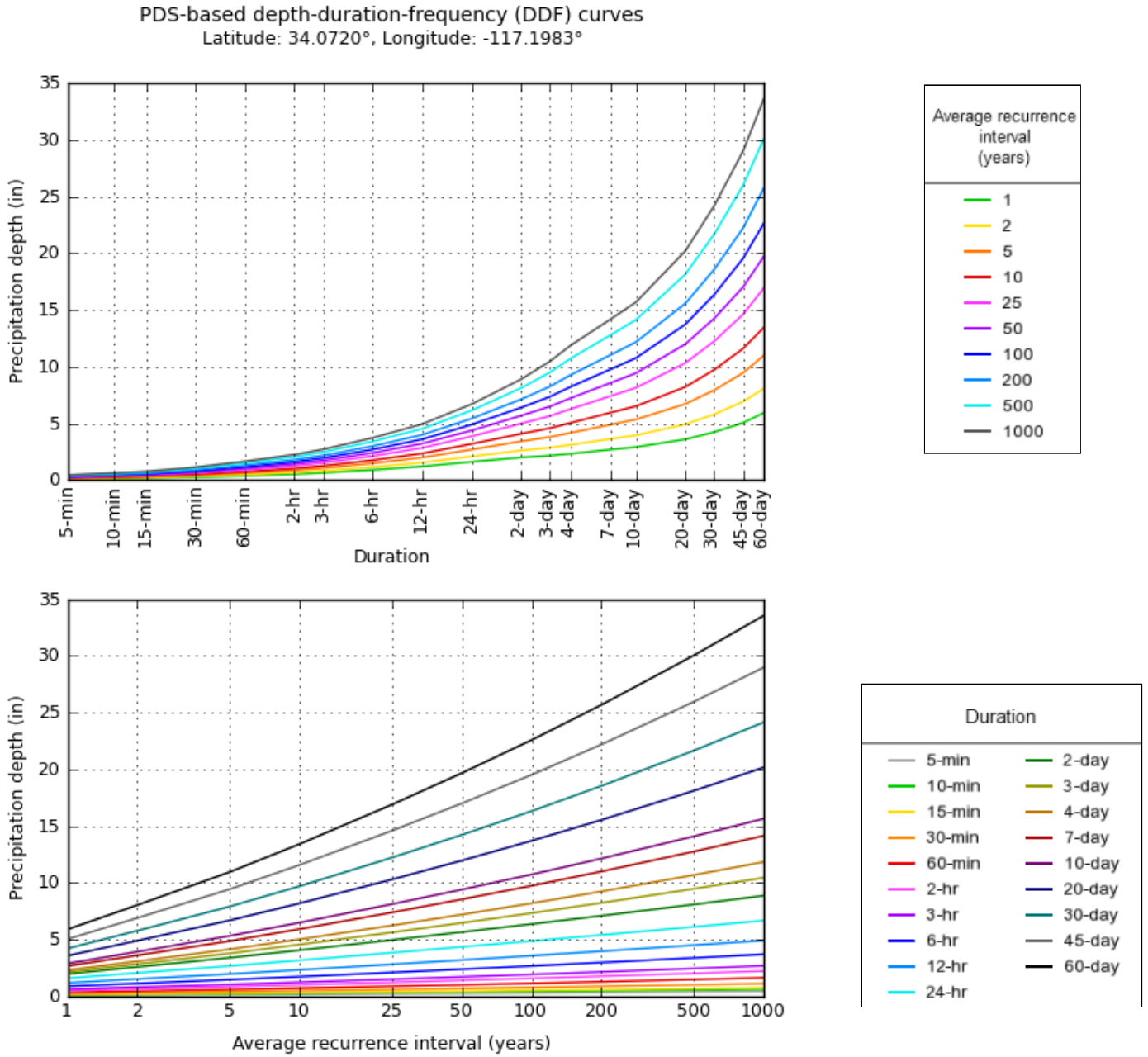
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



NOAA Atlas 14, Volume 6, Version 2

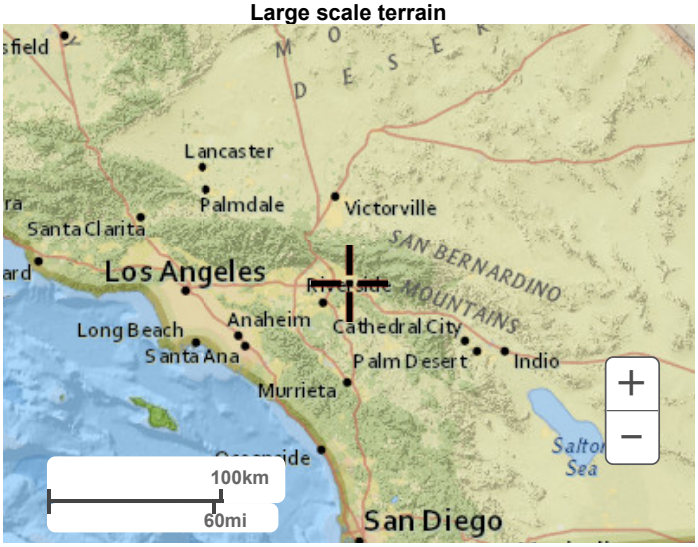
Created (GMT): Thu Aug 11 18:22:48 2022

Back to Top

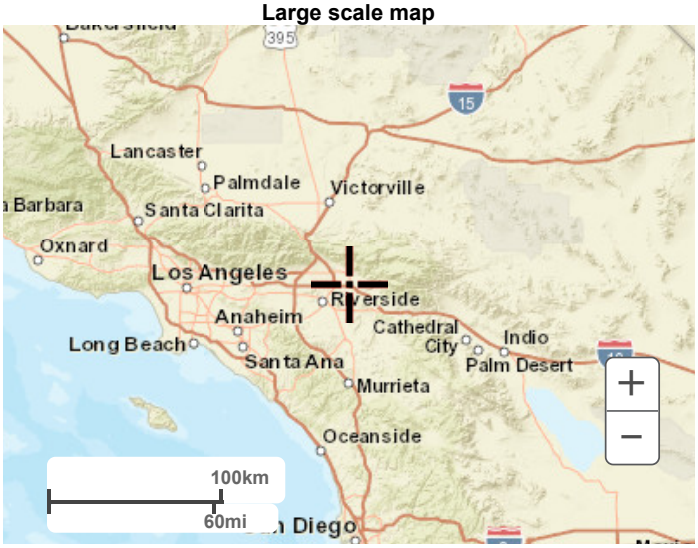
Maps & aerials

Small scale terrain

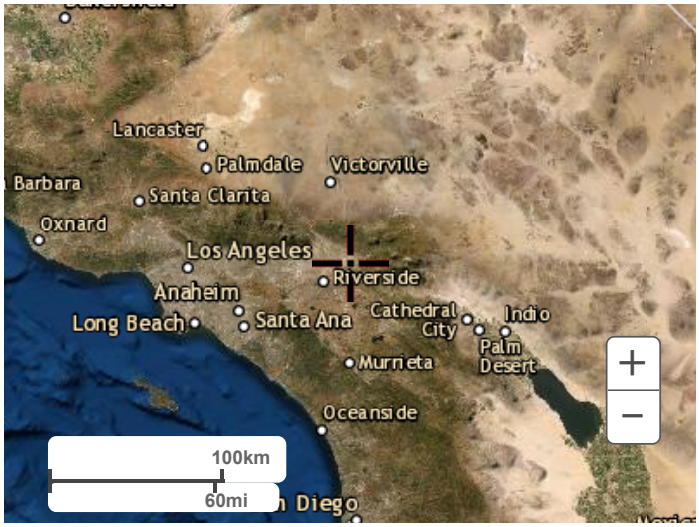
Large scale terrain



Large scale map



Large scale aerial



Back to Top

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

SOIL TYPE

Map Scale: 1:2,340 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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 13, Sep 13, 2021

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

Date(s) aerial images were photographed: Nov 11, 2020—Nov 15, 2020

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
HbA	Hanford sandy loam, 0 to 2 percent slopes	23.7	81.6%
TuB	Tujunga loamy sand, 0 to 5 percent slopes	5.3	18.4%
Totals for Area of Interest		**29.0**	**100.0%**

San Bernardino County Southwestern Part, California

HbA—Hanford sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2y8tv
Elevation: 790 to 1,610 feet
Mean annual precipitation: 10 to 19 inches
Mean annual air temperature: 65 to 65 degrees F
Frost-free period: 345 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Hanford

Setting

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

Typical profile

A - 0 to 12 inches: sandy loam
C - 12 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Minor Components

Hanford, steeper slopes

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Greenfield, sandy loam

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed

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

Data Source Information

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 13, Sep 13, 2021

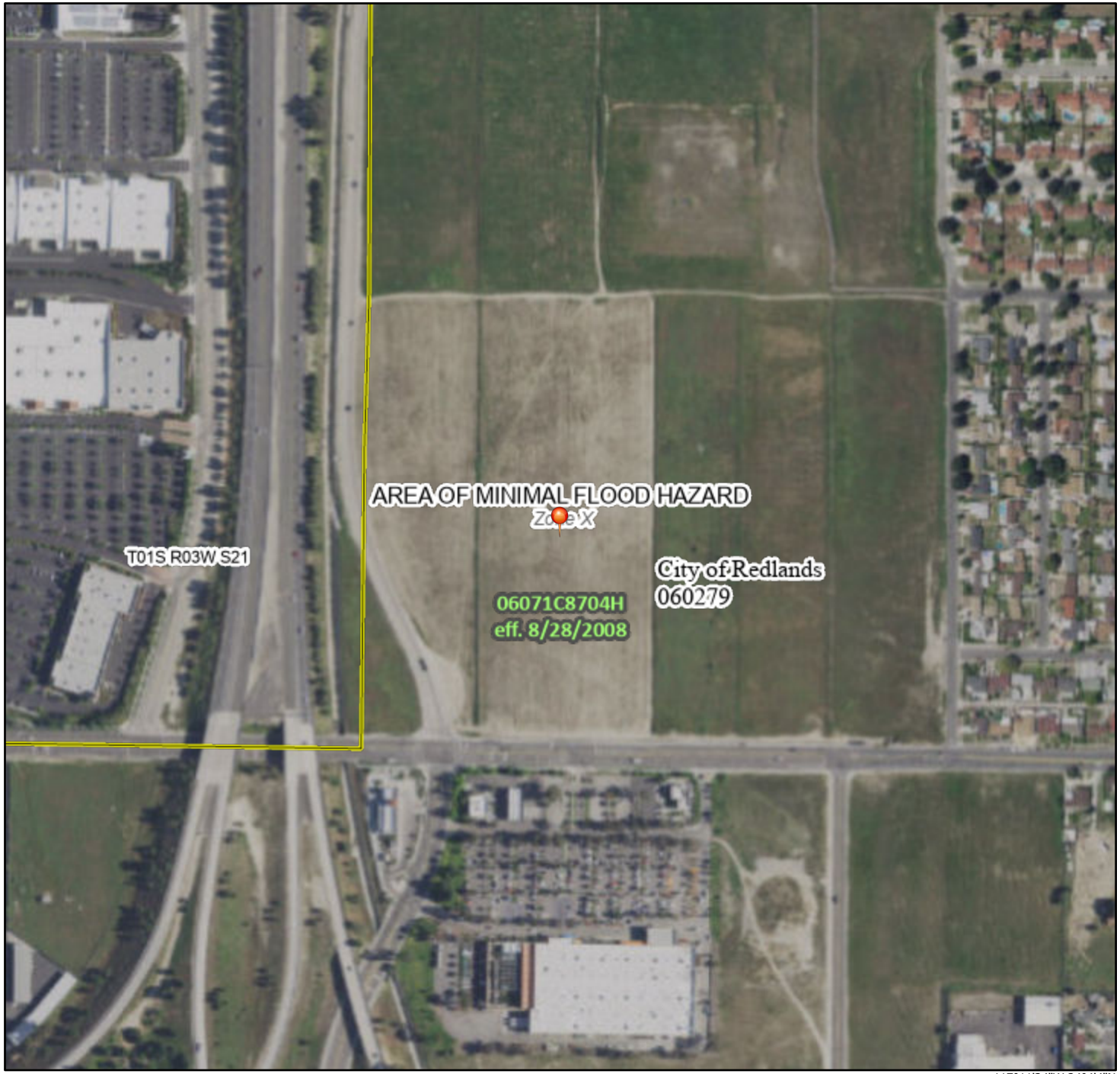
APPENDIX C

FIRMette

National Flood Hazard Layer FIRMette

FEMA

117°12'12"W 34°4'34"N



117°11'34"W 34°4'4"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 / 17.5 Cross Sections with 1% Annual Chance / 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 8/12/2022 at 3:08 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 MAPS

EXISTING FLOW DIRECTION

PROPOSED SURFACE FLOW DIRECTION

PROPOSED STORM DRAIN PIPE FLOW DIRECTION

DRAINAGE MANAGEMENT AREA LABEL

LEGEND

CENTER LINE

PROPERTY LINE

EASEMENT LINE

LIMITS OF DRAINAGE AREA AND APPROXIMATE LIMITS OF DISTURBANCE

LONGEST FLOW PATH

EXISTING FLOW DIRECTION

DMA ID / ACRES — DRAINAGE MANAGEMENT AREA LABEL

FLOOD ZONE

FLOOD ZONE X : AREA OF MINIMAL FLOOD HAZARD

S0°18'33"E 717.50'

N00°18'33"W NODE 100 (1293.62 FS) 1280.50'

S0°18'33"E 563.00'

FLOW PATH = 300'
S = 1.90%

NODE 101
(1287.91FS)

FLOW PATH = 755'
S = 1.40%

DMA 1
12.80

S89°41'27"W 770.55'

N00°18'36"W 1308.75'

1071.75'

PROPERTY LINE

N89°47'47"W 824.63'

N89°47'47"W 329.65'

N01°08'11"E 336.47'

NODE 102
(1276.75 FS)

R=1200.00'
Δ=27°26'37"
L=574.78'

N00°19'24"W 1307.59'

TENNESSEE STREET

N89°35'59"E 307.06'

N0°23'35"E 297'

N89°35'59"W 317.22'

R=30.00'
L=42.48'
Δ=80°58'13"

177.08'

R=894.00'
Δ=17°40'14"
L=275.72'

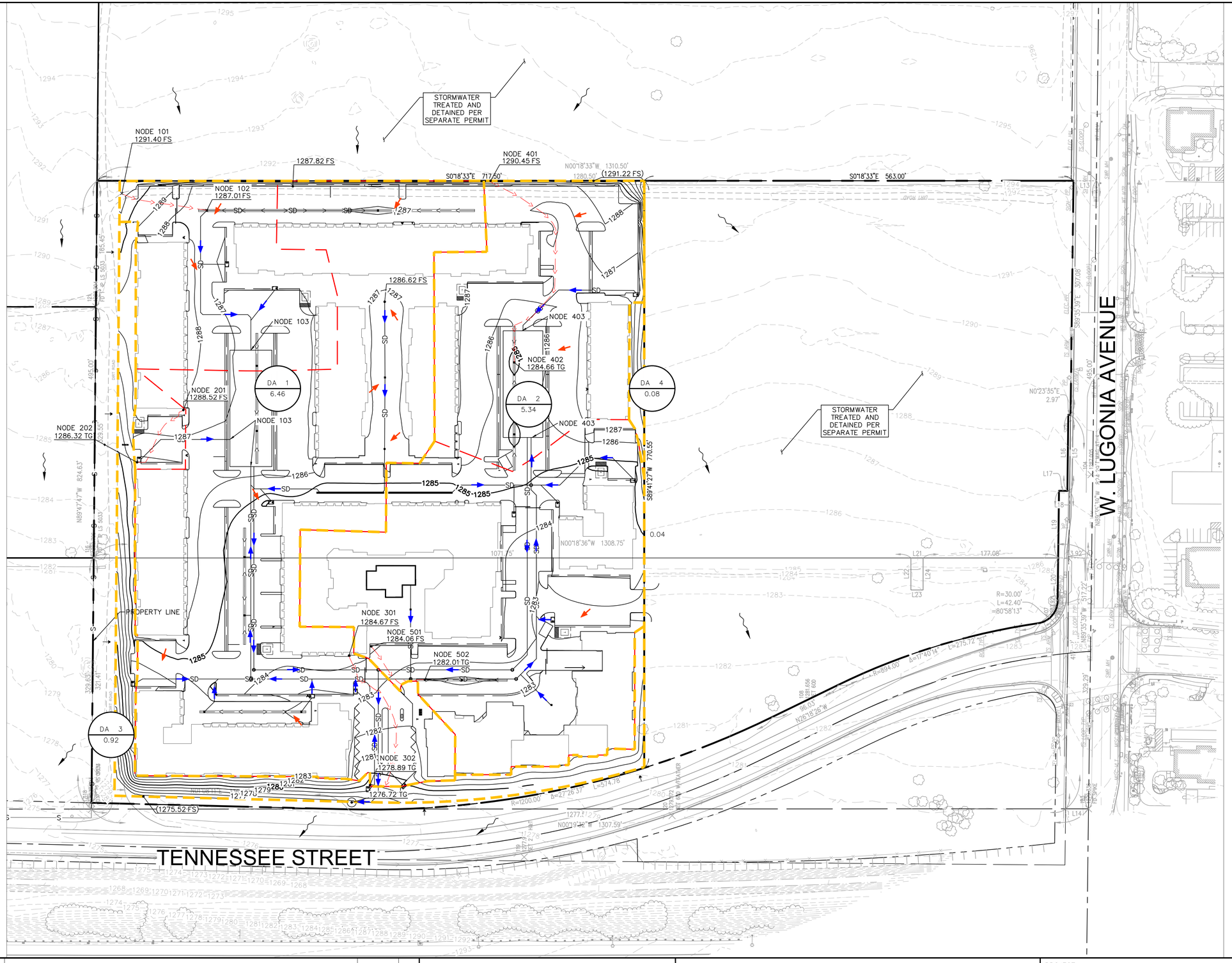
N26°18'26"W 96.53'

339.29'

W. LUGONIA AVENUE

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120



LEGEND

- CENTER LINE
- PROPERTY LINE
- EASEMENT LINE
- LIMITS OF DRAINAGE AREA AND APPROXIMATE LIMITS OF DISTURBANCE
- DRAINAGE SUB AREA DELINEATION
- PROPOSED STORM DRAIN PIPE
- PROPOSED STORM DRAIN INLET
- LONGEST FLOW PATH
- EXISTING FLOW DIRECTION
- PROPOSED SURFACE FLOW DIRECTION
- PROPOSED STORM DRAIN PIPE FLOW DIRECTION
- DRAINAGE MANAGEMENT AREA LABEL (DA ID / ACRES)

FLOOD ZONE

FLOOD ZONE X : AREA OF MINIMAL FLOOD HAZARD

DMA ID	% IMPERVIOUS	AREA (ACRES)
DA-1	93.1%	6.46
DA-2	93.3%	5.34
DA-3	20%	0.92
DA-4	60%	0.08

No.	REVISIONS	DATE	BY

Kimley»Horn

3880 LEMON ST. RIVERSIDE, CA 92501
PHONE: 760-565-5103
WWW.KIMLEY-HORN.COM

PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT:
DPC REDLANDS MARKETPLACE
REDLANDS, CALIFORNIA
APN'S 0167-171-007, 014

DRAWING NAME:
PROPOSED HYDROLOGY MAP

ISSUE: CONCEPTUAL
DATE: 2022-08-31
CHECKED: DRAWN:
DRAWING FILE:
PROJECT NO.:
SCALE: AS SHOWN

SHEET NUMBER

K:\ORA_LDEV\194423001 - DPC REDLANDS\CAD\EXHIBITS\REPORTS\DPC REDLANDS PROPOSED HYDROLOGY EXHIBIT.DWG 9/26/2023 9:04:23 AM

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:



 ************************* DESCRIPTION OF STUDY *************************
* PROPOSED 10 YEAR ANALYSIS                                             *
* DPC REDLANDS                                                          *
* DMA 1                                                                 *
 *************************************************************************

  FILE NAME: DPC100PR.DAT
  TIME/DATE OF STUDY: 18:52 02/02/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 0.7330

  *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

+-------------------------------------------------------------------------+
| INITIAL SUB-AREA DMA 1A: 0.5 AC                                         |
|                                                                         |
|                                                                         |
+-------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  ELEVATION DATA: UPSTREAM(FEET) =   1290.77  DOWNSTREAM(FEET) =   1287.83

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.255
  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        0.50      0.98     0.100    32    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.42
  TOTAL AREA(ACRES) =      0.50   PEAK FLOW RATE(CFS) =      1.42

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.255
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.86      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) =    0.86      SUBAREA RUNOFF(CFS) =    2.44
  EFFECTIVE AREA(ACRES) =      1.36   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       3.87

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1283.83  DOWNSTREAM(FEET) =  1282.43
  FLOW LENGTH(FEET) =   279.22   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.69
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.87
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =    5.99
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     374.22 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.99
  RAINFALL INTENSITY(INCH/HR) =   2.92
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.36
  TOTAL STREAM AREA(ACRES) =       1.36
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.87

+----------------------------------------------------------------------------+
| INTIAL SUB-AREA DMA 1B 0.16 AC                                             |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    99.75
  ELEVATION DATA: UPSTREAM(FEET) =   1289.16  DOWNSTREAM(FEET) =   1285.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.255
  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        0.16      0.98     0.100    32    5.00
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1280.73  DOWNSTREAM(FEET) =  1280.10
  FLOW LENGTH(FEET) =   125.68   MANNING'S N =  0.011
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.69
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.45
  PIPE TRAVEL TIME(MIN.) =   0.78    Tc(MIN.) =    5.78
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    103.00 =     225.43 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.78
  RAINFALL INTENSITY(INCH/HR) =   2.98
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.97
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.16
  TOTAL STREAM AREA(ACRES) =       0.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.45

+--------------------------------------------------------------------------+
| INITIAL SUB-AREA DMA 1C: 0.5 AC                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   219.48
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   1284.59  DOWNSTREAM(FEET) =   1278.93

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.459
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.088
  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        4.94      0.98     0.100    32    5.46
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     13.30
  TOTAL AREA(ACRES) =      4.94   PEAK FLOW RATE(CFS) =     13.30

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1274.93  DOWNSTREAM(FEET) =  1271.93
  FLOW LENGTH(FEET) =   598.74   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.39
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.30
  PIPE TRAVEL TIME(MIN.) =   1.56    Tc(MIN.) =    7.02
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    103.00 =     818.22 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.02
  RAINFALL INTENSITY(INCH/HR) =   2.66
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.94
  TOTAL STREAM AREA(ACRES) =       4.94
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.30

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.87    5.99    2.921  0.98( 0.10) 0.10       1.4     101.00
```

```
     2        0.45    5.78    2.984  0.97( 0.10) 0.10       0.2     201.00
     3       13.30    7.02    2.656  0.98( 0.10) 0.10       4.9     301.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.62    5.78    2.984  0.98( 0.10) 0.10       5.5     201.00
      2       16.83    5.99    2.921  0.97( 0.10) 0.10       5.7     101.00
      3       17.20    7.02    2.656  0.98( 0.10) 0.10       6.5     301.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.20    Tc(MIN.) =     7.02
  EFFECTIVE AREA(ACRES) =       6.46   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.5
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    103.00 =     818.22 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.5  TC(MIN.) =      7.02
  EFFECTIVE AREA(ACRES) =      6.46  AREA-AVERAGED Fm(INCH/HR)=  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      17.20

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.62    5.78    2.984  0.98( 0.10) 0.10       5.5     201.00
      2       16.83    5.99    2.921  0.97( 0.10) 0.10       5.7     101.00
      3       17.20    7.02    2.656  0.98( 0.10) 0.10       6.5     301.00
============================================================================
============================================================================
  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:
```



