PRELIMINARY HYDROLOGY, HYDRAULICS, & STORMWATER TREATMENT STUDY

FOR

LA COSTA HOTEL

COMMERCIAL DEVELOPMENT
18-188 MIN/DR/CDP

516 LA COSTA AVENUE
ENCINITAS, CA 92024

PREPARED FOR:

DM LA COSTA AVENUE, LLC
1650 N. COAST HIGHWAY 101
ENCINITAS CA 92024

DATE:
JULY 2021

PREPARED BY:

PASCO LARET SUITER & ASSOCIATES
535 NORTH HIGHWAY 101, SUITE A
SOLANA BEACH, CA 92075

BRIAN M. ARDOLINO, RCE 71651 DATE 7/23/21
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>1.0</td>
</tr>
<tr>
<td>Introduction</td>
<td>1.1</td>
</tr>
<tr>
<td>Existing Conditions</td>
<td>1.2</td>
</tr>
<tr>
<td>Proposed Project</td>
<td>1.3</td>
</tr>
<tr>
<td>Hydrologic Unit Contribution</td>
<td>1.4</td>
</tr>
<tr>
<td>Post-Developed Anticipated Pollutants</td>
<td>1.5</td>
</tr>
<tr>
<td>Summary of Results and Conditions</td>
<td>1.6</td>
</tr>
<tr>
<td>Conclusions</td>
<td>1.7</td>
</tr>
<tr>
<td>References</td>
<td>1.8</td>
</tr>
<tr>
<td>Methodology</td>
<td>2.0</td>
</tr>
<tr>
<td>Introduction</td>
<td>2.1</td>
</tr>
<tr>
<td>County of San Diego Criteria</td>
<td>2.2</td>
</tr>
<tr>
<td>City of Encinitas Standards</td>
<td>2.3</td>
</tr>
<tr>
<td>Runoff coefficient determination</td>
<td>2.4</td>
</tr>
<tr>
<td>Hydrology &amp; Hydraulic Model Output</td>
<td>3.0</td>
</tr>
<tr>
<td>Pre-Developed Hydrologic Model Output (100 Year Event)</td>
<td>3.1</td>
</tr>
<tr>
<td>Post-Developed Hydrologic Model Output (100 Year Event)</td>
<td>3.2</td>
</tr>
<tr>
<td>Hydraulic Calculations</td>
<td>3.3</td>
</tr>
<tr>
<td>Volume Sizing Requirements</td>
<td>3.4</td>
</tr>
<tr>
<td>Hydromodification Analysis</td>
<td>3.5</td>
</tr>
<tr>
<td>Attachments</td>
<td>4.0</td>
</tr>
<tr>
<td>Isopluvial Maps</td>
<td></td>
</tr>
<tr>
<td>Runoff Coefficients</td>
<td></td>
</tr>
<tr>
<td>Basin Maps</td>
<td></td>
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1.0 EXECUTIVE SUMMARY

1.1 Introduction

This Hydrology Study for the La Costa Hotel project has been prepared to analyze the hydrologic and hydraulic characteristics of the existing and proposed project site. This report intends to present both the methodology and the calculations used for determining the runoff from the project site in both the pre-developed (existing) conditions and the post-developed (proposed) conditions produced by the 100 year 6 hour storm. In addition, this report will propose the sizing of all necessary storm drain facilities and storm drain piping necessary for the storm drain system to safely convey the runoff from the 100-year rainfall event.

1.2 Existing Conditions

The project site is located at 516 La Costa Ave, and is bound by a gas station to the east, Batiquitos Lagoon to the North, residential homes and green houses to the west, and La Costa Avenue to the south as shown on the Vicinity Map.

Vicinity Map
Not to scale
The existing project site is an undeveloped tree farm. The drainage characteristics of the site consist generally of sheet flow from south to north, and ultimately discharges north into the Batiquitos Lagoon. A steep slope along the northern edge of the property drains east toward the Interstate 5 freeway which then discharges into an existing earthen ditch in the Interstate 5 corridor where it is ultimately conveyed north to the Batiquitos Lagoon.

1.3 Proposed Project

The intent of the proposed project is to develop a hotel with restaurant. The proposed development consists of grading to create pads suitable for the construction of structures, new driveway and parking area, stormwater treatment basin, curb and associated hardscape and landscape, and associated underground utilities.

A bioretention basin is proposed on the north end of the site. In general, the site will drain south to north either along proposed curb or will sheet flow into proposed stormdrain that will discharge into the Bioretention Basin. The basin will be lined and has an overflow inlet to discharge out via a PVC pipe that outlets to two proposed MaxWell IV infiltration pits by Torrent where the water will infiltrate on site. In the instance of an emergency, where stormwater will not infiltrate, an emergency overflow pipe directly connected to the infiltration pit will gravity drain stormwater to the La Costa 48 project to the west. The stormdrain pipe will be connected to the La Costa 48 project’s drainage inlet B, the emergency overflow inlet located on the easterly portion of the site.

1.4 Hydrologic Unit Contribution

As identified by the San Diego Basin Plan, the proposed project site drains within Carlsbad Hydrologic Unit, specifically the San Marcos Hydrologic Sub Area (904.51).

According to the California 2010 USEPA 303d list published by the San Diego Regional Water Quality Control Board, there are no impaired water bodies downstream of the project site that are associated with the Pacific Ocean Shoreline in this basin.

Drainage from the site ultimately discharges to the Pacific Ocean, but the site does not directly discharge into the ocean itself. The path of discharge from the pre-developed is as follows: initially collected and conveyed to the north edge of the site, conveyed either along the Interstate 5 corridor earthen ditch to the Batiquitos Lagoon or directly northwest to Batiquitos Lagoon, ultimately discharging into the Pacific Ocean. The path of discharge from the post-developed project is as follows: initially collected and conveyed to the north edge of the site, and then routed to an infiltration pit system.

1.5 Preliminary Hydrology Calculations

The existing 100 year peak discharge is 1.09 cfs, and is associated with a time of concentration (Tc) of 12.6 minutes and a total area of 1.2 acres.
The post-developed condition peak discharge is 1.22 cfs, and is associated with a Tc of 14.45 minutes and a total area of 1.0 acres.

1.6 Conclusions

The proposed development and proposed storm drain design will be capable of not only safely conveying the 100-year storm runoff flow, but has included many instruments into the storm drain system design to ensure that the discharge from the project site is of the best possible quality and will not pose any significant impact or threats to the water quality of the Pacific Ocean, or the public storm drain system. In addition, the proposed development and storm drain improvements will not significantly alter the existing drainage patterns. Any increase in storm water runoff will be detained and will not increase the potential for flooding or create an increase in erosion.

This project has been deemed a Priority Project and therefore is subject to Hydromodification criteria. See section 3.5 for Hydromodification Analysis note.

It is with these above reasons that it can be concluded that there will be no negative impact to the downstream storm drain facilities or an increased potential of flooding. Since a major goal of this project is to ensure that all storm water quality issues are addressed to the maximum extent practical, the peak discharge for the proposed site will be utilized to adequately size the components of the storm drain system for this project.

1.7 References

“San Diego County Hydrology Manual”, revised June 2003, County of San Diego, Department of Public Works, Flood Control Section.


“Grading, Erosion and Sediment Control Ordinance/Chapter”, City of Encinitas, Engineering Services and Community Development Department, revised November 2002.
2.0 METHODOLOGY

2.1 Introduction

The hydrologic model used to perform the hydrologic analysis presented in this report utilizes the Ration Method (RM) equation, \( Q = CIA \). The RM formula estimates the peak rate of runoff based on the variables of area, runoff coefficient, and rainfall intensity. The rainfall intensity \( I \) is equal to:

\[
I = 7.44 \times P_6 \times D^{-0.645}
\]

Where:

- \( I \) = Intensity (in/hr)
- \( P_6 \) = 6-hour precipitation (inches)
- \( D \) = duration (minutes – use Tc)

Using the Time of Concentration (Tc), which is the time required for a given element of water that originates at the most remote point of the basin being analyzed to reach the point at which the runoff from the basin is being analyzed. The RM equation determines the storm water runoff rate \( Q \) for a given basin in terms of flow (typically in cubic feet per second (cfs) but sometimes as gallons per minute (gpm)). The RM equation is as follows:

\[
Q = CIA
\]

Where:

- \( Q \) = flow (in cfs)
- \( C \) = runoff coefficient, ratio of rainfall that produces storm water runoff (runoff vs. infiltration/evaporation/absorption/etc)
- \( I \) = average rainfall intensity for a duration equal to the Tc for the area, in inches per hour.
- \( A \) = drainage area contributing to the basin in acres.

The RM equation assumes that the storm event being analyzed delivers precipitation to the entire basin uniformly, and therefore the peak discharge rate will occur when a raindrop that falls at the most remote portion of the basin arrives at the point of analysis. The RM also assumes that the fraction of rainfall that becomes runoff or the runoff coefficient \( C \) is not affected by the storm intensity, \( I \), or the precipitation zone number.