```
  FILE NAME: DPC100PR.DAT
  TIME/DATE OF STUDY: 18:27 02/02/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.1600

  *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

+----------------------------------------------------------------------+
| INITIAL SUB-AREA DMA 1A: 0.5 AC                                      |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

**********************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
======================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  ELEVATION DATA: UPSTREAM(FEET) =   1290.77  DOWNSTREAM(FEET) =   1287.83

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.152
  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        0.50      0.74     0.100    52    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.28
  TOTAL AREA(ACRES) =      0.50   PEAK FLOW RATE(CFS) =      2.28

**********************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
======================================================================
  MAINLINE Tc(MIN.) =    5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.152
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.86      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) =    0.86      SUBAREA RUNOFF(CFS) =    3.93
  EFFECTIVE AREA(ACRES) =      1.36   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       6.22

**********************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1283.83  DOWNSTREAM(FEET) =  1282.43
  FLOW LENGTH(FEET) =   279.22   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.28
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.22
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =    5.88
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     374.22 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.88
  RAINFALL INTENSITY(INCH/HR) =   4.67
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.36
  TOTAL STREAM AREA(ACRES) =       1.36
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.22

+--------------------------------------------------------------------------+
| INTIAL SUB-AREA DMA 1B 0.16 AC                                           |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    99.75
  ELEVATION DATA: UPSTREAM(FEET) =   1289.16  DOWNSTREAM(FEET) =   1285.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.152
  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        0.16      0.74     0.100    52    5.00
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.73
  TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.73

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1280.73  DOWNSTREAM(FEET) =  1280.10
  FLOW LENGTH(FEET) =   125.68   MANNING'S N =  0.011
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.07
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.73
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =    5.68
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    103.00 =     225.43 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.68
  RAINFALL INTENSITY(INCH/HR) =   4.77
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.16
  TOTAL STREAM AREA(ACRES) =       0.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.73

+--------------------------------------------------------------------------+
| INITIAL SUB-AREA DMA 1C: 0.5 AC                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   219.48
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   1284.59  DOWNSTREAM(FEET) =   1278.93

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.459
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.887
  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        4.94      0.74     0.100    52    5.46
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     21.40
  TOTAL AREA(ACRES) =      4.94   PEAK FLOW RATE(CFS) =     21.40

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1274.93  DOWNSTREAM(FEET) =  1271.93
  FLOW LENGTH(FEET) =   598.74   MANNING'S N =  0.011
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.12
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.40
  PIPE TRAVEL TIME(MIN.) =   1.40    Tc(MIN.) =    6.86
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    103.00 =     818.22 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.86
  RAINFALL INTENSITY(INCH/HR) =   4.26
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.94
  TOTAL STREAM AREA(ACRES) =       4.94
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      21.40

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.22    5.88    4.674  0.74( 0.07) 0.10       1.4     101.00
```

```
     2        0.73    5.68    4.771  0.74( 0.07) 0.10       0.2     201.00
     3       21.40    6.86    4.261  0.74( 0.07) 0.10       4.9     301.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       26.75    5.68    4.771  0.74( 0.07) 0.10       5.6     201.00
      2       27.08    5.88    4.674  0.74( 0.07) 0.10       5.8     101.00
      3       27.71    6.86    4.261  0.74( 0.07) 0.10       6.5     301.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.71    Tc(MIN.) =     6.86
  EFFECTIVE AREA(ACRES) =       6.46   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.5
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    103.00 =     818.22 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.5  TC(MIN.) =      6.86
  EFFECTIVE AREA(ACRES) =      6.46  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      27.71

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       26.75    5.68    4.771  0.74( 0.07) 0.10       5.6     201.00
      2       27.08    5.88    4.674  0.74( 0.07) 0.10       5.8     101.00
      3       27.71    6.86    4.261  0.74( 0.07) 0.10       6.5     301.00
================================================================================
================================================================================
  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:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* PROPOSED 10 YEAR ANALYSIS                                             *
* DPC REDLANDS                                                          *
* DMA 2                                                                 *
 *************************************************************************

  FILE NAME: DPC1002.DAT
  TIME/DATE OF STUDY: 18:54 02/02/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 0.7330

  *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    401.00 TO NODE    402.00 IS CODE =  21
-------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   119.96
  ELEVATION DATA: UPSTREAM(FEET) =   1292.80  DOWNSTREAM(FEET) =   1287.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.057
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.902
  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.)
  RESIDENTIAL
  ".4 DWELLING/ACRE"         A        1.96      0.98     0.900    32    6.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      3.57
  TOTAL AREA(ACRES) =      1.96   PEAK FLOW RATE(CFS) =      3.57

*************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  31
-------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1283.00  DOWNSTREAM(FEET) =  1282.19
  FLOW LENGTH(FEET) =   162.10   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.57
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    6.64
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =     282.06 FEET.

*************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 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.) =    6.64
  RAINFALL INTENSITY(INCH/HR) =   2.75
  AREA-AVERAGED Fm(INCH/HR) =  0.88
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.90
  EFFECTIVE STREAM AREA(ACRES) =       1.96
  TOTAL STREAM AREA(ACRES) =       1.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.57

+---------------------------------------------------------------------------+
|                                                                           |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    96.83
  ELEVATION DATA: UPSTREAM(FEET) =   1284.06  DOWNSTREAM(FEET) =   1282.01

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.255
  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        3.38      0.98     0.100    32    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.61
  TOTAL AREA(ACRES) =      3.38   PEAK FLOW RATE(CFS) =      9.61

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1278.01  DOWNSTREAM(FEET) =  1276.76
  FLOW LENGTH(FEET) =   450.11   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.56
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.61
```

```
  PIPE TRAVEL TIME(MIN.) =   1.65    Tc(MIN.) =    6.65
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    103.00 =     546.94 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    6.65
  RAINFALL INTENSITY(INCH/HR) =   2.74
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.38
  TOTAL STREAM AREA(ACRES) =       3.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.61

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.57    6.64    2.745  0.98( 0.88) 0.90       2.0     401.00
      2        9.61    6.65    2.744  0.98( 0.10) 0.10       3.4     501.00

  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       13.18    6.64    2.745  0.98( 0.38) 0.39       5.3     401.00
      2       13.18    6.65    2.744  0.98( 0.38) 0.39       5.3     501.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.18    Tc(MIN.) =     6.65
  EFFECTIVE AREA(ACRES) =       5.34   AREA-AVERAGED Fm(INCH/HR) =  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.39
  TOTAL AREA(ACRES) =        5.3
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    103.00 =     546.94 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.3  TC(MIN.) =      6.65
  EFFECTIVE AREA(ACRES) =      5.34  AREA-AVERAGED Fm(INCH/HR)=  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.394
  PEAK FLOW RATE(CFS)   =      13.18

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	13.18	6.64	2.745	0.98(0.38) 0.39	5.3	401.00
2	13.18	6.65	2.744	0.98(0.38) 0.39	5.3	501.00

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:
```



```
  FILE NAME: DPC1002.DAT
  TIME/DATE OF STUDY: 18:49 02/02/2023
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.1600

  *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    401.00 TO NODE    402.00 IS CODE =  21
-------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   119.96
  ELEVATION DATA: UPSTREAM(FEET) =   1292.80  DOWNSTREAM(FEET) =   1287.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.057
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.592
  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.)
  RESIDENTIAL
  ".4 DWELLING/ACRE"         A        1.96      0.74     0.900    52    6.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      6.92
  TOTAL AREA(ACRES) =      1.96   PEAK FLOW RATE(CFS) =      6.92

*************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  31
-------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1283.00  DOWNSTREAM(FEET) =  1282.19
  FLOW LENGTH(FEET) =   162.10   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.39
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.92
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    6.56
  LONGEST FLOWPATH FROM NODE    401.00 TO NODE    403.00 =     282.06 FEET.

*************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 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.) =    6.56
  RAINFALL INTENSITY(INCH/HR) =   4.38
  AREA-AVERAGED Fm(INCH/HR) =  0.67
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.90
  EFFECTIVE STREAM AREA(ACRES) =       1.96
  TOTAL STREAM AREA(ACRES) =       1.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.92

+---------------------------------------------------------------------------+
|                                                                           |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    96.83
  ELEVATION DATA: UPSTREAM(FEET) =   1284.06  DOWNSTREAM(FEET) =   1282.01

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.152
  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        3.38      0.74     0.100    52    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     15.45
  TOTAL AREA(ACRES) =      3.38   PEAK FLOW RATE(CFS) =     15.45

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1278.01  DOWNSTREAM(FEET) =  1276.76
  FLOW LENGTH(FEET) =   450.11   MANNING'S N =  0.011
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.28
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.45
```

```
  PIPE TRAVEL TIME(MIN.) =   1.42    Tc(MIN.) =    6.42
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    103.00 =     546.94 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 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.) =    6.42
  RAINFALL INTENSITY(INCH/HR) =   4.43
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.38
  TOTAL STREAM AREA(ACRES) =       3.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      15.45

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.92    6.56    4.378  0.74( 0.67) 0.90       2.0     401.00
      2       15.45    6.42    4.434  0.74( 0.07) 0.10       3.4     501.00

  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       22.33    6.42    4.434  0.74( 0.29) 0.39       5.3     501.00
      2       22.17    6.56    4.378  0.74( 0.29) 0.39       5.3     401.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.33    Tc(MIN.) =     6.42
  EFFECTIVE AREA(ACRES) =       5.30   AREA-AVERAGED Fm(INCH/HR) =  0.29
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.39
  TOTAL AREA(ACRES) =        5.3
  LONGEST FLOWPATH FROM NODE    501.00 TO NODE    103.00 =     546.94 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.3  TC(MIN.) =      6.42
  EFFECTIVE AREA(ACRES) =      5.30  AREA-AVERAGED Fm(INCH/HR)=  0.29
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap = 0.390
  PEAK FLOW RATE(CFS)   =      22.33

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	22.33	6.42	4.434	0.74(0.29) 0.39	5.3	501.00
2	22.17	6.56	4.378	0.74(0.29) 0.39	5.3	401.00

END OF RATIONAL METHOD ANALYSIS

APPENDIX F

UNIT HYDROGRAPHS

DMA 1

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

     TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.16 (inches)

     SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
        TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
          1         6.46        6.90       32.(AMC II)     1.328        0.760

     TOTAL AREA (Acres) =      6.46

     AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.092

     AREA-AVERAGED LOW LOSS FRACTION, Y = 0.240
 ===============================================================================
```

DMA 2

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

     TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.16 (inches)

     SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
        TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
          1          5.34        6.90       32.(AMC II)     1.328       0.760

     TOTAL AREA (Acres) =      5.34

     AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.092

     AREA-AVERAGED LOW LOSS FRACTION, Y = 0.240
 ===============================================================================
```

DMA 1

RATIONAL METHOD CALIBRATION COEFFICIENT = 1.38
TOTAL CATCHMENT AREA(ACRES) = 6.46
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.092
LOW LOSS FRACTION = 0.240
TIME OF CONCENTRATION(MIN.) = 6.86
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) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.80
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.16
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.94
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.69
24-HOUR POINT RAINFALL VALUE(INCHES) = 4.89

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 2.88
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = -0.25

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.11	0.0026	0.60	Q	.	.	.	.
0.22	0.0083	0.60	Q	.	.	.	.
0.34	0.0139	0.60	Q	.	.	.	.
0.45	0.0196	0.60	Q	.	.	.	.
0.56	0.0253	0.61	Q	.	.	.	.
0.68	0.0310	0.61	Q	.	.	.	.
0.79	0.0368	0.61	Q	.	.	.	.
0.91	0.0426	0.61	Q	.	.	.	.
1.02	0.0484	0.62	Q	.	.	.	.
1.14	0.0542	0.62	Q	.	.	.	.
1.25	0.0600	0.62	Q	.	.	.	.
1.37	0.0659	0.62	Q	.	.	.	.
1.48	0.0718	0.63	Q	.	.	.	.
1.59	0.0777	0.63	Q	.	.	.	.
1.71	0.0837	0.63	Q	.	.	.	.
1.82	0.0897	0.63	Q	.	.	.	.
1.94	0.0957	0.64	Q	.	.	.	.
2.05	0.1017	0.64	Q	.	.	.	.
2.17	0.1078	0.64	Q	.	.	.	.
2.28	0.1139	0.65	Q	.	.	.	.
2.39	0.1200	0.65	Q	.	.	.	.
2.51	0.1262	0.65	Q	.	.	.	.

2.62	0.1323	0.66	Q	.	.	.	.
2.74	0.1385	0.66	Q	.	.	.	.
2.85	0.1448	0.66	Q	.	.	.	.
2.97	0.1511	0.66	Q	.	.	.	.
3.08	0.1574	0.67	Q	.	.	.	.
3.19	0.1637	0.67	Q	.	.	.	.
3.31	0.1701	0.68	Q	.	.	.	.
3.42	0.1765	0.68	Q	.	.	.	.
3.54	0.1829	0.68	Q	.	.	.	.
3.65	0.1894	0.69	Q	.	.	.	.
3.77	0.1959	0.69	Q	.	.	.	.
3.88	0.2024	0.69	Q	.	.	.	.
3.99	0.2090	0.70	Q	.	.	.	.
4.11	0.2156	0.70	Q	.	.	.	.
4.22	0.2222	0.71	Q	.	.	.	.
4.34	0.2289	0.71	Q	.	.	.	.
4.45	0.2356	0.71	Q	.	.	.	.
4.57	0.2423	0.72	Q	.	.	.	.
4.68	0.2491	0.72	Q	.	.	.	.
4.80	0.2560	0.72	Q	.	.	.	.
4.91	0.2628	0.73	Q	.	.	.	.
5.02	0.2697	0.73	Q	.	.	.	.
5.14	0.2767	0.74	Q	.	.	.	.
5.25	0.2837	0.74	Q	.	.	.	.
5.37	0.2907	0.75	Q	.	.	.	.
5.48	0.2978	0.75	.Q	.	.	.	.
5.60	0.3049	0.76	.Q	.	.	.	.
5.71	0.3120	0.76	.Q	.	.	.	.
5.82	0.3192	0.77	.Q	.	.	.	.
5.94	0.3265	0.77	.Q	.	.	.	.
6.05	0.3338	0.78	.Q	.	.	.	.
6.17	0.3411	0.78	.Q	.	.	.	.
6.28	0.3485	0.79	.Q	.	.	.	.
6.40	0.3560	0.79	.Q	.	.	.	.
6.51	0.3635	0.80	.Q	.	.	.	.
6.62	0.3710	0.80	.Q	.	.	.	.
6.74	0.3786	0.81	.Q	.	.	.	.
6.85	0.3863	0.81	.Q	.	.	.	.
6.97	0.3940	0.82	.Q	.	.	.	.
7.08	0.4017	0.82	.Q	.	.	.	.
7.20	0.4095	0.83	.Q	.	.	.	.
7.31	0.4174	0.84	.Q	.	.	.	.
7.43	0.4254	0.84	.Q	.	.	.	.
7.54	0.4333	0.85	.Q	.	.	.	.
7.65	0.4414	0.86	.Q	.	.	.	.
7.77	0.4495	0.86	.Q	.	.	.	.
7.88	0.4577	0.87	.Q	.	.	.	.
8.00	0.4659	0.87	.Q	.	.	.	.
8.11	0.4742	0.88	.Q	.	.	.	.
8.23	0.4826	0.89	.Q	.	.	.	.

8.34	0.4911	0.90	.Q	.	.	.	.
8.45	0.4996	0.90	.Q	.	.	.	.
8.57	0.5082	0.91	.Q	.	.	.	.
8.68	0.5168	0.92	.Q	.	.	.	.
8.80	0.5256	0.93	.Q	.	.	.	.
8.91	0.5344	0.94	.Q	.	.	.	.
9.03	0.5433	0.95	.Q	.	.	.	.
9.14	0.5523	0.95	.Q	.	.	.	.
9.25	0.5613	0.97	.Q	.	.	.	.
9.37	0.5705	0.97	.Q	.	.	.	.
9.48	0.5797	0.98	.Q	.	.	.	.
9.60	0.5891	0.99	.Q	.	.	.	.
9.71	0.5985	1.00	.Q	.	.	.	.
9.83	0.6080	1.01	.Q	.	.	.	.
9.94	0.6176	1.03	.Q	.	.	.	.
10.05	0.6274	1.03	.Q	.	.	.	.
10.17	0.6372	1.05	.Q	.	.	.	.
10.28	0.6471	1.06	.Q	.	.	.	.
10.40	0.6572	1.07	.Q	.	.	.	.
10.51	0.6674	1.08	.Q	.	.	.	.
10.63	0.6776	1.10	.Q	.	.	.	.
10.74	0.6881	1.11	.Q	.	.	.	.
10.85	0.6986	1.12	.Q	.	.	.	.
10.97	0.7093	1.13	.Q	.	.	.	.
11.08	0.7201	1.15	.Q	.	.	.	.
11.20	0.7310	1.16	.Q	.	.	.	.
11.31	0.7421	1.18	.Q	.	.	.	.
11.43	0.7533	1.20	.Q	.	.	.	.
11.54	0.7647	1.22	.Q	.	.	.	.
11.66	0.7763	1.23	.Q	.	.	.	.
11.77	0.7880	1.25	.Q	.	.	.	.
11.88	0.8000	1.27	.Q	.	.	.	.
12.00	0.8121	1.29	.Q	.	.	.	.
12.11	0.8246	1.37	.Q	.	.	.	.
12.23	0.8380	1.46	.Q	.	.	.	.
12.34	0.8519	1.48	.Q	.	.	.	.
12.46	0.8660	1.51	. Q	.	.	.	.
12.57	0.8803	1.53	. Q	.	.	.	.
12.68	0.8949	1.56	. Q	.	.	.	.
12.80	0.9097	1.58	. Q	.	.	.	.
12.91	0.9248	1.62	. Q	.	.	.	.
13.03	0.9402	1.64	. Q	.	.	.	.
13.14	0.9560	1.69	. Q	.	.	.	.
13.26	0.9720	1.71	. Q	.	.	.	.
13.37	0.9884	1.76	. Q	.	.	.	.
13.48	1.0051	1.79	. Q	.	.	.	.
13.60	1.0223	1.84	. Q	.	.	.	.
13.71	1.0398	1.87	. Q	.	.	.	.
13.83	1.0579	1.94	. Q	.	.	.	.
13.94	1.0764	1.98	. Q	.	.	.	.

14.06	1.0954	2.05	. Q . . . .
14.17	1.1149	2.08	. Q . . . .
14.28	1.1350	2.17	. Q . . . .
14.40	1.1557	2.22	. Q . . . .
14.51	1.1773	2.34	. Q . . . .
14.63	1.1997	2.40	. Q . . . .
14.74	1.2230	2.54	. Q . . . .
14.86	1.2475	2.63	. Q . . . .
14.97	1.2735	2.88	. Q . . . .
15.09	1.3013	3.02	. Q . . . .
15.20	1.3315	3.36	. Q . . . .
15.31	1.3642	3.57	. Q . . . .
15.43	1.4031	4.64	. Q . . . .
15.54	1.4494	5.17	. Q . . . .
15.66	1.5026	6.09	. Q . . . .
15.77	1.5630	6.70	. Q . . . .
15.89	1.6372	8.99	. .Q . . . .
16.00	1.7353	11.78	. . Q . . . .
16.11	1.9219	27.71	. . . . Q .
16.23	2.0884	7.53	. Q . . . .
16.34	2.1504	5.58	. Q . . . .
16.46	2.1947	3.81	. Q . . . .
16.57	2.2277	3.18	. Q . . . .
16.69	2.2558	2.75	. Q . . . .
16.80	2.2804	2.47	. Q . . . .
16.91	2.3028	2.28	. Q . . . .
17.03	2.3236	2.13	. Q . . . .
17.14	2.3432	2.01	. Q . . . .
17.26	2.3617	1.91	. Q . . . .
17.37	2.3793	1.81	. Q . . . .
17.49	2.3960	1.73	. Q . . . .
17.60	2.4121	1.66	. Q . . . .
17.72	2.4275	1.60	. Q . . . .
17.83	2.4423	1.54	. Q . . . .
17.94	2.4567	1.49	.Q . . . .
18.06	2.4705	1.45	.Q . . . .
18.17	2.4834	1.28	.Q . . . .
18.29	2.4953	1.24	.Q . . . .
18.40	2.5069	1.21	.Q . . . .
18.52	2.5182	1.17	.Q . . . .
18.63	2.5291	1.14	.Q . . . .
18.74	2.5398	1.11	.Q . . . .
18.86	2.5502	1.09	.Q . . . .
18.97	2.5604	1.06	.Q . . . .
19.09	2.5703	1.04	.Q . . . .
19.20	2.5800	1.02	.Q . . . .
19.32	2.5895	1.00	.Q . . . .
19.43	2.5989	0.98	.Q . . . .
19.54	2.6080	0.96	.Q . . . .
19.66	2.6170	0.94	.Q . . . .

19.77	2.6258	0.93	.Q	.	.	.	.
19.89	2.6345	0.91	.Q	.	.	.	.
20.00	2.6430	0.89	.Q	.	.	.	.
20.12	2.6514	0.88	.Q	.	.	.	.
20.23	2.6596	0.87	.Q	.	.	.	.
20.34	2.6678	0.85	.Q	.	.	.	.
20.46	2.6757	0.84	.Q	.	.	.	.
20.57	2.6836	0.83	.Q	.	.	.	.
20.69	2.6914	0.82	.Q	.	.	.	.
20.80	2.6990	0.80	.Q	.	.	.	.
20.92	2.7066	0.79	.Q	.	.	.	.
21.03	2.7140	0.78	.Q	.	.	.	.
21.14	2.7214	0.77	.Q	.	.	.	.
21.26	2.7286	0.76	.Q	.	.	.	.
21.37	2.7358	0.75	.Q	.	.	.	.
21.49	2.7429	0.74	Q	.	.	.	.
21.60	2.7498	0.74	Q	.	.	.	.
21.72	2.7567	0.73	Q	.	.	.	.
21.83	2.7636	0.72	Q	.	.	.	.
21.95	2.7703	0.71	Q	.	.	.	.
22.06	2.7770	0.70	Q	.	.	.	.
22.17	2.7836	0.70	Q	.	.	.	.
22.29	2.7901	0.69	Q	.	.	.	.
22.40	2.7966	0.68	Q	.	.	.	.
22.52	2.8030	0.67	Q	.	.	.	.
22.63	2.8093	0.67	Q	.	.	.	.
22.75	2.8156	0.66	Q	.	.	.	.
22.86	2.8218	0.65	Q	.	.	.	.
22.97	2.8280	0.65	Q	.	.	.	.
23.09	2.8341	0.64	Q	.	.	.	.
23.20	2.8401	0.64	Q	.	.	.	.
23.32	2.8461	0.63	Q	.	.	.	.
23.43	2.8520	0.62	Q	.	.	.	.
23.55	2.8579	0.62	Q	.	.	.	.
23.66	2.8637	0.61	Q	.	.	.	.
23.77	2.8695	0.61	Q	.	.	.	.
23.89	2.8752	0.60	Q	.	.	.	.
24.00	2.8809	0.60	Q	.	.	.	.
24.12	2.8837	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%	1440.6
10%	102.9

20%	48.0
30%	20.6
40%	13.7
50%	6.9
60%	6.9
70%	6.9
80%	6.9
90%	6.9

DMA 2

RATIONAL METHOD CALIBRATION COEFFICIENT = 1.30
TOTAL CATCHMENT AREA(ACRES) = 5.34
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.092
LOW LOSS FRACTION = 0.240
TIME OF CONCENTRATION(MIN.) = 6.42
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) = 0.31
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.80
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.16
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.94
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.69
24-HOUR POINT RAINFALL VALUE(INCHES) = 4.89

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 2.25
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = -0.08

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.06	0.0011	0.46	Q	.	.	.	.
0.16	0.0052	0.46	Q	.	.	.	.
0.27	0.0093	0.47	Q	.	.	.	.
0.38	0.0135	0.47	Q	.	.	.	.
0.48	0.0176	0.47	Q	.	.	.	.
0.59	0.0218	0.47	Q	.	.	.	.
0.70	0.0260	0.47	Q	.	.	.	.
0.81	0.0302	0.48	Q	.	.	.	.
0.91	0.0344	0.48	Q	.	.	.	.
1.02	0.0386	0.48	Q	.	.	.	.
1.13	0.0429	0.48	Q	.	.	.	.
1.23	0.0471	0.48	Q	.	.	.	.
1.34	0.0514	0.49	Q	.	.	.	.
1.45	0.0557	0.49	Q	.	.	.	.
1.55	0.0601	0.49	Q	.	.	.	.
1.66	0.0644	0.49	Q	.	.	.	.
1.77	0.0688	0.49	Q	.	.	.	.
1.88	0.0731	0.50	Q	.	.	.	.
1.98	0.0775	0.50	Q	.	.	.	.
2.09	0.0820	0.50	Q	.	.	.	.
2.20	0.0864	0.50	Q	.	.	.	.
2.30	0.0909	0.50	Q	.	.	.	.

2.41	0.0953	0.51	Q	.	.	.	.
2.52	0.0998	0.51	Q	.	.	.	.
2.62	0.1043	0.51	Q	.	.	.	.
2.73	0.1089	0.51	Q	.	.	.	.
2.84	0.1134	0.52	Q	.	.	.	.
2.95	0.1180	0.52	Q	.	.	.	.
3.05	0.1226	0.52	Q	.	.	.	.
3.16	0.1272	0.52	Q	.	.	.	.
3.27	0.1319	0.53	Q	.	.	.	.
3.37	0.1365	0.53	Q	.	.	.	.
3.48	0.1412	0.53	Q	.	.	.	.
3.59	0.1459	0.53	Q	.	.	.	.
3.69	0.1507	0.54	Q	.	.	.	.
3.80	0.1554	0.54	Q	.	.	.	.
3.91	0.1602	0.54	Q	.	.	.	.
4.02	0.1650	0.54	Q	.	.	.	.
4.12	0.1698	0.55	Q	.	.	.	.
4.23	0.1747	0.55	Q	.	.	.	.
4.34	0.1796	0.55	Q	.	.	.	.
4.44	0.1845	0.56	Q	.	.	.	.
4.55	0.1894	0.56	Q	.	.	.	.
4.66	0.1943	0.56	Q	.	.	.	.
4.76	0.1993	0.57	Q	.	.	.	.
4.87	0.2043	0.57	Q	.	.	.	.
4.98	0.2094	0.57	Q	.	.	.	.
5.09	0.2144	0.57	Q	.	.	.	.
5.19	0.2195	0.58	Q	.	.	.	.
5.30	0.2246	0.58	Q	.	.	.	.
5.41	0.2298	0.58	Q	.	.	.	.
5.51	0.2350	0.59	Q	.	.	.	.
5.62	0.2402	0.59	Q	.	.	.	.
5.73	0.2454	0.59	Q	.	.	.	.
5.84	0.2507	0.60	Q	.	.	.	.
5.94	0.2560	0.60	Q	.	.	.	.
6.05	0.2613	0.61	Q	.	.	.	.
6.16	0.2667	0.61	Q	.	.	.	.
6.26	0.2721	0.61	Q	.	.	.	.
6.37	0.2775	0.62	Q	.	.	.	.
6.48	0.2830	0.62	Q	.	.	.	.
6.58	0.2885	0.62	Q	.	.	.	.
6.69	0.2940	0.63	Q	.	.	.	.
6.80	0.2996	0.63	Q	.	.	.	.
6.90	0.3052	0.64	Q	.	.	.	.
7.01	0.3108	0.64	Q	.	.	.	.
7.12	0.3165	0.65	Q	.	.	.	.
7.23	0.3222	0.65	Q	.	.	.	.
7.33	0.3280	0.65	Q	.	.	.	.
7.44	0.3338	0.66	Q	.	.	.	.
7.55	0.3396	0.66	Q	.	.	.	.
7.65	0.3455	0.67	Q	.	.	.	.

7.76	0.3514	0.67	Q	.	.	.	.
7.87	0.3574	0.68	Q	.	.	.	.
7.97	0.3634	0.68	Q	.	.	.	.
8.08	0.3695	0.69	Q	.	.	.	.
8.19	0.3756	0.69	Q	.	.	.	.
8.30	0.3817	0.70	Q	.	.	.	.
8.40	0.3879	0.70	Q	.	.	.	.
8.51	0.3942	0.71	Q	.	.	.	.
8.62	0.4005	0.72	Q	.	.	.	.
8.72	0.4068	0.72	Q	.	.	.	.
8.83	0.4132	0.73	Q	.	.	.	.
8.94	0.4197	0.73	Q	.	.	.	.
9.05	0.4262	0.74	Q	.	.	.	.
9.15	0.4328	0.75	Q	.	.	.	.
9.26	0.4394	0.75	.Q	.	.	.	.
9.37	0.4461	0.76	.Q	.	.	.	.
9.47	0.4528	0.77	.Q	.	.	.	.
9.58	0.4597	0.77	.Q	.	.	.	.
9.69	0.4665	0.78	.Q	.	.	.	.
9.79	0.4735	0.79	.Q	.	.	.	.
9.90	0.4805	0.80	.Q	.	.	.	.
10.01	0.4876	0.80	.Q	.	.	.	.
10.12	0.4947	0.81	.Q	.	.	.	.
10.22	0.5019	0.82	.Q	.	.	.	.
10.33	0.5092	0.83	.Q	.	.	.	.
10.44	0.5166	0.84	.Q	.	.	.	.
10.54	0.5241	0.85	.Q	.	.	.	.
10.65	0.5316	0.86	.Q	.	.	.	.
10.76	0.5392	0.87	.Q	.	.	.	.
10.86	0.5469	0.88	.Q	.	.	.	.
10.97	0.5547	0.89	.Q	.	.	.	.
11.08	0.5626	0.90	.Q	.	.	.	.
11.18	0.5706	0.91	.Q	.	.	.	.
11.29	0.5787	0.92	.Q	.	.	.	.
11.40	0.5869	0.93	.Q	.	.	.	.
11.51	0.5952	0.94	.Q	.	.	.	.
11.61	0.6036	0.96	.Q	.	.	.	.
11.72	0.6121	0.97	.Q	.	.	.	.
11.83	0.6208	0.99	.Q	.	.	.	.
11.93	0.6295	1.00	.Q	.	.	.	.
12.04	0.6385	1.02	.Q	.	.	.	.
12.15	0.6480	1.12	.Q	.	.	.	.
12.26	0.6580	1.14	.Q	.	.	.	.
12.36	0.6682	1.16	.Q	.	.	.	.
12.47	0.6785	1.18	.Q	.	.	.	.
12.58	0.6890	1.19	.Q	.	.	.	.
12.68	0.6996	1.22	.Q	.	.	.	.
12.79	0.7105	1.23	.Q	.	.	.	.
12.90	0.7215	1.26	.Q	.	.	.	.
13.00	0.7327	1.28	.Q	.	.	.	.

13.11	0.7442	1.31	.Q	.	.	.	.
13.22	0.7558	1.33	.Q	.	.	.	.
13.32	0.7677	1.36	.Q	.	.	.	.
13.43	0.7798	1.38	.Q	.	.	.	.
13.54	0.7922	1.42	.Q	.	.	.	.
13.65	0.8049	1.44	.Q	.	.	.	.
13.75	0.8179	1.49	.Q	.	.	.	.
13.86	0.8311	1.51	. Q	.	.	.	.
13.97	0.8448	1.57	. Q	.	.	.	.
14.07	0.8588	1.60	. Q	.	.	.	.
14.18	0.8731	1.65	. Q	.	.	.	.
14.29	0.8878	1.68	. Q	.	.	.	.
14.40	0.9030	1.76	. Q	.	.	.	.
14.50	0.9187	1.80	. Q	.	.	.	.
14.61	0.9350	1.89	. Q	.	.	.	.
14.72	0.9519	1.94	. Q	.	.	.	.
14.82	0.9696	2.06	. Q	.	.	.	.
14.93	0.9883	2.15	. Q	.	.	.	.
15.04	1.0082	2.35	. Q	.	.	.	.
15.14	1.0294	2.46	. Q	.	.	.	.
15.25	1.0525	2.74	. Q	.	.	.	.
15.36	1.0774	2.91	. Q	.	.	.	.
15.47	1.1076	3.91	. Q	.	.	.	.
15.57	1.1433	4.18	. Q	.	.	.	.
15.68	1.1835	4.92	. Q	.	.	.	.
15.79	1.2290	5.37	. Q	.	.	.	.
15.89	1.2849	7.26	. Q.	.	.	.	.
16.00	1.3590	9.51	. . Q	.	.	.	.
16.11	1.4998	22.33	. .	.	.	Q.	.
16.21	1.6254	6.09	. Q .	.	.	.	.
16.32	1.6723	4.51	. Q	.	.	.	.
16.43	1.7068	3.30	. Q	.	.	.	.
16.53	1.7328	2.59	. Q	.	.	.	.
16.64	1.7542	2.24	. Q	.	.	.	.
16.75	1.7730	1.99	. Q	.	.	.	.
16.86	1.7899	1.84	. Q	.	.	.	.
16.96	1.8057	1.72	. Q	.	.	.	.
17.07	1.8204	1.62	. Q	.	.	.	.
17.18	1.8344	1.54	. Q	.	.	.	.
17.28	1.8477	1.47	.Q	.	.	.	.
17.39	1.8603	1.40	.Q	.	.	.	.
17.50	1.8725	1.34	.Q	.	.	.	.
17.61	1.8841	1.29	.Q	.	.	.	.
17.71	1.8954	1.25	.Q	.	.	.	.
17.82	1.9062	1.21	.Q	.	.	.	.
17.93	1.9167	1.17	.Q	.	.	.	.
18.03	1.9269	1.13	.Q	.	.	.	.
18.14	1.9363	1.01	.Q	.	.	.	.
18.25	1.9451	0.98	.Q	.	.	.	.
18.35	1.9536	0.95	.Q	.	.	.	.

18.46	1.9619	0.93	.Q	.	.	.	.
18.57	1.9700	0.90	.Q	.	.	.	.
18.67	1.9779	0.88	.Q	.	.	.	.
18.78	1.9856	0.86	.Q	.	.	.	.
18.89	1.9932	0.84	.Q	.	.	.	.
19.00	2.0005	0.83	.Q	.	.	.	.
19.10	2.0078	0.81	.Q	.	.	.	.
19.21	2.0148	0.79	.Q	.	.	.	.
19.32	2.0218	0.78	.Q	.	.	.	.
19.42	2.0286	0.76	.Q	.	.	.	.
19.53	2.0353	0.75	Q	.	.	.	.
19.64	2.0418	0.74	Q	.	.	.	.
19.74	2.0483	0.72	Q	.	.	.	.
19.85	2.0547	0.71	Q	.	.	.	.
19.96	2.0609	0.70	Q	.	.	.	.
20.07	2.0671	0.69	Q	.	.	.	.
20.17	2.0731	0.68	Q	.	.	.	.
20.28	2.0791	0.67	Q	.	.	.	.
20.39	2.0850	0.66	Q	.	.	.	.
20.49	2.0908	0.65	Q	.	.	.	.
20.60	2.0965	0.64	Q	.	.	.	.
20.71	2.1021	0.63	Q	.	.	.	.
20.82	2.1077	0.63	Q	.	.	.	.
20.92	2.1132	0.62	Q	.	.	.	.
21.03	2.1186	0.61	Q	.	.	.	.
21.14	2.1240	0.60	Q	.	.	.	.
21.24	2.1293	0.60	Q	.	.	.	.
21.35	2.1345	0.59	Q	.	.	.	.
21.46	2.1397	0.58	Q	.	.	.	.
21.56	2.1448	0.58	Q	.	.	.	.
21.67	2.1499	0.57	Q	.	.	.	.
21.78	2.1549	0.56	Q	.	.	.	.
21.89	2.1599	0.56	Q	.	.	.	.
21.99	2.1648	0.55	Q	.	.	.	.
22.10	2.1696	0.55	Q	.	.	.	.
22.21	2.1744	0.54	Q	.	.	.	.
22.31	2.1792	0.54	Q	.	.	.	.
22.42	2.1839	0.53	Q	.	.	.	.
22.53	2.1886	0.52	Q	.	.	.	.
22.63	2.1932	0.52	Q	.	.	.	.
22.74	2.1978	0.52	Q	.	.	.	.
22.85	2.2023	0.51	Q	.	.	.	.
22.95	2.2068	0.51	Q	.	.	.	.
23.06	2.2112	0.50	Q	.	.	.	.
23.17	2.2157	0.50	Q	.	.	.	.
23.28	2.2200	0.49	Q	.	.	.	.
23.38	2.2244	0.49	Q	.	.	.	.
23.49	2.2287	0.48	Q	.	.	.	.
23.60	2.2330	0.48	Q	.	.	.	.
23.70	2.2372	0.48	Q	.	.	.	.

23.81	2.2414	0.47	Q	.	.	.	.
23.92	2.2456	0.47	Q	.	.	.	.
24.02	2.2497	0.47	Q	.	.	.	.
24.13	2.2518	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%	1444.5
10%	102.7
20%	44.9
30%	19.3
40%	12.8
50%	6.4
60%	6.4
70%	6.4
80%	6.4
90%	6.4

APPENDIX G

INFILTRATION/DETENTION CALCULATIONS

Orifice Calculations

Project Summary	
Title	DPC DMA 1
Engineer	
Company	Kimley Horn
Date	2/2/2023

Notes

Table of Contents

Orifice Calculations

Subsection: User Notifications

User Notifications

Message Id	-1
Scenario	Base
Element Type	Scenario
Element Id	1
Label	Base
Time	(N/A)
Message	The output increment (6.833 min) is not an equal interval of the simulation duration (1,441.133 min). The actual simulation duration is 1,435.000 min.
Source	Precalculation

Orifice Calculations

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
DA1	Base	0	125,017.00	956.667	27.71

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
O-1	Base	0	21,841.00	963.500	5.82

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
RDF-1 (IN)	Base	0	125,017.00	956.667	27.71	(N/A)	(N/A)
RDF-1 (OUT)	Base	0	21,841.00	963.500	5.82	7.37	41,670.00

Orifice Calculations

Subsection: Read Hydrograph
Scenario: Base
Label: DA1

Peak Discharge	27.71 ft³/s
Time to Peak	956.667 min
Hydrograph Volume	125,017.20 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 6.833 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.60	0.60	0.60	0.60	0.61
34.167	0.61	0.61	0.61	0.62	0.62
68.333	0.62	0.62	0.63	0.63	0.63
102.500	0.63	0.64	0.64	0.64	0.65
136.667	0.65	0.65	0.66	0.66	0.66
170.833	0.66	0.67	0.67	0.68	0.68
205.000	0.68	0.69	0.69	0.69	0.70
239.167	0.70	0.71	0.71	0.71	0.72
273.333	0.72	0.72	0.73	0.73	0.74
307.500	0.74	0.75	0.75	0.76	0.76
341.667	0.77	0.77	0.78	0.78	0.79
375.833	0.79	0.80	0.80	0.81	0.81
410.000	0.82	0.82	0.83	0.84	0.84
444.167	0.85	0.86	0.86	0.87	0.87
478.333	0.88	0.89	0.90	0.90	0.91
512.500	0.92	0.93	0.94	0.95	0.95
546.667	0.97	0.97	0.98	0.99	1.00
580.833	1.01	1.03	1.03	1.05	1.06
615.000	1.07	1.08	1.10	1.11	1.12
649.167	1.13	1.15	1.16	1.18	1.20
683.333	1.22	1.23	1.25	1.27	1.29
717.500	1.37	1.46	1.48	1.51	1.53
751.667	1.56	1.58	1.62	1.64	1.69
785.833	1.71	1.76	1.79	1.84	1.87
820.000	1.94	1.98	2.05	2.08	2.17
854.167	2.22	2.34	2.40	2.54	2.63
888.333	2.88	3.02	3.36	3.57	4.64
922.500	5.17	6.09	6.70	8.99	11.78
956.667	27.71	7.53	5.58	3.81	3.18
990.833	2.75	2.47	2.28	2.13	2.01
1,025.000	1.91	1.81	1.73	1.66	1.60
1,059.167	1.54	1.49	1.45	1.28	1.24
1,093.333	1.21	1.17	1.14	1.11	1.09
1,127.500	1.06	1.04	1.02	1.00	0.98
1,161.667	0.96	0.94	0.93	0.91	0.89
1,195.833	0.88	0.87	0.85	0.84	0.83
1,230.000	0.82	0.80	0.79	0.78	0.77

Orifice Calculations

Subsection: Read Hydrograph
Scenario: Base
Label: DA1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 6.833 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1,264.167	0.76	0.75	0.74	0.74	0.73
1,298.333	0.72	0.71	0.70	0.70	0.69
1,332.500	0.68	0.67	0.67	0.66	0.65
1,366.667	0.65	0.64	0.64	0.63	0.62
1,400.833	0.62	0.61	0.61	0.60	0.60
1,435.000	0.00	(N/A)	(N/A)	(N/A)	(N/A)

Orifice Calculations

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

Time vs. Elevation (ft)

Output Time increment = 6.833 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	0.00	0.04	0.09	0.13	0.17
34.167	0.22	0.26	0.31	0.35	0.39
68.333	0.44	0.48	0.52	0.57	0.61
102.500	0.65	0.69	0.74	0.78	0.82
136.667	0.86	0.90	0.94	0.98	1.02
170.833	1.06	1.10	1.14	1.17	1.21
205.000	1.25	1.29	1.32	1.36	1.39
239.167	1.43	1.46	1.49	1.53	1.56
273.333	1.59	1.62	1.65	1.68	1.71
307.500	1.74	1.77	1.80	1.82	1.85
341.667	1.88	1.90	1.93	1.96	1.98
375.833	2.01	2.03	2.05	2.08	2.10
410.000	2.12	2.14	2.16	2.19	2.21
444.167	2.23	2.25	2.27	2.29	2.31
478.333	2.33	2.35	2.37	2.38	2.40
512.500	2.42	2.44	2.46	2.48	2.49
546.667	2.51	2.53	2.55	2.57	2.58
580.833	2.60	2.62	2.64	2.65	2.67
615.000	2.69	2.71	2.73	2.74	2.76
649.167	2.78	2.80	2.82	2.84	2.86
683.333	2.88	2.90	2.92	2.94	2.96
717.500	2.98	3.01	3.04	3.07	3.10
751.667	3.14	3.17	3.20	3.23	3.27
785.833	3.30	3.34	3.37	3.41	3.45
820.000	3.49	3.53	3.57	3.61	3.66
854.167	3.70	3.76	3.81	3.87	3.93
888.333	4.00	4.08	4.18	4.29	4.44
922.500	4.65	4.88	5.13	5.41	5.78
956.667	6.71	7.37	7.19	6.91	6.59
990.833	6.27	5.97	5.71	5.48	5.30
1,025.000	5.16	5.05	4.96	4.89	4.82
1,059.167	4.76	4.70	4.65	4.60	4.54
1,093.333	4.48	4.42	4.36	4.30	4.24
1,127.500	4.18	4.12	4.06	4.00	3.94
1,161.667	3.89	3.83	3.78	3.73	3.68
1,195.833	3.64	3.59	3.55	3.51	3.47
1,230.000	3.43	3.39	3.36	3.32	3.29
1,264.167	3.26	3.22	3.19	3.16	3.14
1,298.333	3.11	3.08	3.05	3.03	3.00
1,332.500	2.98	2.96	2.93	2.91	2.89
1,366.667	2.87	2.85	2.83	2.81	2.79

Orifice Calculations

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

Time vs. Elevation (ft)

Output Time increment = 6.833 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
1,400.833	2.77	2.75	2.73	2.72	2.70
1,435.000	2.66	(N/A)	(N/A)	(N/A)	(N/A)

Orifice Calculations

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

Time vs. Volume (ft³)

Output Time increment = 6.833 min
Time on left represents time for first value in each row.

Time (min)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.00	246.00	492.00	737.00	984.00
34.167	1,232.00	1,479.00	1,726.00	1,973.00	2,220.00
68.333	2,466.00	2,711.00	2,955.00	3,200.00	3,442.00
102.500	3,681.00	3,921.00	4,159.00	4,395.00	4,629.00
136.667	4,863.00	5,093.00	5,322.00	5,550.00	5,773.00
170.833	5,993.00	6,212.00	6,428.00	6,642.00	6,855.00
205.000	7,063.00	7,269.00	7,472.00	7,671.00	7,868.00
239.167	8,063.00	8,255.00	8,444.00	8,629.00	8,811.00
273.333	8,991.00	9,166.00	9,338.00	9,508.00	9,675.00
307.500	9,839.00	10,001.00	10,160.00	10,317.00	10,471.00
341.667	10,622.00	10,771.00	10,917.00	11,061.00	11,202.00
375.833	11,341.00	11,477.00	11,610.00	11,742.00	11,870.00
410.000	11,997.00	12,121.00	12,243.00	12,364.00	12,484.00
444.167	12,601.00	12,717.00	12,832.00	12,944.00	13,055.00
478.333	13,163.00	13,271.00	13,379.00	13,485.00	13,588.00
512.500	13,692.00	13,796.00	13,900.00	14,003.00	14,105.00
546.667	14,206.00	14,307.00	14,406.00	14,505.00	14,604.00
580.833	14,703.00	14,804.00	14,905.00	15,005.00	15,107.00
615.000	15,208.00	15,310.00	15,412.00	15,517.00	15,620.00
649.167	15,723.00	15,828.00	15,934.00	16,041.00	16,151.00
683.333	16,264.00	16,377.00	16,492.00	16,609.00	16,729.00
717.500	16,863.00	17,024.00	17,200.00	17,377.00	17,555.00
751.667	17,735.00	17,915.00	18,098.00	18,284.00	18,474.00
785.833	18,668.00	18,866.00	19,069.00	19,277.00	19,490.00
820.000	19,710.00	19,941.00	20,180.00	20,426.00	20,681.00
854.167	20,949.00	21,235.00	21,540.00	21,865.00	22,217.00
888.333	22,614.00	23,071.00	23,613.00	24,252.00	25,131.00
922.500	26,292.00	27,618.00	28,996.00	30,568.00	32,679.00
956.667	37,942.00	41,670.00	40,678.00	39,092.00	37,245.00
990.833	35,444.00	33,769.00	32,270.00	30,984.00	29,966.00
1,025.000	29,194.00	28,576.00	28,066.00	27,631.00	27,251.00
1,059.167	26,908.00	26,591.00	26,295.00	25,985.00	25,657.00
1,093.333	25,330.00	25,000.00	24,666.00	24,329.00	23,992.00
1,127.500	23,653.00	23,314.00	22,976.00	22,639.00	22,308.00
1,161.667	21,991.00	21,685.00	21,392.00	21,110.00	20,838.00
1,195.833	20,575.00	20,324.00	20,082.00	19,847.00	19,621.00
1,230.000	19,404.00	19,193.00	18,988.00	18,789.00	18,597.00
1,264.167	18,412.00	18,232.00	18,057.00	17,889.00	17,728.00
1,298.333	17,571.00	17,418.00	17,268.00	17,124.00	16,985.00
1,332.500	16,848.00	16,714.00	16,585.00	16,459.00	16,336.00
1,366.667	16,216.00	16,100.00	15,987.00	15,877.00	15,768.00

Orifice Calculations

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

Time vs. Volume (ft³)

Output Time increment = 6.833 min
Time on left represents time for first value in each row.