2.2 County of San Diego Criteria

As defined by the County Hydrology Manual dated June 2003, the rational method is the preferred equation for determining the hydrologic characteristics of basins up to approximately one square mile in size. The County of San Diego has developed its own tables, nomographs, and methodologies for analyzing storm water runoff for areas within the county. The County has also developed precipitation isopluvial contour maps that show even lines of rainfall anticipated from a given storm event (i.e. 100-year, 6-hour storm).
One of the variables of the RM equation is the runoff coefficient, C. The runoff coefficient is dependent only upon land use and soil type and the County of San Diego has developed a table of Runoff Coefficients for Urban Areas to be applied to basin located within the County of San Diego. The table categorizes the land use, the associated development density (dwelling units per acre) and the percentage of impervious area. Each of the categories listed has an associated runoff coefficient, C, for each soil type class.

The County has also illustrated in detail the methodology for determining the time of concentration, in particular the initial time of concentration. The County has adopted the Federal Aviation Agency’s (FAA) overland time of flow equation. This equation essentially limits the flow path length for the initial time of concentration to lengths under 100 feet, and is dependent on land use and slope.

2.3 City of Encinitas Standards

The City of Encinitas has additional requirements for hydrology reports which are outlined in the Grading, Erosion and Sediment Control Ordinance. Please refer to this manual for further details.

2.4 Runoff Coefficient Determination

As stated in section 2.2, the runoff coefficient is dependent only upon land use and soil type and the County of San Diego has developed a table of Runoff Coefficients for Urban Areas to be applied to basin located within the County of San Diego. The table, included at the end of this section, categorizes the land use, the associated development density (dwelling units per acre) and the percentage of impervious area. Weighted runoff coefficients were calculated based on the existing and proposed impervious areas for each basin per the County Hydrology Manual section 3.1.2. See section 3.0 and hydrologic node maps for calculations.
3.0 HYDROLOGY MODEL OUTPUT

**Rational Method Parameters**
Runoff Coefficient \( C = 0.9 \times (\% \text{ Impervious}) + C_p (1-\% \text{ Impervious}) \)
\( C_p = 0.25 \) for existing condition pervious type “B” soils
100 Year 6 Hour Storm Precipitation (P6) = 2.5 in (see rainfall isopluvial*)

\[
Ti = \frac{[11.9(L/Mi)^{3/\Delta H}]0.385}{0.385}
\]

\( Ti = Ti + Tc \)

\( I = \text{Intensity in/hr}, I = 7.44 \times P6 \times D - 0.645* \)

Duration (D) = Time of Concentration, Tc

\( Q = \text{Peak Runoff}, Q = C^*I^*A \) (cfs)

*From San Diego County Hydrology Manual, June 2003 Revision

3.1 Pre-Developed Hydrologic Model Output

******************************************************************************
** RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE **
** Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT **
** 2003,1985,1981 HYDROLOGY MANUAL **
** (c) Copyright 1982-2016 Advanced Engineering Software (aes) **
** Ver. 23.0 Release Date: 07/01/2016  License ID 1452 **

Analysis prepared by:
Pasco Laret Suiter & Associates

******************************************************************************
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** 2003,1985,1981 HYDROLOGY MANUAL **
** (c) Copyright 1982-2016 Advanced Engineering Software (aes) **
** Ver. 23.0 Release Date: 07/01/2016  License ID 1452 **

Analysis prepared by:
Pasco Laret Suiter & Associates

************************************************************************************
** DESCRIPTION OF STUDY **********************************************************
* 2882 LA COSTA HOTEL *
* 100 YEAR PRE-DEVELOPED ANALYSIS *
* NOVEMBER 2019 *

**********************************************************************************

FILE NAME: 2882E100.DAT
TIME/DATE OF STUDY: 12:32 11/26/2019

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) =  2.500
SPECIFIED MINIMUM PIPE SIZE(INCH) =  3.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
FOR ALL DOWNSTREAM ANALYSES

*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*

<table>
<thead>
<tr>
<th>NO.</th>
<th>HALF-CROWN TO STREET-CROSSFALL</th>
<th>STREET-CROSSFALL</th>
<th>CURB GUTTER-GEOMETRIES: MANNING</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>WIDTH</td>
<td>CROSSFALL IN-/ OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>30.0</td>
<td>20.0</td>
<td>0.018/0.018/0.020 0.67 2.00 0.0313 0.167 0.0150</td>
</tr>
</tbody>
</table>