Time (min)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
1,400.833	15,662.00	15,559.00	15,458.00	15,360.00	15,264.00
1,435.000	15,052.00	(N/A)	(N/A)	(N/A)	(N/A)

Orifice Calculations

Subsection: Outlet Input Data Scenario: Base

Label: Composite Outlet Structure - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	8.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	4.50	8.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Orifice Calculations

Subsection: Outlet Input Data Scenario: Base

Label: Composite Outlet Structure - 1

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	4.50 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

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 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Orifice Calculations

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

Label: RDF-1

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	6.9500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 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	6.833 min

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.00	0.00	0.00	0.000	0.00	0.00	0.00
0.10	0.00	565.49	7.069	0.00	0.00	2.76
0.20	0.00	1,130.97	28.274	0.00	0.00	5.52
0.30	0.00	1,696.46	63.617	0.01	0.01	8.29
0.40	0.00	2,261.95	113.097	0.02	0.02	11.05
0.50	0.00	2,827.43	176.715	0.03	0.03	13.82
0.60	0.00	3,392.92	254.469	0.04	0.04	16.59
0.70	0.00	3,958.41	346.361	0.06	0.06	19.37
0.80	0.00	4,523.89	452.389	0.07	0.07	22.14
0.90	0.00	5,089.38	572.555	0.09	0.09	24.92
1.00	0.00	5,654.87	706.858	0.11	0.11	27.70
1.10	0.00	6,220.35	855.299	0.14	0.14	30.48
1.20	0.00	6,785.84	1,017.876	0.16	0.16	33.27
1.30	0.00	7,351.33	1,194.591	0.19	0.19	36.05
1.40	0.00	7,916.81	1,385.442	0.22	0.22	38.84
1.50	0.00	8,482.30	1,590.431	0.26	0.26	41.63
1.60	0.00	9,047.79	1,809.557	0.29	0.29	44.43
1.70	0.00	9,613.27	2,042.821	0.33	0.33	47.22
1.80	0.00	10,178.76	2,290.221	0.37	0.37	50.02
1.90	0.00	10,744.25	2,551.759	0.41	0.41	52.82
2.00	0.00	11,309.73	2,827.433	0.45	0.45	55.62
2.10	0.00	11,875.22	3,117.245	0.50	0.50	58.43
2.20	0.00	12,440.71	3,421.194	0.55	0.55	61.24
2.30	0.00	13,006.19	3,739.281	0.60	0.60	64.05
2.40	0.00	13,571.68	4,071.504	0.66	0.66	66.86
2.50	0.00	14,137.17	4,417.865	0.71	0.71	69.67
2.60	0.00	14,702.65	4,778.362	0.77	0.77	72.49
2.70	0.00	15,268.14	5,152.997	0.83	0.83	75.31

Orifice Calculations

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

Label: RDF-1

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2.80	0.00	15,833.63	5,541.769	0.89	0.89	78.13
2.90	0.00	16,399.11	5,944.679	0.96	0.96	80.95
3.00	0.00	16,964.60	6,361.725	1.02	1.02	83.78
3.10	0.00	17,530.09	6,792.909	1.09	1.09	86.61
3.20	0.00	18,095.57	7,238.229	1.16	1.16	89.44
3.30	0.00	18,661.06	7,697.687	1.24	1.24	92.27
3.40	0.00	19,226.55	8,171.282	1.31	1.31	95.10
3.50	0.00	19,792.03	8,659.015	1.39	1.39	97.94
3.60	0.00	20,357.52	9,160.884	1.47	1.47	100.78
3.70	0.00	20,923.01	9,676.891	1.56	1.56	103.62
3.80	0.00	21,488.49	10,207.035	1.64	1.64	106.46
3.90	0.00	22,053.98	10,751.315	1.73	1.73	109.31
4.00	0.00	22,619.47	11,309.734	1.82	1.82	112.16
4.10	0.00	23,184.95	11,545.179	1.86	1.86	114.95
4.20	0.00	23,750.44	11,783.049	1.90	1.90	117.75
4.30	0.00	24,315.93	12,023.345	1.93	1.93	120.55
4.40	0.00	24,881.41	12,266.067	1.97	1.97	123.35
4.50	0.00	25,446.90	12,511.214	2.01	2.01	126.14
4.60	0.03	26,012.39	12,758.787	2.05	2.09	128.98
4.70	0.13	26,577.87	13,008.785	2.09	2.23	131.87
4.80	0.29	27,143.36	13,261.209	2.13	2.43	134.83
4.90	0.50	27,708.85	13,516.059	2.17	2.68	137.84
5.00	0.76	28,274.33	13,773.334	2.22	2.98	140.90
5.10	1.07	28,839.82	14,033.034	2.26	3.33	144.01
5.20	1.41	29,405.31	14,295.160	2.30	3.71	147.15
5.30	1.78	29,970.79	14,559.712	2.34	4.12	150.32
5.40	2.17	30,536.28	14,826.689	2.39	4.56	153.51
5.50	2.67	31,101.77	15,096.092	2.43	5.10	156.82
5.60	2.93	31,667.25	15,367.921	2.47	5.40	159.87
5.70	3.16	32,232.74	15,642.174	2.52	5.68	162.91
5.80	3.38	32,798.23	15,918.854	2.56	5.94	165.93
5.90	3.59	33,363.71	16,197.959	2.61	6.19	168.94
6.00	3.78	33,929.20	16,479.489	2.65	6.43	171.94
6.10	3.96	34,494.69	16,763.446	2.70	6.66	174.93
6.20	4.14	35,060.17	17,049.827	2.74	6.88	177.91
6.30	4.31	35,625.66	17,338.634	2.79	7.10	180.88
6.40	4.47	36,191.15	17,629.867	2.84	7.31	183.85
6.50	4.63	36,756.63	17,923.526	2.88	7.51	186.81
6.60	4.78	37,322.12	18,219.609	2.93	7.71	189.77
6.70	4.93	37,887.61	18,518.119	2.98	7.91	192.73
6.80	5.07	38,453.09	18,819.054	3.03	8.10	195.68
6.90	5.21	39,018.58	19,122.414	3.08	8.29	198.62
7.00	5.35	39,584.07	19,428.201	3.13	8.47	201.56

Orifice Calculations

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

Label: RDF-1

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
7.10	5.48	40,149.55	19,736.412	3.18	8.65	204.50
7.20	5.61	40,715.04	20,047.049	3.23	8.83	207.44
7.30	5.73	41,280.53	20,360.112	3.28	9.01	210.38
7.40	5.86	41,846.01	20,675.601	3.33	9.18	213.31
7.50	5.98	42,411.50	20,993.514	3.38	9.35	216.24
7.60	6.10	42,976.99	21,313.854	3.43	9.52	219.17
7.70	6.21	43,542.47	21,636.619	3.48	9.69	222.09
7.80	6.33	44,107.96	21,961.809	3.53	9.86	225.02
7.90	6.44	44,673.45	22,289.425	3.59	10.02	227.94
8.00	6.55	45,238.93	22,619.467	3.64	10.19	230.86

Orifice Calculations

Subsection: Pond Infiltration Calculations
Scenario: Base
Label: RDF-1 (IN)

Average Infiltration Rating Table

Elevation (Water Surface) (ft)	Area (Total) (ft²)	Flow (Infiltration) (ft³/s)
0.00	0.0	0.00
0.10	7.1	0.00
0.20	28.3	0.00
0.30	63.6	0.01
0.40	113.1	0.02
0.50	176.7	0.03
0.60	254.5	0.04
0.70	346.4	0.06
0.80	452.4	0.07
0.90	572.6	0.09
1.00	706.9	0.11
1.10	855.3	0.14
1.20	1,017.9	0.16
1.30	1,194.6	0.19
1.40	1,385.4	0.22
1.50	1,590.4	0.26
1.60	1,809.6	0.29
1.70	2,042.8	0.33
1.80	2,290.2	0.37
1.90	2,551.8	0.41
2.00	2,827.4	0.45
2.10	3,117.2	0.50
2.20	3,421.2	0.55
2.30	3,739.3	0.60
2.40	4,071.5	0.66
2.50	4,417.9	0.71
2.60	4,778.4	0.77
2.70	5,153.0	0.83
2.80	5,541.8	0.89
2.90	5,944.7	0.96
3.00	6,361.7	1.02
3.10	6,792.9	1.09
3.20	7,238.2	1.16
3.30	7,697.7	1.24
3.40	8,171.3	1.31
3.50	8,659.0	1.39
3.60	9,160.9	1.47
3.70	9,676.9	1.56
3.80	10,207.0	1.64
3.90	10,751.3	1.73
4.00	11,309.7	1.82
4.10	11,545.2	1.86
4.20	11,783.0	1.90

Orifice Calculations

Subsection: Pond Infiltration Calculations
Scenario: Base
Label: RDF-1 (IN)

Average Infiltration Rating Table

Elevation (Water Surface) (ft)	Area (Total) (ft^2)	Flow (Infiltration) (ft^3/s)
4.30	12,023.3	1.93
4.40	12,266.1	1.97
4.50	12,511.2	2.01
4.60	12,758.8	2.05
4.70	13,008.8	2.09
4.80	13,261.2	2.13
4.90	13,516.1	2.17
5.00	13,773.3	2.22
5.10	14,033.0	2.26
5.20	14,295.2	2.30
5.30	14,559.7	2.34
5.40	14,826.7	2.39
5.50	15,096.1	2.43
5.60	15,367.9	2.47
5.70	15,642.2	2.52
5.80	15,918.9	2.56
5.90	16,198.0	2.61
6.00	16,479.5	2.65
6.10	16,763.4	2.70
6.20	17,049.8	2.74
6.30	17,338.6	2.79
6.40	17,629.9	2.84
6.50	17,923.5	2.88
6.60	18,219.6	2.93
6.70	18,518.1	2.98
6.80	18,819.1	3.03
6.90	19,122.4	3.08
7.00	19,428.2	3.13
7.10	19,736.4	3.18
7.20	20,047.0	3.23
7.30	20,360.1	3.28
7.40	20,675.6	3.33
7.50	20,993.5	3.38
7.60	21,313.9	3.43
7.70	21,636.6	3.48
7.80	21,961.8	3.53
7.90	22,289.4	3.59
8.00	22,619.5	3.64

Orifice Calculations

Subsection: Level Pool Pond Routing Summary
Scenario: Base
Label: RDF-1 (IN)

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	6.9500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 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	6.833 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	27.71 ft³/s	Time to Peak (Flow, In)	956.667 min
Infiltration (Peak)	3.31 ft³/s	Time to Peak (Infiltration)	963.500 min
Flow (Peak Outlet)	5.82 ft³/s	Time to Peak (Flow, Outlet)	963.500 min

Elevation (Water Surface, Peak)	7.37 ft
Volume (Peak)	41,670.45 ft³

Mass Balance (ft³)	
Volume (Initial)	0.00 ft³
Volume (Total Inflow)	125,017.00 ft³
Volume (Total Infiltration)	88,447.00 ft³
Volume (Total Outlet Outflow)	21,841.00 ft³
Volume (Retained)	14,729.00 ft³
Volume (Unrouted)	0.00 ft³
Error (Mass Balance)	0.0 %

Orifice Calculations

Subsection: Pond Inflow Summary
Scenario: Base
Label: RDF-1 (IN)

Summary for Hydrograph Addition at 'RDF-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (min)	Flow (Peak) (ft^3/s)
Flow (From)	DA1	125,017.20	956.667	27.71
Flow (In)	RDF-1	125,017.20	956.667	27.71

Orifice Calculations

Index

Orifice Calculations

Project Summary	
Title	DPC DMA 2
Engineer	
Company	Kimley Horn
Date	2/2/2023

Notes

Table of Contents

Orifice Calculations

Subsection: User Notifications

User Notifications

Message Id	-1
Scenario	Base
Element Type	Scenario
Element Id	1
Label	Base
Time	(N/A)
Message	The output increment (6.390 min) is not an equal interval of the simulation duration (1,431.360 min). The actual simulation duration is 1,429.867 min.
Source	Precalculation

Orifice Calculations

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
DA1	Base	0	97,579.00	957.500	22.33

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
O-1	Base	0	15,558.00	963.883	5.38

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
RDF-1 (IN)	Base	0	97,399.00	957.500	22.33	(N/A)	(N/A)
RDF-1 (OUT)	Base	0	15,558.00	963.883	5.38	7.52	32,615.00

Orifice Calculations

Subsection: Read Hydrograph
Scenario: Base
Label: DA1

Peak Discharge	22.33 ft³/s
Time to Peak	957.500 min
Hydrograph Volume	97,578.83 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 6.383 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.46	0.46	0.47	0.47	0.47
31.917	0.47	0.47	0.48	0.48	0.48
63.833	0.48	0.48	0.49	0.49	0.49
95.750	0.49	0.49	0.50	0.50	0.50
127.667	0.50	0.50	0.51	0.51	0.51
159.583	0.51	0.52	0.52	0.52	0.52
191.500	0.53	0.53	0.53	0.53	0.54
223.417	0.54	0.54	0.54	0.55	0.55
255.333	0.55	0.56	0.56	0.56	0.57
287.250	0.57	0.57	0.57	0.58	0.58
319.167	0.58	0.59	0.59	0.59	0.60
351.083	0.60	0.61	0.61	0.61	0.62
383.000	0.62	0.62	0.63	0.63	0.64
414.917	0.64	0.65	0.65	0.65	0.66
446.833	0.66	0.67	0.67	0.68	0.68
478.750	0.69	0.69	0.70	0.70	0.71
510.667	0.72	0.72	0.73	0.73	0.74
542.583	0.75	0.75	0.76	0.77	0.77
574.500	0.78	0.79	0.80	0.80	0.81
606.417	0.82	0.83	0.84	0.85	0.86
638.333	0.87	0.88	0.89	0.90	0.91
670.250	0.92	0.93	0.94	0.96	0.97
702.167	0.99	1.00	1.02	1.12	1.14
734.083	1.16	1.18	1.19	1.22	1.23
766.000	1.26	1.28	1.31	1.33	1.36
797.917	1.38	1.42	1.44	1.49	1.51
829.833	1.57	1.60	1.65	1.68	1.76
861.750	1.80	1.89	1.94	2.06	2.15
893.667	2.35	2.46	2.74	2.91	3.91
925.583	4.18	4.92	5.37	7.26	9.51
957.500	22.33	6.09	4.51	3.30	2.59
989.417	2.24	1.99	1.84	1.72	1.62
1,021.333	1.54	1.47	1.40	1.34	1.29
1,053.250	1.25	1.21	1.17	1.13	1.01
1,085.167	0.98	0.95	0.93	0.90	0.88
1,117.083	0.86	0.84	0.83	0.81	0.79
1,149.000	0.78	0.76	0.75	0.74	0.72

Orifice Calculations

Subsection: Read Hydrograph
Scenario: Base
Label: DA1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 6.383 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1,180.917	0.71	0.70	0.69	0.68	0.67
1,212.833	0.66	0.65	0.64	0.63	0.63
1,244.750	0.62	0.61	0.60	0.60	0.59
1,276.667	0.58	0.58	0.57	0.56	0.56
1,308.583	0.55	0.55	0.54	0.54	0.53
1,340.500	0.52	0.52	0.52	0.51	0.51
1,372.417	0.50	0.50	0.49	0.49	0.48
1,404.333	0.48	0.48	0.47	0.47	0.47
1,436.250	0.00	0.47	(N/A)	(N/A)	(N/A)

Orifice Calculations

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

Time vs. Elevation (ft)

Output Time increment = 6.390 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	0.00	0.04	0.08	0.12	0.16
31.917	0.21	0.25	0.29	0.33	0.37
63.833	0.41	0.45	0.49	0.54	0.58
95.750	0.62	0.66	0.70	0.74	0.78
127.667	0.82	0.86	0.89	0.93	0.97
159.583	1.01	1.05	1.08	1.12	1.16
191.500	1.19	1.23	1.26	1.30	1.33
223.417	1.36	1.40	1.43	1.46	1.49
255.333	1.52	1.55	1.58	1.61	1.64
287.250	1.67	1.70	1.73	1.76	1.78
319.167	1.81	1.84	1.86	1.89	1.91
351.083	1.94	1.96	1.98	2.01	2.03
383.000	2.05	2.08	2.10	2.12	2.14
414.917	2.16	2.18	2.20	2.22	2.24
446.833	2.26	2.28	2.30	2.32	2.33
478.750	2.35	2.37	2.39	2.41	2.42
510.667	2.44	2.46	2.48	2.49	2.51
542.583	2.53	2.54	2.56	2.58	2.59
574.500	2.61	2.63	2.64	2.66	2.68
606.417	2.69	2.71	2.73	2.74	2.76
638.333	2.78	2.79	2.81	2.83	2.85
670.250	2.87	2.88	2.90	2.92	2.94
702.167	2.96	2.98	3.00	3.02	3.05
734.083	3.08	3.11	3.14	3.17	3.20
766.000	3.23	3.26	3.29	3.33	3.36
797.917	3.39	3.43	3.46	3.50	3.53
829.833	3.57	3.61	3.66	3.70	3.74
861.750	3.79	3.84	3.90	3.95	4.02
893.667	4.09	4.18	4.28	4.40	4.56
925.583	4.78	5.03	5.32	5.64	6.03
957.500	6.92	7.52	7.30	7.00	6.67
989.417	6.35	6.07	5.85	5.69	5.56
1,021.333	5.47	5.39	5.32	5.26	5.20
1,053.250	5.15	5.10	5.05	5.00	4.94
1,085.167	4.88	4.82	4.76	4.70	4.64
1,117.083	4.58	4.51	4.45	4.39	4.33
1,149.000	4.27	4.20	4.14	4.08	4.02
1,180.917	3.96	3.91	3.85	3.80	3.75
1,212.833	3.70	3.66	3.61	3.57	3.53
1,244.750	3.49	3.45	3.41	3.38	3.34
1,276.667	3.31	3.28	3.24	3.21	3.18

Orifice Calculations

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

Time vs. Elevation (ft)

Output Time increment = 6.390 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
1,308.583	3.16	3.13	3.10	3.08	3.05
1,340.500	3.03	3.00	2.98	2.96	2.94
1,372.417	2.91	2.89	2.87	2.85	2.83
1,404.333	2.81	2.80	2.78	2.76	2.74

Orifice Calculations

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

Time vs. Volume (ft³)

Output Time increment = 6.390 min
Time on left represents time for first value in each row.

Time (min)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.00	176.00	354.00	534.00	713.00
31.917	892.00	1,070.00	1,249.00	1,430.00	1,610.00
63.833	1,788.00	1,966.00	2,144.00	2,323.00	2,500.00
95.750	2,676.00	2,850.00	3,024.00	3,198.00	3,370.00
127.667	3,541.00	3,709.00	3,876.00	4,044.00	4,209.00
159.583	4,371.00	4,533.00	4,695.00	4,853.00	5,009.00
191.500	5,164.00	5,318.00	5,470.00	5,618.00	5,765.00
223.417	5,911.00	6,055.00	6,195.00	6,334.00	6,471.00
255.333	6,606.00	6,739.00	6,872.00	7,001.00	7,128.00
287.250	7,255.00	7,378.00	7,498.00	7,616.00	7,734.00
319.167	7,848.00	7,961.00	8,073.00	8,181.00	8,289.00
351.083	8,395.00	8,500.00	8,603.00	8,704.00	8,803.00
383.000	8,901.00	8,997.00	9,091.00	9,183.00	9,275.00
414.917	9,366.00	9,456.00	9,544.00	9,630.00	9,714.00
446.833	9,798.00	9,881.00	9,962.00	10,043.00	10,123.00
478.750	10,202.00	10,280.00	10,357.00	10,433.00	10,508.00
510.667	10,584.00	10,659.00	10,734.00	10,807.00	10,880.00
542.583	10,953.00	11,026.00	11,098.00	11,170.00	11,242.00
574.500	11,313.00	11,385.00	11,457.00	11,529.00	11,600.00
606.417	11,671.00	11,744.00	11,817.00	11,891.00	11,965.00
638.333	12,041.00	12,117.00	12,193.00	12,270.00	12,347.00
670.250	12,425.00	12,503.00	12,582.00	12,663.00	12,746.00
702.167	12,830.00	12,917.00	13,005.00	13,112.00	13,236.00
734.083	13,363.00	13,490.00	13,618.00	13,747.00	13,877.00
766.000	14,008.00	14,143.00	14,280.00	14,419.00	14,561.00
797.917	14,706.00	14,854.00	15,005.00	15,162.00	15,324.00
829.833	15,492.00	15,668.00	15,849.00	16,035.00	16,231.00
861.750	16,439.00	16,659.00	16,892.00	17,144.00	17,421.00
893.667	17,742.00	18,114.00	18,550.00	19,059.00	19,777.00
925.583	20,715.00	21,816.00	23,050.00	24,463.00	26,156.00
957.500	30,017.00	32,615.00	31,665.00	30,360.00	28,923.00
989.417	27,547.00	26,333.00	25,366.00	24,659.00	24,123.00
1,021.333	23,700.00	23,353.00	23,054.00	22,787.00	22,544.00
1,053.250	22,317.00	22,101.00	21,887.00	21,671.00	21,434.00
1,085.167	21,175.00	20,911.00	20,646.00	20,378.00	20,108.00
1,117.083	19,838.00	19,567.00	19,298.00	19,030.00	18,762.00
1,149.000	18,495.00	18,229.00	17,964.00	17,703.00	17,442.00
1,180.917	17,185.00	16,938.00	16,702.00	16,475.00	16,258.00
1,212.833	16,049.00	15,848.00	15,654.00	15,467.00	15,288.00
1,244.750	15,117.00	14,951.00	14,789.00	14,635.00	14,486.00
1,276.667	14,341.00	14,201.00	14,066.00	13,934.00	13,807.00

Orifice Calculations

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

Time vs. Volume (ft³)

Output Time increment = 6.390 min
Time on left represents time for first value in each row.

Time (min)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
1,308.583	13,684.00	13,565.00	13,449.00	13,337.00	13,229.00
1,340.500	13,121.00	13,017.00	12,917.00	12,820.00	12,726.00
1,372.417	12,633.00	12,543.00	12,455.00	12,369.00	12,285.00
1,404.333	12,202.00	12,123.00	12,046.00	11,970.00	11,897.00

Orifice Calculations

Subsection: Outlet Input Data Scenario: Base

Label: Composite Outlet Structure - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	8.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	5.00	8.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Orifice Calculations

Subsection: Outlet Input Data Scenario: Base

Label: Composite Outlet Structure - 1

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	5.00 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

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 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Orifice Calculations

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

Label: RDF-1

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	6.9500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 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	6.383 min

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.00	0.00	0.00	0.000	0.00	0.00	0.00
0.10	0.00	433.54	5.419	0.00	0.00	2.26
0.20	0.00	867.08	21.677	0.00	0.00	4.53
0.30	0.00	1,300.62	48.773	0.01	0.01	6.80
0.40	0.00	1,734.16	86.708	0.01	0.01	9.07
0.50	0.00	2,167.70	135.481	0.02	0.02	11.34
0.60	0.00	2,601.24	195.093	0.03	0.03	13.61
0.70	0.00	3,034.78	265.543	0.04	0.04	15.89
0.80	0.00	3,468.32	346.832	0.06	0.06	18.17
0.90	0.00	3,901.86	438.959	0.07	0.07	20.45
1.00	0.00	4,335.40	541.925	0.09	0.09	22.73
1.10	0.00	4,768.94	655.729	0.11	0.11	25.01
1.20	0.00	5,202.48	780.372	0.13	0.13	27.29
1.30	0.00	5,636.02	915.853	0.15	0.15	29.58
1.40	0.00	6,069.56	1,062.172	0.17	0.17	31.87
1.50	0.00	6,503.10	1,219.331	0.20	0.20	34.15
1.60	0.00	6,936.64	1,387.327	0.22	0.22	36.45
1.70	0.00	7,370.18	1,566.162	0.25	0.25	38.74
1.80	0.00	7,803.72	1,755.836	0.28	0.28	41.03
1.90	0.00	8,237.26	1,956.348	0.31	0.31	43.33
2.00	0.00	8,670.80	2,167.699	0.35	0.35	45.63
2.10	0.00	9,104.34	2,389.888	0.38	0.38	47.93
2.20	0.00	9,537.88	2,622.916	0.42	0.42	50.23
2.30	0.00	9,971.42	2,866.782	0.46	0.46	52.53
2.40	0.00	10,404.95	3,121.486	0.50	0.50	54.84
2.50	0.00	10,838.49	3,387.030	0.54	0.54	57.14
2.60	0.00	11,272.03	3,663.411	0.59	0.59	59.45
2.70	0.00	11,705.57	3,950.631	0.64	0.64	61.76

Orifice Calculations

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

Label: RDF-1

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2.80	0.00	12,139.11	4,248.690	0.68	0.68	64.07
2.90	0.00	12,572.65	4,557.587	0.73	0.73	66.39
3.00	0.00	13,006.19	4,877.323	0.78	0.78	68.70
3.10	0.00	13,439.73	5,207.897	0.84	0.84	71.02
3.20	0.00	13,873.27	5,549.309	0.89	0.89	73.34
3.30	0.00	14,306.81	5,901.560	0.95	0.95	75.66
3.40	0.00	14,740.35	6,264.650	1.01	1.01	77.98
3.50	0.00	15,173.89	6,638.578	1.07	1.07	80.31
3.60	0.00	15,607.43	7,023.345	1.13	1.13	82.63
3.70	0.00	16,040.97	7,418.950	1.19	1.19	84.96
3.80	0.00	16,474.51	7,825.393	1.26	1.26	87.29
3.90	0.00	16,908.05	8,242.675	1.33	1.33	89.62
4.00	0.00	17,341.59	8,670.796	1.39	1.39	91.95
4.10	0.00	17,775.13	8,851.304	1.42	1.42	94.24
4.20	0.00	18,208.67	9,033.671	1.45	1.45	96.54
4.30	0.00	18,642.21	9,217.898	1.48	1.48	98.83
4.40	0.00	19,075.75	9,403.985	1.51	1.51	101.13
4.50	0.00	19,509.29	9,591.931	1.54	1.54	103.42
4.60	0.00	19,942.83	9,781.737	1.57	1.57	105.71
4.70	0.00	20,376.37	9,973.402	1.60	1.60	108.01
4.80	0.00	20,809.91	10,166.927	1.64	1.64	110.30
4.90	0.00	21,243.45	10,362.312	1.67	1.67	112.60
5.00	0.00	21,676.99	10,559.556	1.70	1.70	114.89
5.10	0.03	22,110.53	10,758.660	1.73	1.76	117.22
5.20	0.13	22,544.07	10,959.623	1.76	1.90	119.62
5.30	0.29	22,977.61	11,162.446	1.80	2.09	122.08
5.40	0.50	23,411.15	11,367.129	1.83	2.33	124.58
5.50	0.76	23,844.69	11,573.671	1.86	2.62	127.14
5.60	1.07	24,278.23	11,782.072	1.90	2.97	129.74
5.70	1.41	24,711.77	11,992.334	1.93	3.34	132.38
5.80	1.78	25,145.31	12,204.455	1.96	3.74	135.05
5.90	2.17	25,578.85	12,418.435	2.00	4.17	137.74
6.00	2.67	26,012.39	12,634.275	2.03	4.71	140.54
6.10	2.93	26,445.93	12,851.975	2.07	5.00	143.09
6.20	3.16	26,879.47	13,071.534	2.10	5.27	145.63
6.30	3.38	27,313.01	13,292.953	2.14	5.52	148.15
6.40	3.59	27,746.55	13,516.232	2.17	5.76	150.65
6.50	3.78	28,180.09	13,741.370	2.21	5.99	153.15
6.60	3.96	28,613.63	13,968.367	2.25	6.21	155.63
6.70	4.14	29,047.17	14,197.224	2.28	6.42	158.11
6.80	4.31	29,480.71	14,427.941	2.32	6.63	160.58
6.90	4.47	29,914.25	14,660.518	2.36	6.83	163.04
7.00	4.63	30,347.79	14,894.954	2.40	7.03	165.50

Orifice Calculations

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

Label: RDF-1

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
7.10	4.78	30,781.32	15,131.249	2.43	7.22	167.95
7.20	4.93	31,214.86	15,369.405	2.47	7.40	170.40
7.30	5.07	31,648.40	15,609.419	2.51	7.58	172.85
7.40	5.21	32,081.94	15,851.294	2.55	7.76	175.29
7.50	5.35	32,515.48	16,095.028	2.59	7.94	177.73
7.60	5.48	32,949.02	16,340.621	2.63	8.11	180.16
7.70	5.61	33,382.56	16,588.074	2.67	8.28	182.60
7.80	5.73	33,816.10	16,837.387	2.71	8.44	185.03
7.90	5.86	34,249.64	17,088.560	2.75	8.61	187.45
8.00	5.98	34,683.18	17,341.591	2.79	8.77	189.88

Orifice Calculations

Subsection: Pond Infiltration Calculations
Scenario: Base
Label: RDF-1 (IN)

Average Infiltration Rating Table

Elevation (Water Surface) (ft)	Area (Total) (ft²)	Flow (Infiltration) (ft³/s)
0.00	0.0	0.00
0.10	5.4	0.00
0.20	21.7	0.00
0.30	48.8	0.01
0.40	86.7	0.01
0.50	135.5	0.02
0.60	195.1	0.03
0.70	265.5	0.04
0.80	346.8	0.06
0.90	439.0	0.07
1.00	541.9	0.09
1.10	655.7	0.11
1.20	780.4	0.13
1.30	915.9	0.15
1.40	1,062.2	0.17
1.50	1,219.3	0.20
1.60	1,387.3	0.22
1.70	1,566.2	0.25
1.80	1,755.8	0.28
1.90	1,956.3	0.31
2.00	2,167.7	0.35
2.10	2,389.9	0.38
2.20	2,622.9	0.42
2.30	2,866.8	0.46
2.40	3,121.5	0.50
2.50	3,387.0	0.54
2.60	3,663.4	0.59
2.70	3,950.6	0.64
2.80	4,248.7	0.68
2.90	4,557.6	0.73
3.00	4,877.3	0.78
3.10	5,207.9	0.84
3.20	5,549.3	0.89
3.30	5,901.6	0.95
3.40	6,264.6	1.01
3.50	6,638.6	1.07
3.60	7,023.3	1.13
3.70	7,418.9	1.19
3.80	7,825.4	1.26
3.90	8,242.7	1.33
4.00	8,670.8	1.39
4.10	8,851.3	1.42
4.20	9,033.7	1.45

Orifice Calculations

Subsection: Pond Infiltration Calculations
Scenario: Base
Label: RDF-1 (IN)

Average Infiltration Rating Table

Elevation (Water Surface) (ft)	Area (Total) (ft²)	Flow (Infiltration) (ft³/s)
4.30	9,217.9	1.48
4.40	9,404.0	1.51
4.50	9,591.9	1.54
4.60	9,781.7	1.57
4.70	9,973.4	1.60
4.80	10,166.9	1.64
4.90	10,362.3	1.67
5.00	10,559.6	1.70
5.10	10,758.7	1.73
5.20	10,959.6	1.76
5.30	11,162.4	1.80
5.40	11,367.1	1.83
5.50	11,573.7	1.86
5.60	11,782.1	1.90
5.70	11,992.3	1.93
5.80	12,204.5	1.96
5.90	12,418.4	2.00
6.00	12,634.3	2.03
6.10	12,852.0	2.07
6.20	13,071.5	2.10
6.30	13,293.0	2.14
6.40	13,516.2	2.17
6.50	13,741.4	2.21
6.60	13,968.4	2.25
6.70	14,197.2	2.28
6.80	14,427.9	2.32
6.90	14,660.5	2.36
7.00	14,895.0	2.40
7.10	15,131.2	2.43
7.20	15,369.4	2.47
7.30	15,609.4	2.51
7.40	15,851.3	2.55
7.50	16,095.0	2.59
7.60	16,340.6	2.63
7.70	16,588.1	2.67
7.80	16,837.4	2.71
7.90	17,088.6	2.75
8.00	17,341.6	2.79

Orifice Calculations

Subsection: Level Pool Pond Routing Summary
Scenario: Base
Label: RDF-1 (IN)

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	6.9500 in/h

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 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	6.383 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	22.33 ft³/s	Time to Peak (Flow, In)	957.500 min
Infiltration (Peak)	2.60 ft³/s	Time to Peak (Infiltration)	963.883 min
Flow (Peak Outlet)	5.38 ft³/s	Time to Peak (Flow, Outlet)	963.883 min

Elevation (Water Surface, Peak)	7.52 ft
Volume (Peak)	32,615.19 ft³

Mass Balance (ft³)	
Volume (Initial)	0.00 ft³
Volume (Total Inflow)	97,399.00 ft³
Volume (Total Infiltration)	70,190.00 ft³
Volume (Total Outlet Outflow)	15,558.00 ft³
Volume (Retained)	11,650.00 ft³
Volume (Unrouted)	0.00 ft³
Error (Mass Balance)	0.0 %

Orifice Calculations

Subsection: Pond Inflow Summary
Scenario: Base
Label: RDF-1 (IN)

Summary for Hydrograph Addition at 'RDF-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA1

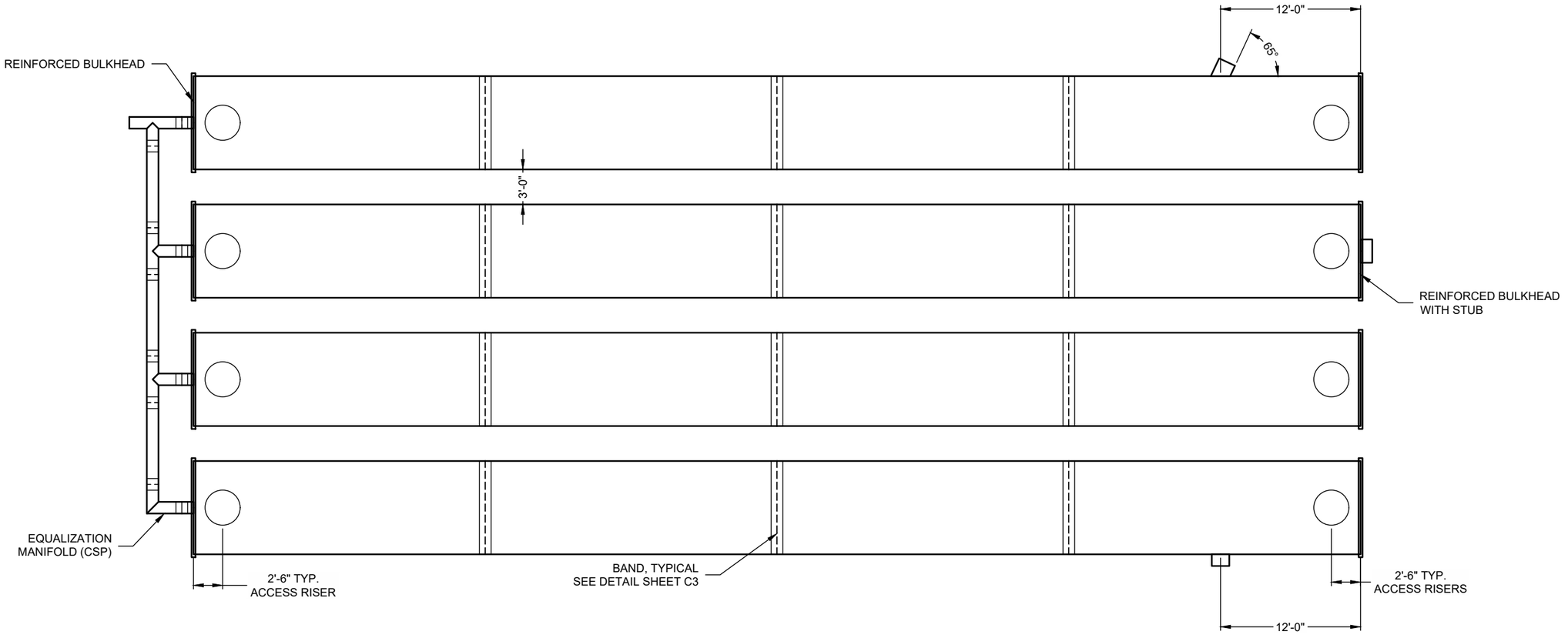
Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (min)	Flow (Peak) (ft³/s)
Flow (From)	DA1	97,578.83	957.500	22.33
Flow (In)	RDF-1	97,398.82	957.500	22.33

Orifice Calculations

Index

SAMPLE UNDERGROUND DETENTION SPECIFICITION



ASSEMBLY

SCALE: 1" = 10'

THE UNDERSIGNED HEREBY APPROVES THE ATTACHED (6) PAGES INCLUDING THE FOLLOWING:

- **MAINLINE PIPE GAGE = 18, 16, 14, 12, 10, 8**
- **WALL TYPE = SOLID OR PERF**
- **DIAMETER = 12 - 144"**
- **FINISH = ALT2, POLY, GALV, ALUM**
- **CORRUGATION = 2 2/3x1/2, 3x1, 5x1**

CUSTOMER _____ DATE _____

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE.
- ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD (EOR) PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE AS REQUIRED, BY CONTRACTOR.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- ALL ACCESS CASTINGS ARE THE RESPONSIBILITY OF THE CONTRACTOR AND ARE NOT SUPPLIED BY CONTECH.

MARK	DATE	REVISION DESCRIPTION	BY

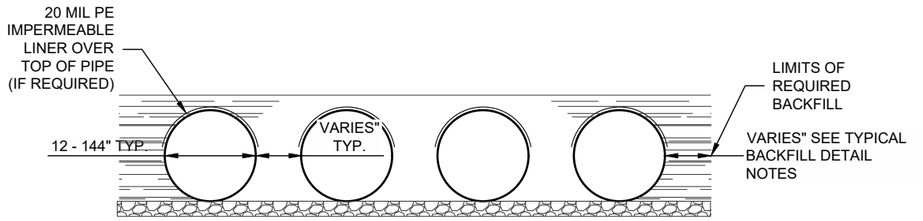
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH CONTRACT DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

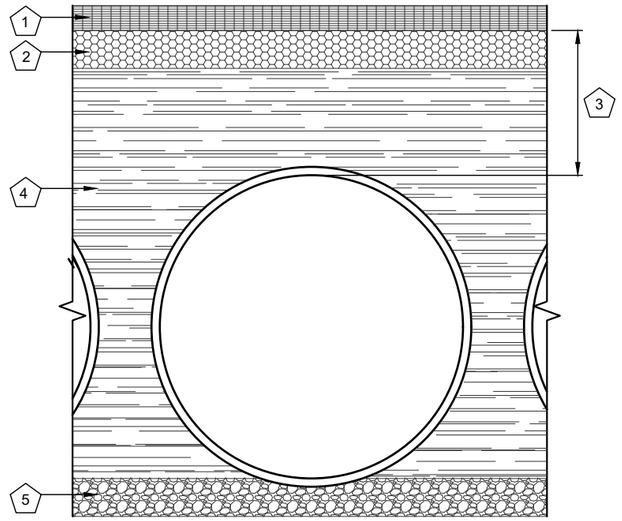
PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
SHEET NO.: C1 OF 6		

SAMPLE UNDERGROUND DETENTION SPECIFICITION



TYPICAL SECTION VIEW
NOT TO SCALE

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



KEY

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102"
   AND LARGER MEASURED TO TOP OF RIGID
   OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145
   A1, A2 OR A3, OR APPROVED EQUAL.
   PLACED IN 8" LIFTS (COMPACTED TO MIN.
   90% STANDARD DENSITY PER AASHTO T99.)
5. GRANULAR BEDDING, ROUGHLY SHAPED TO
   FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH

FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, 4" - 6" OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

THE BACKFILL SHALL BE AN A1, A2 OR A3 GRANULAR FILL PER AASHTO M145, OR A WELL-GRADED GRANULAR FILL AS APPROVED BY THE SITE ENGINEER (SEE INSTALLATION GUIDELINES). THE MATERIAL SHALL BE PLACED IN 8" LOOSE LIFTS AND COMPACTED TO 90% AASHTO T99 STANDARD PROCTOR DENSITY. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.

BACKFILL DETAIL
NOT TO SCALE

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

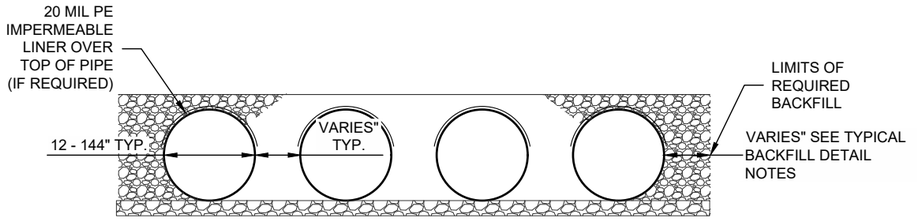
CONTECH CMP DETENTION SYSTEMS
CONTECH **CONTRACT** DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
SHEET NO.: C2 (2) OF 6		

C:\USERS\DHOPKINS\DESKTOP\000000-001-CMP SAMPLE SQLID - PERF.DWG 3/7/2019 5:49 PM

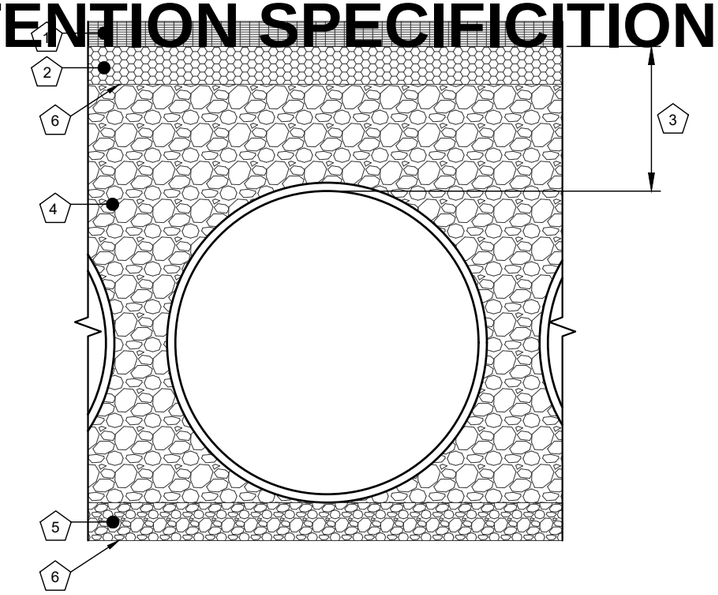
SAMPLE UNDERGROUND DETENTION SPECIFICITION



TYPICAL SECTION VIEW

NOT TO SCALE

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



KEY ⬠

1.) RIGID OR FLEXIBLE PAVEMENT

2.) GRANULAR ROAD BASE

3.) 12" MIN. FOR DIAMETERS THROUGH 96" 18" MIN. FOR DIAMETERS FROM 102" AND LARGER MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.

4.) FREE DRAINING ANGULAR WASHED STONE 3/4" - 2" MIN. PARTICLE SIZE.

5.) GRANULAR BEDDING, ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE, 4"- 6" IN DEPTH.

6.) CONTECH C-40 OR C-45 NON-WOVEN GEOTEXTILE REQUIRED, WRAPPING TRENCH ONLY.

FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, THE 4 INCHES OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

THE BACKFILL MATERIAL SHALL BE FREE-DRAINING ANGULAR WASHED STONE 3/4" - 2" PARTICLE SIZE. MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR-TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE PROJECT ENGINEER OR HIS REPRESENTATIVE IS SATISFIED WITH THE LEVEL OF COMPACTION. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

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

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

1/C3 BACKFILL DETAIL

SCALE: N.T.S.

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

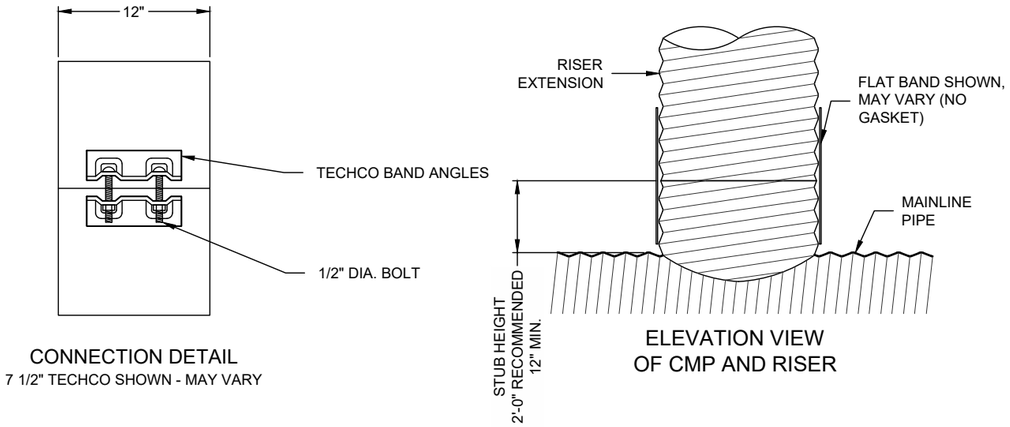
CONTECH CMP DETENTION SYSTEMS

CONTECH **CONTRACT** DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED:	DRAWN:	
xxx	DAH	
CHECKED:	APPROVED:	
xxx	xxx	
SHEET NO.:		
C2 OF 6		

SAMPLE UNDERGROUND DETENTION SPECIFICITION



CONNECTION DETAIL
7 1/2" TECHCO SHOWN - MAY VARY

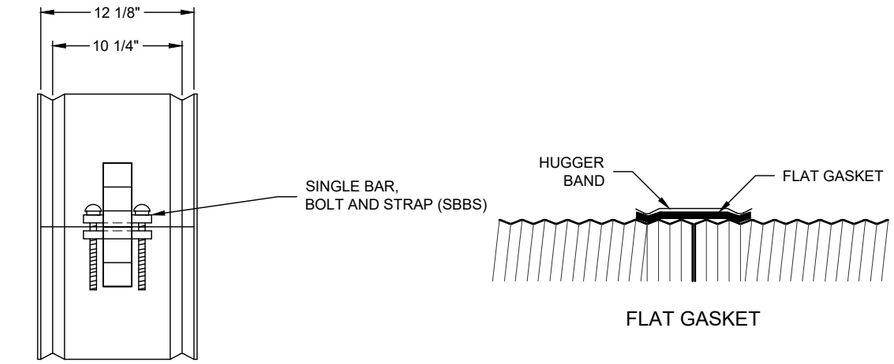
ELEVATION VIEW
OF CMP AND RISER

PLAIN END CMP RISER PIPE

GENERAL NOTES:

1. **DELIVERED BAND STYLE AND FASTENER TYPE MAY VARY BY FABRICATION PLANT.**
2. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
3. BAND MATERIAL AND GAGE TO BE SAME AS RISER MATERIAL.
4. IF RISER HAS A HEIGHT OF COVER OF 10' OR MORE, USE A SLIP JOINT.
5. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" 2-PIECES
6. ALL RISER JOINT COMPONENTS WILL BE FIELD ASSEMBLED.
7. MANHOLE RISERS IN APPLICATIONS WHERE TRAFFIC LOADS ARE IMPOSED REQUIRE SPECIAL DESIGN CONSIDERATIONS.
8. DIMENSIONS SUBJECT TO MANUFACTURING TOLERANCES.

12" RISER BAND DETAIL
NOT TO SCALE



CONNECTION DETAIL
(SBBS)

2 2/3"x1/2" RE-ROLLED END HEL-COR PIPE

GENERAL NOTES:

1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
3. BANDS ARE SHAPED TO MATCH THE PIPE-ARCH WHEN APPLICABLE.
4. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" THRU 96" 2-PIECES
   - 102" THRU 144" 3-PIECES
5. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
6. ALL CMP IS REROLLED TO HAVE ANNULAR END CORRUGATIONS OF 2 2/3"x1/2"
7. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
8. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).

H-12 HUGGER BAND DETAIL
NOT TO SCALE

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

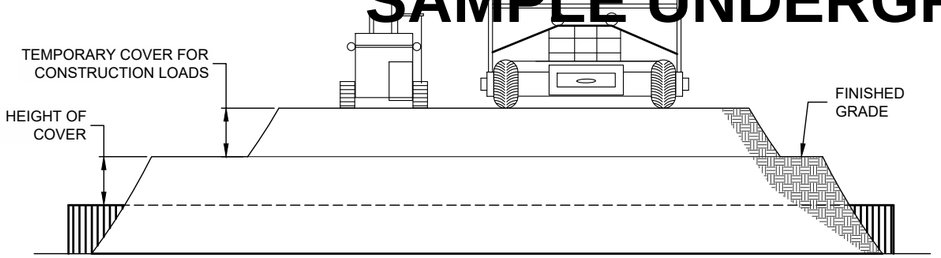
CONTECH CMP DETENTION SYSTEMS
CONTECH **CONTRACT** DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
SHEET NO.: C3 OF 6		

C:\USERS\DHOPKINS\DESKTOP\000000-001-CMP SAMPLE SQLID - PERF.DWG 3/7/2019 5:49 PM

SAMPLE UNDERGROUND DETENTION SPECIFICITION



CONSTRUCTION LOADS

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

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

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

CONSTRUCTION LOADING DIAGRAM

NOT TO SCALE

SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE CORRUGATED STEEL PIPE (CSP) DETAILED IN THE PROJECT PLANS.

MATERIAL

THE ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M274 OR ASTM A929.

PIPE

THE CSP SHALL BE MANUFACTURED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF AASHTO M36 OR ASTM A760. THE PIPE SIZES, GAGES AND CORRUGATIONS SHALL BE AS SHOWN ON THE PROJECT PLANS.

ALL FABRICATION OF THE PRODUCT SHALL OCCUR WITHIN THE UNITED STATES.

HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH RECOMMENDATIONS OF THE NATIONAL CORRUGATED STEEL PIPE ASSOCIATION (NCSPA)

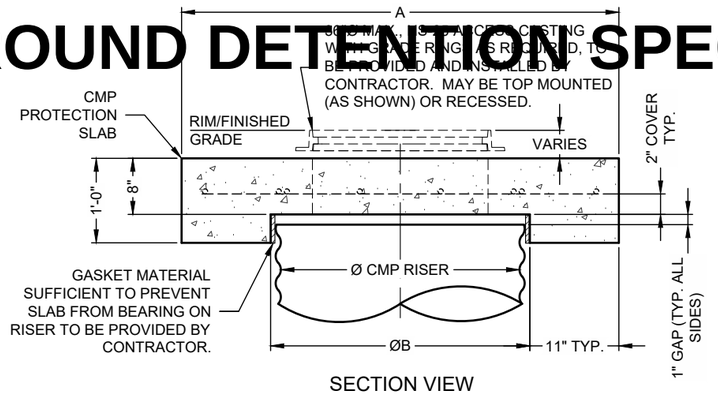
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II OR ASTM A798 AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

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

MATERIAL SPECIFICATION

NOT TO SCALE

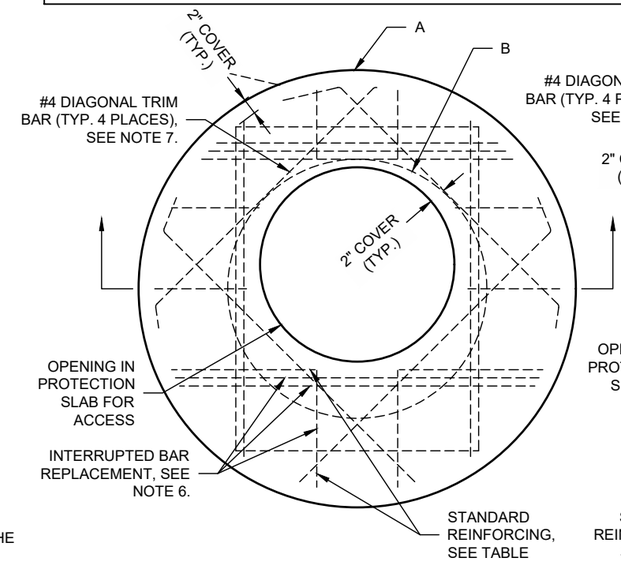


SECTION VIEW

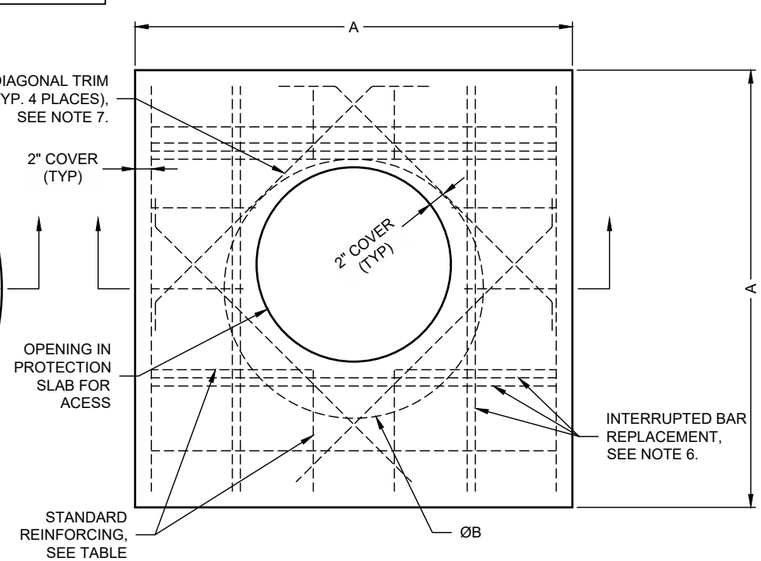
REINFORCING TABLE				
Ø CMP RISER	A	B Ø	REINFORCING	**BEARING PRESSURE (PSF)
24"	4'Ø 4'x4'	26"	#5 @ 10" OCEW #5 @ 10" OCEW	2,540 1,900
30"	4'-6"Ø 4'-6" x 4'-6"	32"	#5 @ 10" OCEW #5 @ 9" OCEW	2,260 1,670
36"	5'Ø 5' x 5'	38"	#5 @ 9" OCEW #5 @ 8" OCEW	2,060 1,500
42"	5'-6"Ø 5'-6" x 5'-6"	44"	#5 @ 8" OCEW #5 @ 8" OCEW	1,490 1,370
48"	6'Ø 6' x 6'	50"	#5 @ 7" OCEW #5 @ 7" OCEW	1,210 1,270

** ASSUMED SOIL BEARING CAPACITY

ACCESS CASTING NOT SUPPLIED BY CONTECH



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION AND ACI 350.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 4,000 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERS, ARCHITECTS AND LAND SURVEYORS, ENDWELL, NY.

MANHOLE CAP DETAIL

NOT TO SCALE

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

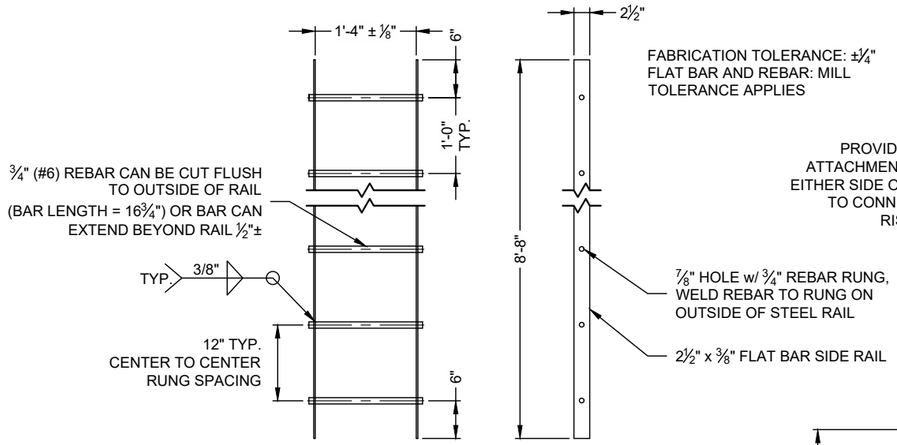
CONTECH CMP DETENTION SYSTEMS

CONTECH **CONTRACT** DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
SHEET NO.: C4 OF 6		

SAMPLE UNDERGROUND DETENTION SPECIFICITION



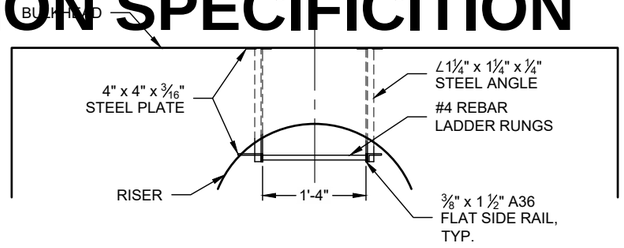
ELEVATION SIDE

NOTES:
1. LADDERS CAN BE MADE IN STANDARD LENGTHS AND CUT TO FIT
2. ALL MATERIAL TO MEET ASTM A36
3. LADDER TO BE HOT DIPPED GALVANIZED PER ASTM A-123 AFTER FABRICATION IS COMPLETE

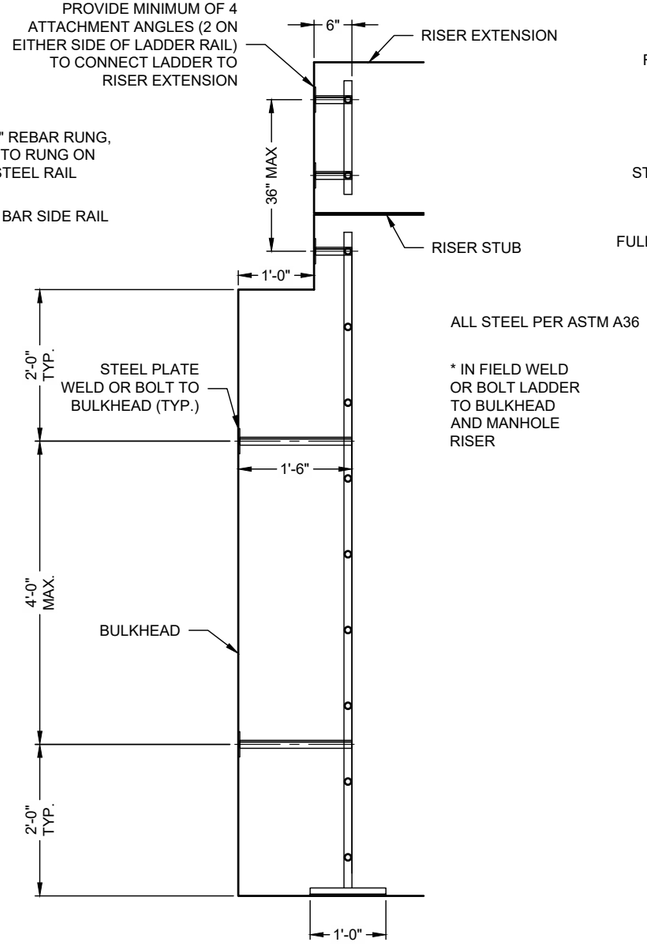
STANDARD LADDER DETAIL

NOT TO SCALE

PART No. HALAGVL16



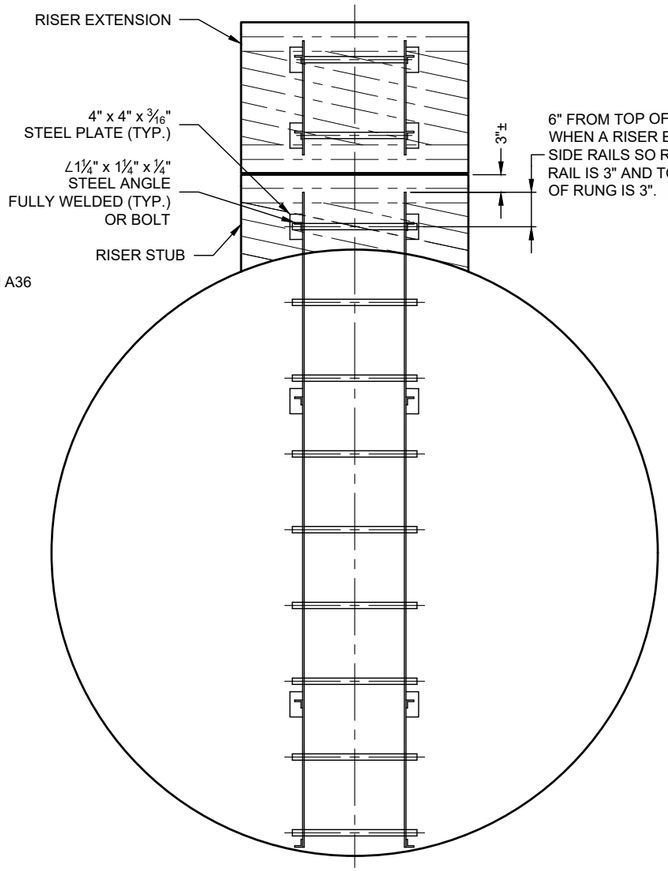
PLAN



ALL STEEL PER ASTM A36

* IN FIELD WELD OR BOLT LADDER TO BULKHEAD AND MANHOLE RISER

SIDE



ELEVATION

RISER LADDER DETAIL

NOT TO SCALE

NOTE:
THIS DRAWING IS INTENDED TO APPLY TO LADDERS INSTALLED IN RISERS HAVING A DIAMETER OF 36" OR LARGER AND LOCATED ONE FOOT FROM THE BULKHEAD ONLY

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

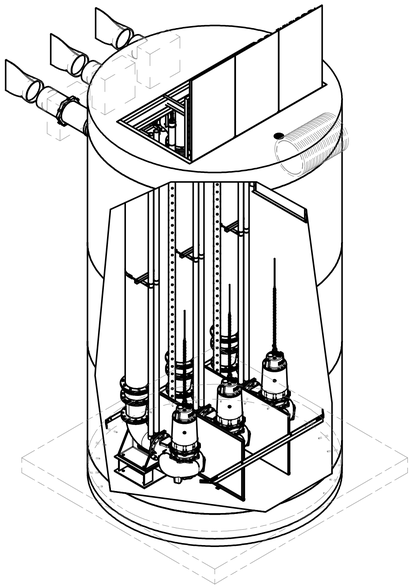
CONTECH CMP DETENTION SYSTEMS

CONTECH **CONTRACT** DRAWING

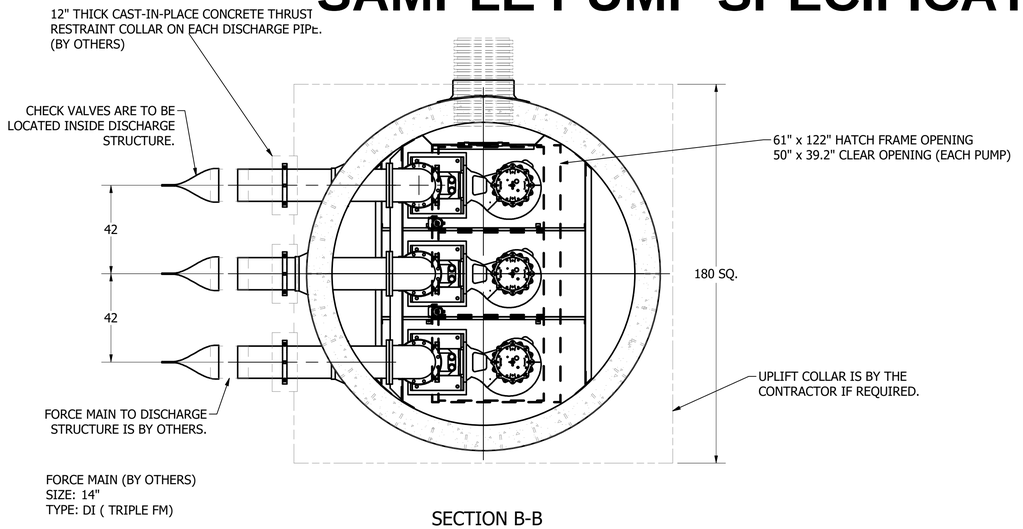
12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
SHEET NO.: C5 OF 6		

SAMPLE PUMP SPECIFICATIONS



12'DIAMETER WET WELL
14"DISCHARGE PIPING
TRIPLEX KEEN PUMPS
14" TIDEFLEX CHECK VALVES



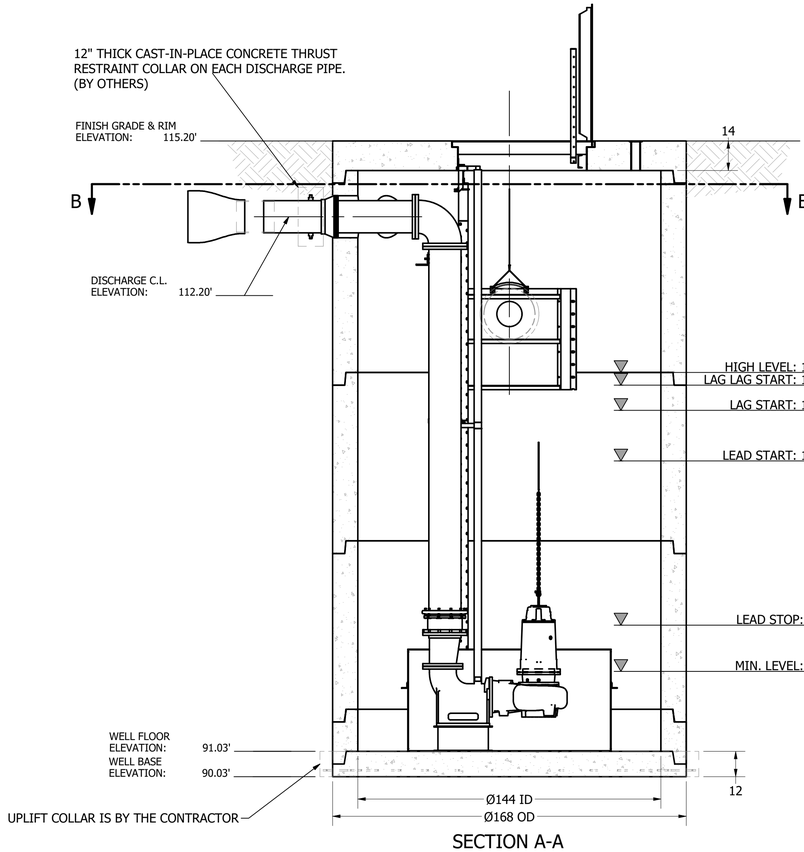
SECTION B-B
SCALE 1 / 36

NOTE: TOP SLAB AND HATCH ARE H-20 LOW-SPEED* TRAFFIC RATED

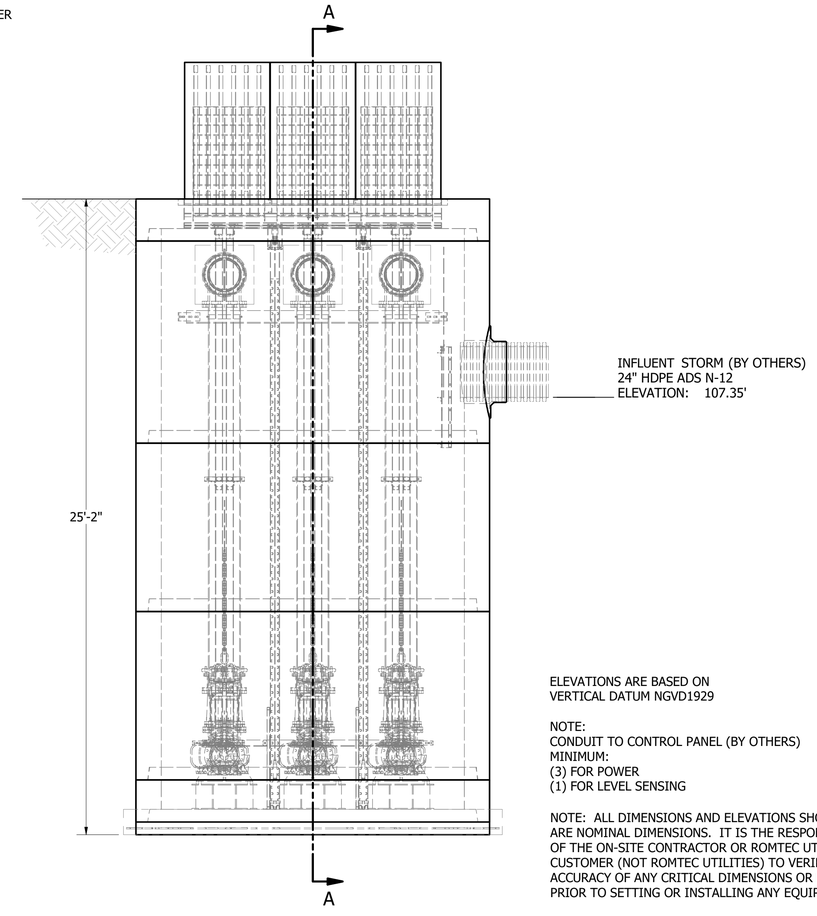
*LOW SPEED TRAFFIC: 15 MPH AND LOWER

PUMP PACKAGE
CONFIGURATION: TRIPLEX
MODEL: KEEN K12VK
HP: 25
DUTY POINT: 3639 GPM AT 20.3ft TDH

FEATURES
H20 HATCH
DUCTILE IRON PIPING, 14"
TIDE FLEX CHECK VALVES, 14"
(2) PRESSURE TRANSDUCER, LEVEL CONTROL
STAINLESS INLET DIFFUSER PANEL
STAINLESS GUIDE RAILS
QUICK CONNECT DISCHARGE ELBOWS
STAINLESS PUMP DIVIDER BAFFLES



SECTION A-A
SCALE 1 / 36



ELEVATIONS ARE BASED ON VERTICAL DATUM NGVD1929

NOTE:
CONDUIT TO CONTROL PANEL (BY OTHERS)
MINIMUM:
(3) FOR POWER
(1) FOR LEVEL SENSING

NOTE: ALL DIMENSIONS AND ELEVATIONS SHOWN ARE NOMINAL DIMENSIONS. IT IS THE RESPONSIBILITY OF THE ON-SITE CONTRACTOR OR ROMTEC UTILITIES CUSTOMER (NOT ROMTEC UTILITIES) TO VERIFY THE ACCURACY OF ANY CRITICAL DIMENSIONS OR ELEVATIONS PRIOR TO SETTING OR INSTALLING ANY EQUIPMENT.

ALL MATERIALS SHOWN ON THIS SHEET WILL BE SUPPLIED BY ROMTEC UTILITIES AND DELIVERED TO THE SITE AFTER THE HOLE HAS BEEN EXCAVATED AND SHORED. THE CONTRACTOR SHALL SUPPLY A CRANE OF SUFFICIENT SIZE TO LOWER ALL THE CONCRETE PIECES INTO THE HOLE SAFELY. THE CONTRACTOR SHALL INSTALL THE WET WELL (AND VALVE VAULT AND METERING VAULT IF APPLICABLE). ROMTEC UTILITIES WILL PROVIDE A REPRESENTATIVE FOR TECHNICAL ASSISTANCE ON THE DAY OF INSTALLATION TO ANSWER ANY QUESTIONS THAT MAY ARISE. THE CONTRACTOR IS RESPONSIBLE FOR ALL PLUMBING AND ELECTRICAL CONNECTIONS AND INSTALLATION. ITEMS NOTED AS "BY OTHERS" WILL BE PROVIDED AND INSTALLED BY THE CONTRACTOR. ROMTEC UTILITIES WILL NOT INSTALL ANY OF THE COMPONENTS SHOWN ON THIS PAGE.

ROMTEC UTILITIES

VERIFY SCALE
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALE ACCORDINGLY
0 1"

REV	DATE	DESCRIPTION	
2	11/10/2021	ADDED VERTICAL DATUM NOTE	KB
1	3-19-21	BASIC DESIGN REVIEW	KB

REVISION HISTORY

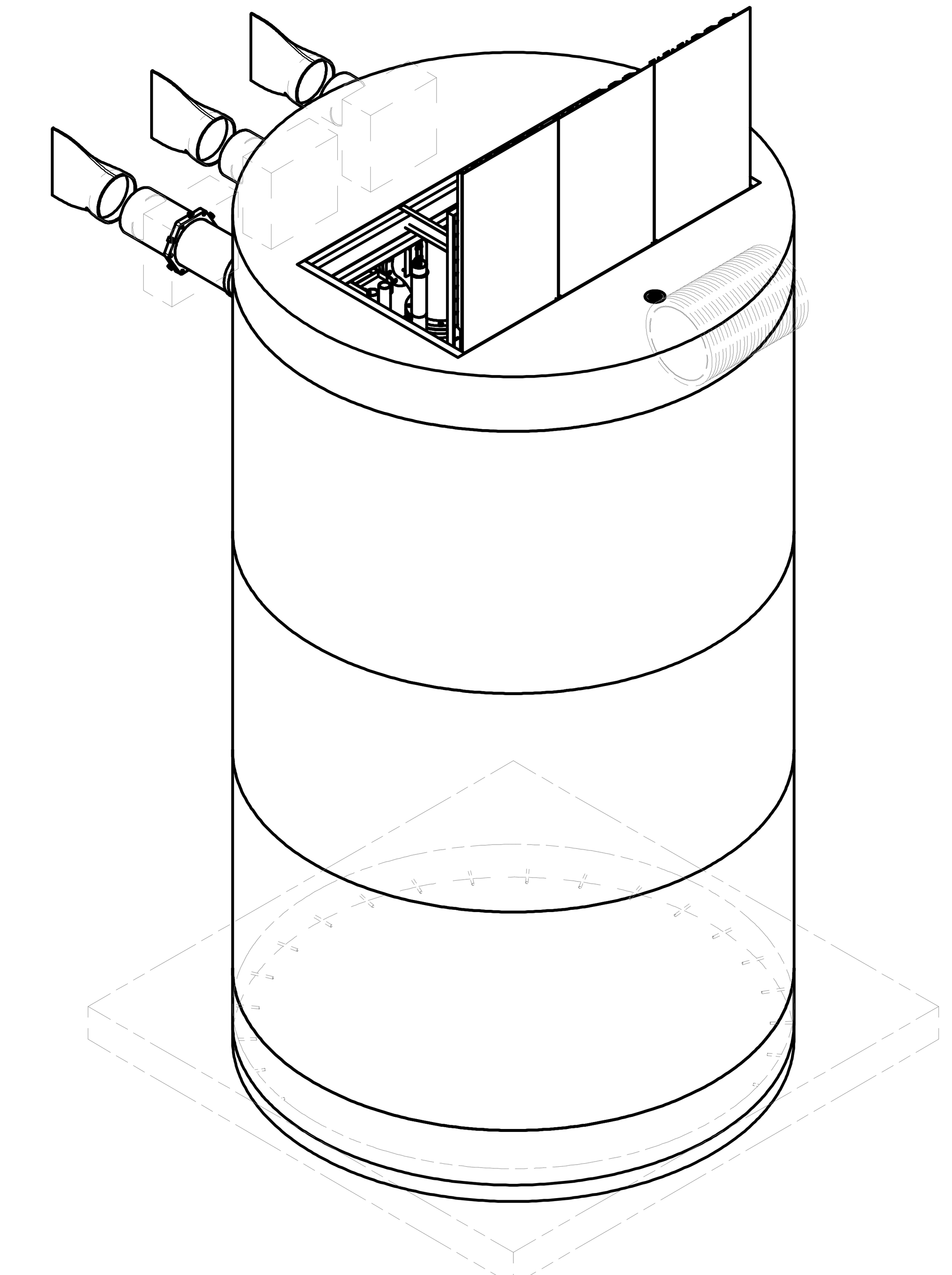
DSN: KB
DRN: KB & AD
CKD: KB
DATE: 10-29-20

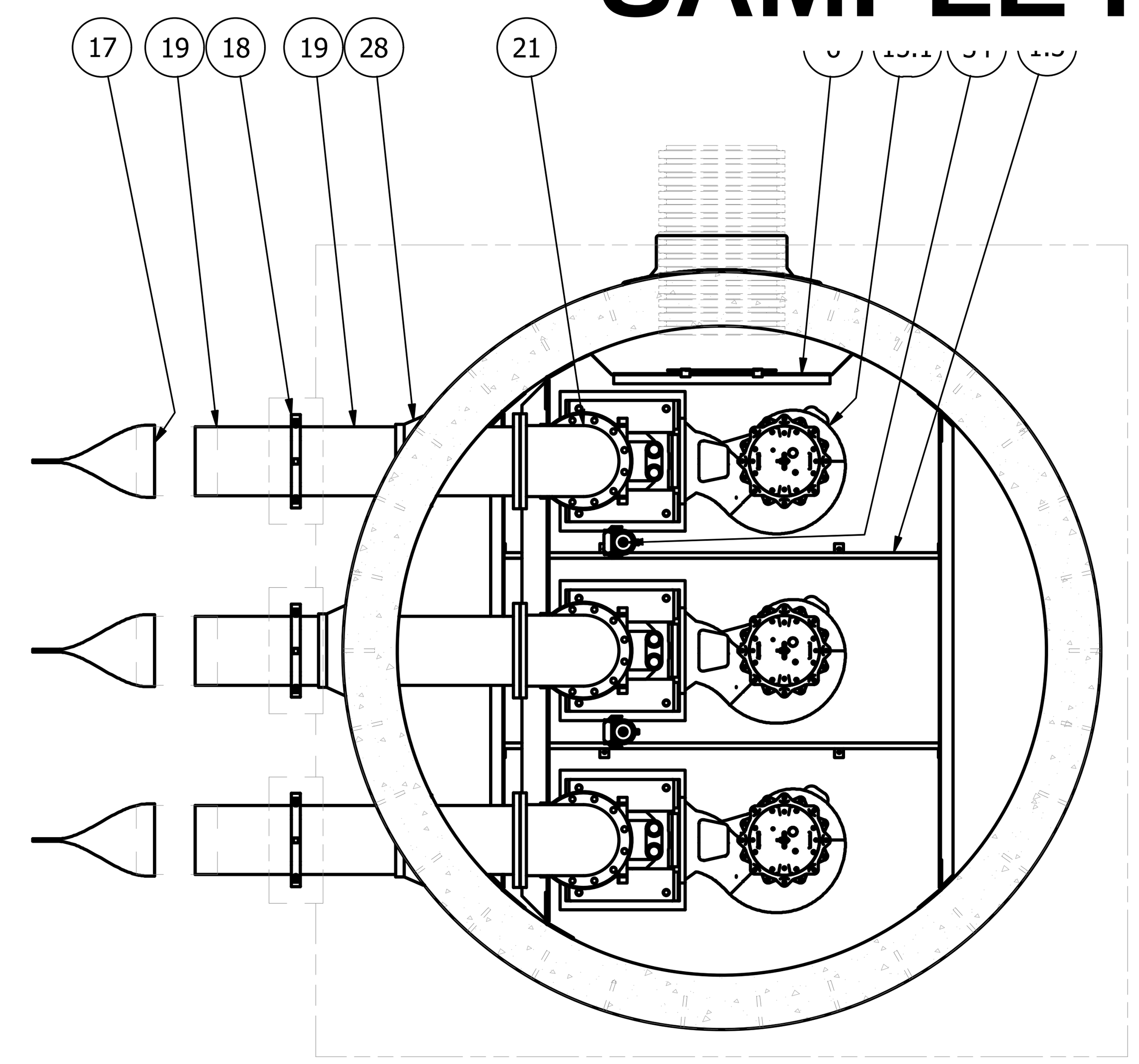
ROMTEC UTILITIES
18240 NORTH BANK ROAD
ROSEBURG, OREGON 97470
PHONE: (541) 496-9678
WWW.ROMTECUTILITIES.COM

HAMPTON PARK
CAPITOL HEIGHTS, MD
STORMWATER PUMP STATION
BASIC DESIGN DRAWING

MECHANICAL SHEET
1 OF 3

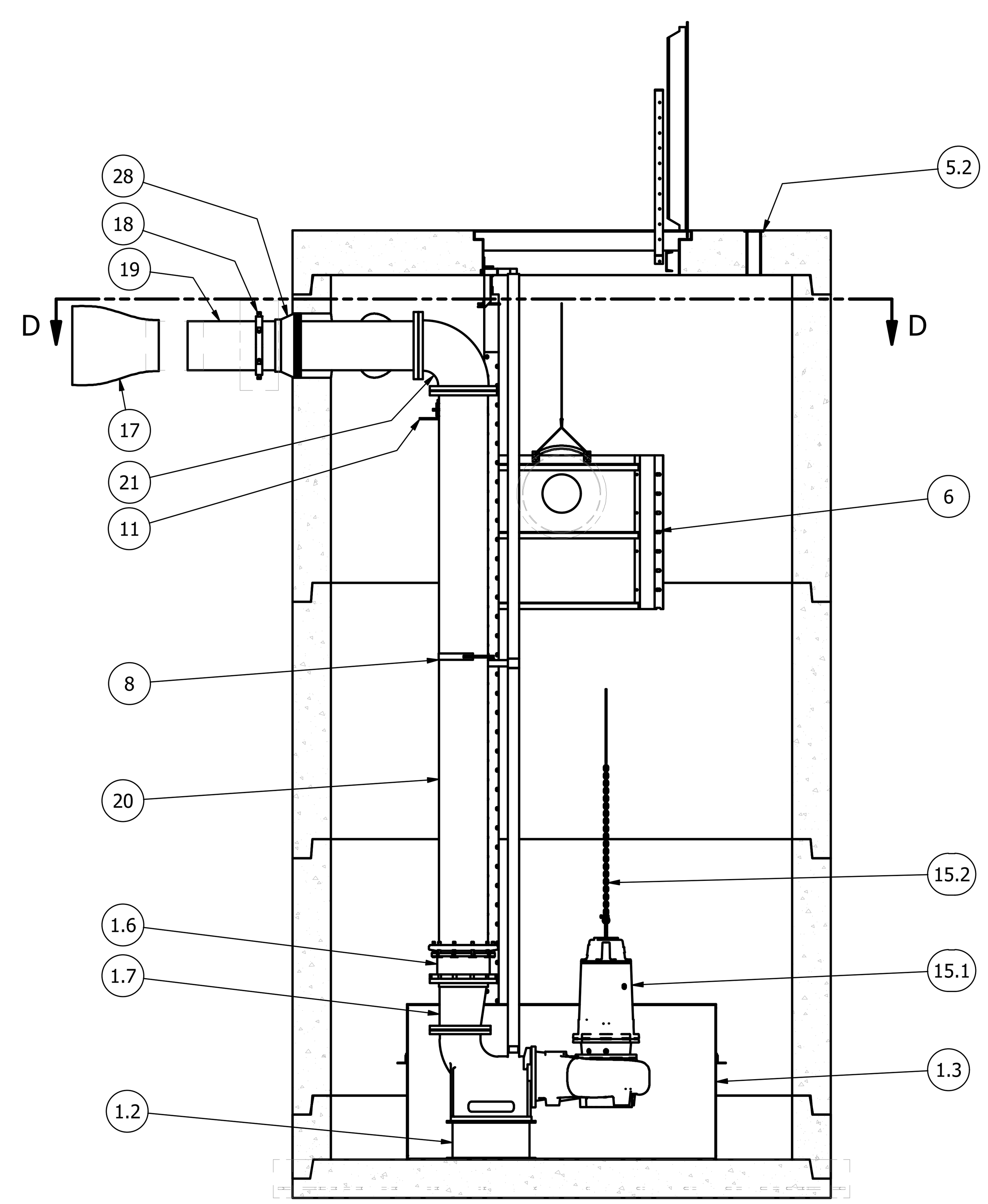
SAMPLE PUMP SPECIFICATIONS



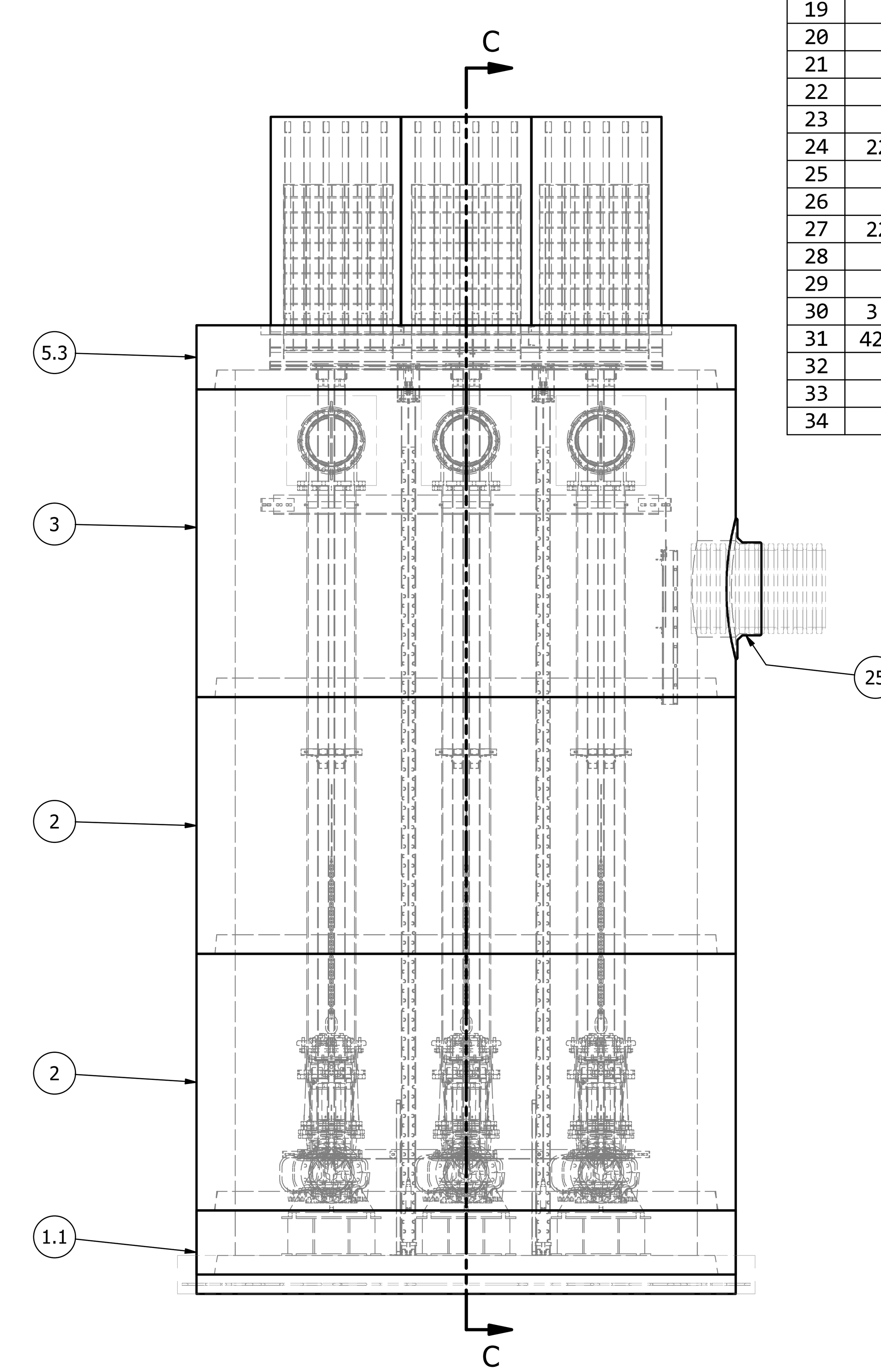


SECTION D-D
SCALE 1 / 36

PARTS LIST			
ITEM	QTY	STOCK NUMBER	DESCRIPTION
1	1	10-CB000000	BASE SLAB ASSEMBLY
1.1	1	10-CB122400	BASE - WW - 12ft DIA x 24in
1.2	3	31-99999999	PUMP PEDESTAL - STEEL
1.3	1	31-99999999	DIVIDER WALL ASSEMBLY - 304SS
1.4	3	31-EL1200KE	DISCHARGE ELBOW - 12in - KEEN
1.5	3	31-HW00AKS6	ANCHOR KIT - 316SS - DISCHARGE ELBOW
1.6	3	44-AD14RMD0	RFCA - 14in - ROMAC - FBEC w SS HARDWARE
1.7	3	48-RD1412DE	REDUCER - DI - 14in x 12in - ECCENTRIC
1.8	3	49-GS120000	GASKET - FLANGE - 12in
2	2	12-CR1272CP	BARREL - 12ft DIA x 6ft H
3	1	12-CR1296CP	BARREL - 12ft DIA x 8ft H
4	1	13-KY000000	HATCH KEY
5	1	14-CT000000	TOP SLAB ASSEMBLY
5.1	1	13-HH999999	HATCH - H20 - TRIPLEX
5.2	1	13-VT0400CS	VENT - STEEL - TRAFFIC AREAS
5.3	1	14-CT12HDD0	TOP SLAB - 12ft DIA - H20 - DUPLEX
6	1	15-DP100000	DEFLECTOR PANEL ASSEMBLY - 10ft
7	3	17-AC38000B	BOLT KIT - UPPER GUIDE BAR BRACKET
8	3	17-IG03S6KE	BRACKET - 304SS - INTERMEDIATE GUIDE - 3in
9	3	17-UG0300KN	BRACKET - 304SS - UPPER GUIDE - 3in
10	4	18-AC00CH00	CABLE HANGER ASSEMBLY - 316SS
11	1	18-BR000000	BRACKET ASSEMBLY - 316SS - DISCHARGE SUPPORT
12	2	18-BR04SWLO	STILLING WELL - LOWER SUPPORT - 4in
13	2	18-BR04SWUP	STILLING WELL - UPPER SUPPORT - 4in
14	4	18-HD080000	LIFTING CLUTCH - 8 TON
15	1	30-PU000000	PUMP SHIPPING CRATE
15.1	3	30-PU0000KE	PUMP - KEEN K12VK - 25HP
15.2	3	32-AC0000EB	LIFTING SLING ASSEMBLY - 316SS CHAIN
15.3	3	32-CGSS000E	CABLE SUPPORT GRIP - 304SS - 1in-1.24in
15.4	1	32-PLGE0000	GRIP EYE UNIT
16	120.0 ft	40-PP0300S4	PIPE - 304SS SCH40 - 3in DIA
17	3	42-TF140000	CHECK VALVE - TIDEFLEX - 14in
18	3	44-RG140STR	RETAINER GLAND - 14in
19	3	45-FP140720	SPOOL - DI - 14in DIA x 72in - FLGxPE
20	3	45-FP141860	SPOOL - DI - 14in DIA x 186in - FLGxPE
21	3	46-EL1490DI	ELBOW - DI - 14in x 90deg - FLG x FLG
22	6	49-GS140000	GASKET - FLANGE - 14in
23	1	51-AC00NSTB	NEVER SIEZE - TUBE
24	220 ft	51-JWCS2120	JOINT WRAP - 12in - CONSEAL CS-212
25	1	51-SECS1800	SEALANT - BUCKET - CONSEAL CS-1800
26	10	51-SECS190T	SEALANT - CONSEAL CS-1900 - 30oz TUBE
27	220 ft	51-SECS231L	SEALANT - 2in x 1in - CONSEAL CS-231
28	3	59-KB201400	KOR-N-SEAL - 20in CORE x 14in PIPE
29	2	62-CG00PT00	CORD GRIP - PRESSURE TRANSDUCER - WEDGE CLAMP
30	3.0 ft	70-PP0400P4	PIPE - PVC SCH40 - 4in DIA
31	42.0 ft	70-SW0400P4	STILLING WELL - 4in PVC PIPE - PERFORATED
32	2	80-ACBELLOW	ANEROID BELLOWS
33	2	80-FI00PT00	DESSICANT FILTER - PRESSURE TRANSDUCER
34	2	80-PT1500EH	PRESSURE TRANSDUCER - 0-15PSI - 60ft CABLE



SECTION C-C
SCALE 1 / 36



ROMTEC UTILITIES

ELEVATIONS ARE BASED ON VERTICAL DATUM NGVD1929

REV	DATE	DESCRIPTION	BY
2	11/10/2021	ADDED VERTICAL DATUM NOTE	KB
1	3-19-21	BASIC DESIGN REVIEW	KB

REVISION HISTORY

VERIFY SCALE
0 — 1"

DSN: KB
DRN: KB
CKD:
DATE: 6-16-21

ROMTEC UTILITIES
18240 NORTH BANK ROAD
ROSEBURG, OREGON 97470
PHONE: (541) 496-9678
WWW.ROMTECUTILITIES.COM

HAMPTON PARK
CAPITOL HEIGHTS, MD

STORMWATER PUMP STATION
COMPONENT DRAWING

MECHANICAL SHEET
2 OF 3

SAMPLE PUMP SPECIFICATIONS

ACCEPTED PUMP PERFORMANCE STANDARDS

A. ROMTEC UTILITIES PUMP EQUIPMENT FOR THIS SYSTEM TO MEET THE PROVIDED DESIGN CRITERIA. THE PUMP PERFORMANCE CURVE(S) SHOW THE PUMP ACHIEVING A PUMPING RATE IN GALLONS PER MINUTE (GPM) AT A SPECIFIC TOTAL DYNAMIC HEAD (TDH). THIS INDUSTRY STANDARDS FOR MEETING THIS TARGET POINT ARE AS FOLLOWS:

B. THE HYDRAULIC INSTITUTE SPECIFIES A LEVEL A AND A LEVEL B ACCEPTANCE. LEVEL A ALLOWS +10% FLOW AT THE RATED TDH, OR A +8% TDH AT THE RATED FLOW, WITH NO NEGATIVE TOLERANCE. LEVEL B ALLOWS +/-5% FLOW AT THE RATED TDH, OR +5%/-3% OF RATED TDH AT THE RATED FLOW.

C. THE PUMPS SHOULD PERFORM WITHIN THIS RANGE AS LONG AS THE TDH PROVIDED BY THE CUSTOMER IN THE GIVEN DESIGN CRITERIA IS TRUE AND CORRECT. WHEN ROMTEC UTILITIES CALCULATES THE TDH USING CUSTOMER SUPPLIED DOCUMENTS (E.G., FORCE MAIN PROFILES), AND THE ACTUAL FIELD CONDITIONS DIFFER FROM THE PROVIDED PLANS, ROMTEC UTILITIES CANNOT BE HELD RESPONSIBLE FOR PUMP PERFORMANCE ISSUES TIED TO CHANGES IN THE CALCULATED TO ACTUAL TDH.

NOT ALL ELECTRICAL COMPONENTS ARE SUBMERGENCE RATED

A. FLOW METERS, LIMIT SWITCHES, AND INTRUSION SWITCHES ARE EXAMPLES OF ELECTRICAL COMPONENTS THAT MAY NOT BE SUBMERGENCE RATED. THESE COMPONENTS WILL BE HOUSED IN A STRUCTURE THAT IS NOT INTENDED TO FILL WITH WATER AND HAS A MEANS FOR WATER EGRESS, SUCH AS A VAULT WITH A DRAINBACK PIPE.

B. WATER DAMAGE TO NON-SUBMERGENCE RATED ELECTRICAL COMPONENTS IS NOT COVERED UNDER THE ROMTEC UTILITIES WARRANTY. ROMTEC UTILITIES CAN ASSIST WITH THE REPLACEMENT OF DAMAGED COMPONENT(S), BUT ROMTEC UTILITIES IS NOT RESPONSIBLE FOR THE COST OF THE REPLACEMENT(S).

C. ANY POTTING KITS SUPPLIED BY ROMTEC UTILITIES MUST BE INSTALLED BY THE INSTALLING CONTRACTOR. IF WATER DAMAGE OCCURS TO ITEMS THAT SHOULD HAVE HAD A POTTING KIT INSTALLED, ROMTEC UTILITIES CAN ASSIST WITH REPLACING THE DAMAGED COMPONENT(S), BUT ROMTEC UTILITIES IS NOT RESPONSIBLE FOR THE COST OF THE REPLACEMENT(S).

FINAL CONCRETE DIMENSIONS

A. ACTUAL CONCRETE DIMENSIONS WILL BE WITHIN +/- 0.5" FOR MAJOR DIMENSIONS ON THE APPROVED PRODUCTION DRAWING(S) (LENGTH, WIDTH, HEIGHT; CORE LOCATIONS; WALL THICKNESS; ETC.). ROMTEC UTILITIES WILL NOT ACCEPT ANY CHARGES FOR FIELD ADJUSTMENTS OR ENGINEERED PLAN REVISIONS BASED ON THESE SLIGHT CHANGES TO CONCRETE DIMENSIONS IN THE FIELD.

NOTE: MANUFACTURERS OF PRECAST CONCRETE CANNOT PRODUCE ITEMS SUCH AS BARRELS, BASES, OR TOP SLABS TO EXACT DIMENSIONS MEASURED IN HUNDREDTHS OF AN INCH. THE PRODUCTION DRAWINGS MAY SHOW DIMENSIONS IN THE HUNDREDTHS OF AN INCH, BUT IT IS NOT REALISTIC TO CAST CONCRETE TO THOSE EXACT DIMENSIONS.

B. ALL CONCRETE JOINTS MUST BE THOROUGHLY CLEANED AND DRIED PRIOR TO APPLYING BUTYL SEALANT, CAULKING, AND/OR JOINT WRAP.

C. CORED HOLES FOR ELECTRICAL WIRING AND CONDUITS ARE **NOT** BY ROMTEC UTILITIES. THEY ARE THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR.

OUTFALL DESIGN

A. ROMTEC UTILITIES IS NOT RESPONSIBLE FOR THE OUTFALL STRUCTURE AT THE DISCHARGE END OF THE FORCE MAIN. ROMTEC UTILITIES HAS NOT REVIEWED THE SIZE OF THE OUTFALL STRUCTURE TO DETERMINE ITS ABILITY TO HANDLE THE SYSTEM'S PUMPING RATE. REVIEW OF THE OUTFALL STRUCTURE FOR COMPATIBILITY WITH THIS SYSTEM IS THE RESPONSIBILITY OF THE OWNER AND/OR THE OWNER'S REPRESENTATIVE.

B. ANY PROBLEMS WITH THE OUTFALL STRUCTURE DURING SYSTEM STARTUP AND GENERAL OPERATION ARE THE RESPONSIBILITY OF OTHERS, NOT ROMTEC UTILITIES.

STRUCTURAL AND MECHANICAL DISCLAIMERS

1. ROMTEC UTILITIES IS NOT RESPONSIBLE FOR STRUCTURAL OR LEAK TESTING

A. THE CUSTOMER IS RESPONSIBLE FOR ANY ONSITE HYDROSTATIC OR VACUUM TESTING OF UNDERGROUND STRUCTURES. THE ROMTEC UTILITIES WARRANTY TERMS REQUIRE THAT ANY AND ALL TESTING OF UNDERGROUND STRUCTURES OCCURS PRIOR TO BACKFILLING AROUND THE STRUCTURE(S).

B. ROMTEC UTILITIES RECOMMENDS THE FOLLOWING TEST METHODS IF NECESSARY:
   a. ASTM C497-05, SECTION 8, HYDROSTATIC TEST METHOD
   b. ASTM C497-05, SECTION 9, PERMEABILITY TEST METHOD

C. REPAIR OF CONCRETE STRUCTURES IS ALLOWABLE IF NECESSITATED BY DAMAGE THAT OCCURRED DURING SHIPPING. THE ROMTEC UTILITIES WARRANTY TERMS REQUIRE THAT ANY REPAIR TO CONCRETE STRUCTURES CONFORMS TO THE REQUIREMENTS OF ASTM C478-09, AND THAT ROMTEC UTILITIES BE NOTIFIED IF ANY REPAIRS ARE PLANNED.

D. ROMTEC UTILITIES STRONGLY RECOMMENDS AGAINST THE USE OF ANY TYPE OF CONCRETE AS BACKFILL MATERIAL.

2. ANY STRUCTURAL LEAKING FOUND DURING OR AFTER THE INSTALLATION OF UNDERGROUND STRUCTURES IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR

A. ROMTEC UTILITIES HAS MADE EVERY EFFORT IN THE SYSTEM DESIGN TO HELP THE INSTALLING CONTRACTOR ENSURE THAT UNDERGROUND STRUCTURES ARE WATER TIGHT. ALL PRECAST CONCRETE IS PRODUCED TO MEET OR EXCEED INDUSTRY STANDARDS, INCLUDING ASTM 318, ASTM 478, AND ASTM 857, AS APPLICABLE.

B. THE DESIGN OF THESE CONCRETE STRUCTURES INCLUDES MULTIPLE LAYERS OF LEAK PROOFING AT THE JOINTS BETWEEN THE BASE, BARRELS/RISERS, AND TOP SLAB AS SHOWN ON THE MECHANICAL AND STRUCTURAL DRAWINGS. THESE LAYERS TYPICALLY INCLUDE A COMBINATION OF BUTYL SEALANT, CAULKING, AND/OR JOINT WRAP.

ROMTEC UTILITIES

C. THE STRUCTURES ARE DESIGNED TO BE LIFTED AND PLACED BY USE OF THE PRE-INSTALLED ANCHORS AND LIFTING GEAR.

D. THE ROMTEC UTILITIES PLANS SHOW THE ALIGNMENT OF STRUCTURES IN RELATION TO EACH OTHER. INSTALLING CONTRACTORS ARE EXPECTED TO INSTALL STRUCTURES EXACTLY AS SPECIFIED. FOR EXAMPLE, THE CENTER LINE OF A WET WELL AND VALVE VAULT MUST ALIGN CORRECTLY FOR DISCHARGE PIPING TO ATTACH CORRECTLY. PROBLEMS ARISING FROM INCORRECTLY INSTALLED STRUCTURES AND/OR PIPING BETWEEN THE STRUCTURES ARE THE RESPONSIBILITY OF THE INSTALLER, NOT ROMTEC UTILITIES.

3. CONCRETE STRUCTURES LEAK FOR MANY REASONS DURING AND AFTER INSTALLATION

A. CONCRETE STRUCTURES MUST BE INSTALLED ON A COMPACTED, LEVEL FOUNDATION PER ASTM C1821-16. SPECIFICATION FOR THIS FOUNDATION IS SITE SPECIFIC, AND IS MADE BY OTHERS, NOT BY ROMTEC UTILITIES. ALL JOINTS BETWEEN STACKED CONCRETE SECTIONS MUST BE LEVEL AND EVENLY SUPPORTED. ANY LEANING OR UNEVENLY SUPPORTED STRUCTURES WILL RESULT IN MANY PROBLEMS, INCLUDING LEAKING AT THE JOINTS.

B. MOST STRUCTURAL LEAKS ORIGINATE AT CORED HOLES FOR PIPE PENETRATIONS. THE SYSTEM HAS BEEN DESIGNED SO THAT ALL PIPING ENTERING/EXITING THE STRUCTURE MUST PASS THROUGH PARALLEL TO THE CORED HOLE. IN OTHER WORDS, THE PIPING MUST GO STRAIGHT THROUGH CORED HOLES WITHOUT DEFLECTION. IF THE PIPING IS BROUGHT THROUGH ANY OF THE CORED HOLES AT AN ANGLE, THERE IS RISK OF LEAKING AT THAT LOCATION. IF FIELD CONDITIONS REQUIRE PIPING TO ENTER/EXIT THE STRUCTURE AT AN ANGLE, IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT THE PENETRATION IS WATER TIGHT.

C. AREAS OF HIGH GROUND WATER WILL TEST THE WATER TIGHTNESS OF ALL JOINTS AND PENETRATIONS IN THE STRUCTURE. INSTALLING CONTRACTORS SHOULD TAKE EXTRA PRECAUTIONS TO ENSURE WATER TIGHTNESS WHEN INSTALLING IN AN AREA WITH HIGH GROUND WATER.

D. HIGH GROUND WATER CAN BE SEASONAL, SO THE INSTALLER OR OWNER SHOULD CHECK THE STRUCTURES FOR LEAKS DURING WET MONTHS, ESPECIALLY AFTER AN INSTALLATION DURING A DRY PERIOD.

E. A LEAK IN A LINED OR COATED STRUCTURE MAY COMPOUND THE PROBLEM THAT A LEAK CREATES. INFLOWING WATER FROM THE LEAK CAN FLOW BETWEEN THE LINING/COATING AND THE CONCRETE, CREATING A SEPARATION THAT REQUIRES REPAIR. REPAIR CAN BECOME EVEN MORE DIFFICULT IF THE ACTUAL POINT OF INGRESS IS CONCEALED BY THE LINING/COATING. IN OTHER WORDS, THE ACTUAL POINT OF INGRESS MAY NOT BE THE SAME POINT WHERE THE LEAK SHOWS THROUGH THE LINING/COATING.

F. WHILE ROMTEC UTILITIES MAY SUPPLY AND/OR PRE-INSTALL THE LINING OR COATING, ROMTEC UTILITIES IS NOT RESPONSIBLE FOR ANY COST ASSOCIATED WITH REPAIR OF THE LINING/COATING DUE TO STRUCTURAL LEAKING.

4. PRECAST CONCRETE INSPECTIONS

A. IF REQUIRED, ANY CUSTOMER INSPECTION OF PRECAST CONCRETE MUST BE MADE AT THE PRECASTER FACILITY, NOT AFTER DELIVERY TO THE JOB SITE. IN OTHER WORDS, IF THE CUSTOMER REQUIRES ADDITIONAL CONCRETE INSPECTION, THIS MUST BE PERFORMED PRIOR TO WHEN THE CONCRETE LEAVES THE PRECASTER FACILITY FOR DELIVERY.

5. LININGS AND COATINGS OF CONCRETE

A. MOST CONCRETE COATINGS AND LININGS REQUIRE SIGNIFICANT CURE TIMES (TYPICALLY FOUR WEEKS). ROMTEC UTILITIES IS NOT RESPONSIBLE FOR CONSTRUCTION DELAYS CAUSED BY LINING/COATING CURE TIMES. INSTALLATION OF STRUCTURES THAT OCCURS BEFORE THE CURING PROCESS IS COMPLETE WILL VOID BOTH THE LINING/COATING MANUFACTURER'S WARRANTY AND THE ROMTEC UTILITIES WARRANTY.

B. ANY DAMAGE TO LININGS OR COATINGS THAT OCCURS DURING SHIPPING OR CONSTRUCTION IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO REPAIR OR REPLACE.

INSTALLATION INFO AND RECOMMENDATIONS

ROMTEC UTILITIES DELIVERS THE FOLLOWING ITEMS WITH A TYPICAL PRECAST CONCRETE WET WELL.

A. PRECAST WET WELL BASE ASSEMBLY - THE BASE ARRIVES READY TO BE PLACED ON THE COMPACTED FOUNDATION (AS APPROVED BY THE SITE ENGINEER)

B. PRECAST WET WELL BARRELS - ALL PIPE PENETRATIONS SHOWN ON THE COMPONENT DRAWING(S) ARE PRE-CORED UNLESS OTHERWISE NOTED. PIPE BOOTS ARE PROVIDED FOR USE IN SEALING THE CORED HOLES.

C. PRECAST WET WELL TOP SLAB - THE TOP SLAB WILL INCLUDE THE PRE-INSTALLED HATCH AND IS READY TO BE PLACED.

D. ACCESSORY PALLET - THE PALLET INCLUDES THE FOLLOWING:
   a. BUTYL SEALANT, CAULKING, AND OR JOINT WRAP FOR CONCRETE JOINTS
   b. DISCHARGE PIPING
   c. GUIDE RAILS AND BRACKETS
   d. LEVEL SENSING DEVICES

NOTE: THE SUPPLIED DISCHARGE PIPING AND GUIDE RAILS ARE INTENTIONALLY TOO LONG. THE INSTALLING CONTRACTOR IS EXPECTED TO MEASURE THE PIPING AND TRIM TO FIT AS NEEDED. THE CONTRACTOR MUST ALSO PLUMB THE DISCHARGE PIPING AND SECURE IT TO THE PRE-INSTALLED BRACKET(S).

ROMTEC UTILITIES STRONGLY RECOMMENDS THAT THE INSTALLING CONTRACTOR PROVIDE THE FOLLOWING ITEMS DURING DELIVERY AND INSTALLATION

A. A PERSON ONSITE WHOSE SOLE RESPONSIBILITY IS TO BE IN CHARGE OF SAFETY

B. APPROPRIATE SHORING OF EXCAVATIONS TO PROVIDE A SAFE WORKSPACE

C. AN APPROPRIATELY SIZED CRANE FOR OFFLOADING AND PLACING CONCRETE SECTIONS.

D. AN APPROPRIATELY SIZED FORKLIFT FOR OFFLOADING PALLETS AND/OR CONTROL PANEL COMPONENTS

E. IDENTIFICATION OF ALL OVERHEAD OBSTRUCTIONS PRIOR TO DELIVERY

F. A SECURE COVERED AREA FOR STORING THE ACCESSORY PALLET, CONTROL PANEL, AND PUMPS. IF THIS AREA IS OFFSITE, AN APPROPRIATE TRANSPORTATION VEHICLE WILL BE REQUIRED TO MOVE THESE ITEMS TO THE SECURE LOCATION UNTIL FINAL INSTALLATION.

METHOD FOR PRECAST CONCRETE

ENTS ARE DESIGNED TO BE LIFTED AND PLACED BY USE OF THE PRE-INSTALLED ANCHORS AND

B. PRIOR TO PLACING THE CONCRETE COMPONENTS, ENSURE THAT THE EXCAVATION AND COMPACTED FOUNDATION IS COMPLETE AS SPECIFIED BY THE SITE ENGINEER. THE FOUNDATION MUST NOT ALLOW THE STRUCTURE TO SETTLE OR TILT DURING OR AFTER INSTALLATION.

C. PROVIDE A SAFE, OSHA-APPROVED METHOD OF CAVE-IN PROTECTION (SHORING).

D. USE LIFTING EQUIPMENT OF THE APPROPRIATE SIZE AND CAPACITY. FOR EXAMPLE, A PARTICULARLY HEAVY ITEM SHOULD BE LIFTED USING ONE APPROPRIATELY SIZED CRANE, NOT BY USING TWO UNDERSIZED EXCAVATORS.

NOTE: THE INSTALLING CONTRACTOR IS EXPECTED TO KNOW AND USE INDUSTRY BEST PRACTICES FOR LIFTING AND PLACING PRECAST CONCRETE.

E. THE INSTALLING CONTRACTOR IS EXPECTED TO PROVIDE THE APPROPRIATE LIFTING CABLES, STRAPS, OR CHAINS, AS WELL AS CONNECTION DEVICES TO ATTACH THE CABLES TO THE CRANE AND LIFTING CLUTCHES.

F. ALL LIFTING CABLES, STRAPS, OR CHAINS MUST BE LONG ENOUGH TO PREVENT RIGGING FROM PUTTING LATERAL PRESSURE ON ANY OF THE LIFT ANCHORS. ROMTEC UTILITIES RECOMMENDS THE USE OF A SPREADER BAR WHENEVER THE CABLE LENGTH IS QUESTIONABLE. DAMAGE RESULTING FROM FAILURE TO FOLLOW THIS RECOMMENDATION WILL NOT BE COVERED BY ROMTEC UTILITIES.

G. SEE THE CONCRETE PRODUCTION DRAWINGS FOR WEIGHT OF INDIVIDUAL COMPONENTS.

OFFLOADING AND STORING CONCRETE

A. ALL OFFLOADED CONCRETE THAT IS NOT IMMEDIATELY PLACED IN ITS FINAL INSTALLATION LOCATION MUST BE APPROPRIATELY STORED ON LEVEL DUNNAGE WITH EVEN, REGULAR SUPPORT UNDER THE CONCRETE, NOT DIRECTLY ON UNEVEN GROUND OR WITH UNEVEN, IRREGULAR SUPPORT. DAMAGE CAUSED BY FAILURE TO FOLLOW THIS RECOMMENDATION WILL NOT BE COVERED BY ROMTEC UTILITIES.

B. ALL CONCRETE THAT IS TEMPORARILY STORED PRIOR TO FINAL INSTALLATION SHOULD BE THOROUGHLY CLEANED BEFORE IT IS STACKED. FAILURE TO CLEAN CONCRETE JOINTS PRIOR TO STACKING CAN RESULT IN SEALANT FAILURE AND LEAKS. ROMTEC UTILITIES WILL NOT WARRANTY STRUCTURES THAT ARE NOT CLEAN AND DRY PRIOR TO INSTALLATION.

RECOMMENDATIONS FOR EXTENDED PUMP STORAGE

A. NEVER STORE PUMPS IN THE WET WELL PRIOR TO START-UP. STORE PUMPS IN AN UPRIGHT POSITION IN A CLEAN, DRY LOCATION FREE FROM TEMPERATURE EXTREMES AND DIRECT SUNLIGHT.

B. ONCE DURING EVERY MONTH OF STORAGE, THE PUMP IMPELLERS SHOULD BE MANUALLY ROTATED BY HAND TO ENSURE FREE MOVEMENT OF ALL ROTATING PARTS (SEALS, BEARINGS, AND IMPELLERS). ADD SILICONE SPRAY OR RUST-INHIBITING OIL TO THE LOWER CASING, COMPLETELY COATING THE IMPELLER AND INSIDE OF THE LOWER CASE. ALSO FULLY COAT THE DISCHARGE FLANGE FACE.

C. PROTECT PUMP CABLES FROM DAMAGE AND MOISTURE. CABLES SHOULD BE STORED SO THAT THERE IS NO TENSION ON THE CABLE ENTRY POINT INTO THE PUMP. THE FREE END OF THE CABLE MUST BE PROTECTED FROM MOISTURE AT ALL TIMES. NEVER LIFT A PUMP BY THE CABLE.

D. THE PUMP MANUFACTURER MAY HAVE MORE STORAGE AND HANDLING RECOMMENDATIONS.

INSTALLATION AND BACKFILL RECOMMENDATIONS

A. ALL EXCAVATIONS MUST BE KEPT DRY DURING INSTALLATION. THIS MAY REQUIRE THE USE OF MULTIPLE DEWATERING PUMPS.

B. PRECAST CONCRETE SECTIONS MUST BE LEVEL WHEN PLACED ON THE COMPACTED BASE. THIS COMPACTED BASE IS SPECIFIED BY THE SITE ENGINEER AND/OR GEOTECHNICAL REPORT. ROMTEC UTILITIES STRONGLY RECOMMENDS THAT THE BASE BE THOROUGHLY CLEANED AND TRANSIT-LEVELLED.

C. A SAFE WORKING AREA WILL BE REQUIRED AROUND THE PLACED STRUCTURE FOR THE INSTALLING CONTRACTOR TO APPLY THE SEALANT AND/OR JOINT WRAP.

D. ALL JOINTS MUST BE KEPT CLEAN AND DRY WHILE SEALANT AND/OR JOINT WRAP ARE BEING APPLIED.

E. JOINT SEALANTS SHOULD BE APPLIED PER THE MANUFACTURER'S INSTRUCTIONS AND SPECIFICATIONS. WHEN APPLYING SEALANT, MAKE SURE TO REMOVE THE PAPER BACKING AND MOLD/KNEAD CUT ENDS TOGETHER TO FORM ONE PIECE.

F. SEALANT SHOULD COMPRESS A MINIMUM OF 50% PRIOR TO ANY BACKFILLING. COLD WEATHER MAY DELAY THE TIME IT TAKES TO ACHIEVE PROPER COMPRESSION. IF BACKFILL IS ADDED PRIOR TO SEALANT COMPRESSION, IT MAY PREVENT FULL COMPRESSION AND RESULT IN LEAKS. ROMTEC UTILITIES IS NOT RESPONSIBLE FOR ANY LEAKS RESULTING FROM FAILURE TO FOLLOW THESE RECOMMENDATIONS.

G. PUSHING/PULLING OR MANUAL COMPRESSION OF CONCRETE SECTIONS WITH AN EXCAVATOR IS **NOT** RECOMMENDED. IF CONCRETE SECTIONS ARE MOVED OR REMOVED AFTER PLACEMENT, SEALANT MUST BE REAPPLIED.

H. SUITABLE BACKFILL MATERIAL (PER THE SITE ENGINEER AND/OR GEOTECHNICAL REPORT) MUST BE USED TO AVOID ANY DAMAGE OR SHIFTING OF CONCRETE SECTIONS. ROMTEC UTILITIES STRONGLY ADVISES AGAINST USING ANY TYPE OF CONCRETE AS BACKFILL MATERIAL. POTENTIAL FOR DAMAGE DURING INSTALLATION IS GREATLY INCREASED WITH CONCRETE AS BACKFILL MATERIAL. CONCRETE BACKFILL ALSO SEVERELY LIMITS ACCESS TO PIPING FOR FUTURE MAINTENANCE.

I. BACKFILL MUST BE PLACED EVENLY AROUND THE STRUCTURE IN A MAXIMUM OF 12" COMPACTED LIFTS WITHIN 1' OF THE WALL. FAILURE TO FOLLOW THIS METHOD CAN RESULT IN UNEVEN PRESSURE ON THE CONCRETE STRUCTURE, RESULTING IN SHIFTING OF JOINTS AND/OR PIPING THAT EVENTUALLY CAUSES LEAKING. ROMTEC UTILITIES WILL NOT COVER LEAKS THAT RESULT FROM FAILURE TO FOLLOW THESE RECOMMENDATIONS.

J. USE CAUTION WHEN ADDING BACKFILL MATERIAL TO ENSURE THAT NO PRESSURE OR FORCE IS APPLIED TO THE CONCRETE STRUCTURE, ESPECIALLY NEAR JOINTS OR PIPING.

K. IF HYDROSTATIC OR VACUUM TESTING IS REQUIRED, IT MUST BE PERFORMED PRIOR TO BACKFILLING. ANY LEAKS DISCOVERED AFTER BACKFILLING AROUND THE STRUCTURE ARE THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR.

ELEVATIONS ARE BASED ON VERTICAL DATUM NGVD1929

VERIFY SCALE
GRAPHIC SCALES ARE SUGGESTED FOR 36"X24" SHEET. IF NOT ONE INCH ON FULL SHEET, ADJUST SCALES ACCORDINGLY.
0 — 1"

REV	DATE	DESCRIPTION	BY
2	11/10/2021	ADDED VERTICAL DATUM NOTE	KB
1	3-19-21	BASIC DESIGN REVIEW	KB

REVISION HISTORY

DSN: AD
DRN: AD
CKD: AD
DATE: 10-29-20

ROMTEC UTILITIES
18240 NORTH BANK ROAD
ROSEBURG, OREGON 97470
PHONE: (541) 496-9678
WWW.ROMTECUTILITIES.COM

HAMPTON PARK
CAPITOL HEIGHTS, MD
STORMWATER PUMP STATION
GENERAL NOTES

MECHANICAL SHEET
3 OF 3