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.*

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>> RATIONAL METHOD INITIAL SUBAREA ANALYSIS

*USER SPECIFIED (SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 75.00
DOWNSTREAM ELEVATION (FEET) = 72.20
ELEVATION DIFFERENCE (FEET) = 2.80
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 10.692
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN THE MAXIMUM OVERLAND FLOW LENGTH = 97.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.034
SUBAREA RUNOFF (CFS) = 0.10
TOTAL AREA (ACRES) = 0.10 TOTAL RUNOFF (CFS) = 0.10

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 52

>>> COMPUTE NATURAL VALLEY CHANNEL FLOW

>>> TRAVEL TIME THRU SUBAREA

ELEVATION DATA: UPSTREAM (FEET) = 72.20 DOWNSTREAM (FEET) = 60.40
CHANNEL LENGTH THRU SUBAREA (FEET) = 327.00 CHANNEL SLOPE = 0.0361
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.10
FLOW VELOCITY (FEET/SEC) = 2.85 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN.) = 1.91 Tc (MIN.) = 12.60
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 427.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.628
*USER SPECIFIED (SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2500
SUBAREA AREA (ACRES) = 1.10 SUBAREA RUNOFF (CFS) = 1.00
TOTAL AREA (ACRES) = 1.2 TOTAL RUNOFF (CFS) = 1.09
Tc (MIN.) = 12.60

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 1.2 TC (MIN.) = 12.60
PEAK FLOW RATE (CFS) = 1.09

END OF RATIONAL METHOD ANALYSIS
HYDROLOGIC NODE MAP
516 LA COSTA AVENUE
PRE-DEVELOPMENT MAP

\[ C = 0.9 \times \% \text{ IMPERVIOUS} + 0.25 \times \left( 1 - \% \text{ IMPERVIOUS} \right) \]

\( C = 0.25 \) FOR TYPE B SOIL

LEGEND
- BASIN BOUNDARY
- SUB-AREA
- FLOWLINE
- IMPERVIOUS AREA

95 SF

SCALE: 1" = 40'
TIME (MIN) = 0  DISCHARGE (CFS) = 0
TIME (MIN) = 13  DISCHARGE (CFS) = 0
TIME (MIN) = 26  DISCHARGE (CFS) = 0
TIME (MIN) = 39  DISCHARGE (CFS) = 0
TIME (MIN) = 52  DISCHARGE (CFS) = 0
TIME (MIN) = 65  DISCHARGE (CFS) = 0.1
TIME (MIN) = 78  DISCHARGE (CFS) = 0.1
TIME (MIN) = 91  DISCHARGE (CFS) = 0.1
TIME (MIN) = 104  DISCHARGE (CFS) = 0.1
TIME (MIN) = 117  DISCHARGE (CFS) = 0.1
TIME (MIN) = 130  DISCHARGE (CFS) = 0.1
TIME (MIN) = 143  DISCHARGE (CFS) = 0.1
TIME (MIN) = 156  DISCHARGE (CFS) = 0.1
TIME (MIN) = 169  DISCHARGE (CFS) = 0.1
TIME (MIN) = 182  DISCHARGE (CFS) = 0.1
TIME (MIN) = 195  DISCHARGE (CFS) = 0.1
TIME (MIN) = 208  DISCHARGE (CFS) = 0.1
TIME (MIN) = 221  DISCHARGE (CFS) = 0.1
TIME (MIN) = 234  DISCHARGE (CFS) = 0.2
TIME (MIN) = 247  DISCHARGE (CFS) = 0.3
TIME (MIN) = 260  DISCHARGE (CFS) = 1.09
TIME (MIN) = 273  DISCHARGE (CFS) = 0.2
TIME (MIN) = 286  DISCHARGE (CFS) = 0.1
TIME (MIN) = 299  DISCHARGE (CFS) = 0.1
TIME (MIN) = 312  DISCHARGE (CFS) = 0.1
TIME (MIN) = 325  DISCHARGE (CFS) = 0.1
TIME (MIN) = 338  DISCHARGE (CFS) = 0.1
TIME (MIN) = 351  DISCHARGE (CFS) = 0.1
TIME (MIN) = 364  DISCHARGE (CFS) = 0
TIME (MIN) = 377  DISCHARGE (CFS) = 0.
Hyd. No. 1

100 Year Existing Condition

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 13 min

Peak discharge = 1.090 cfs
Time to peak = 4.33 hrs
Hyd. volume = 2,878 cuft
3.2 Post-Developed Hydrologic Model Output

******************************************************************************************
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Ver. 23.0 Release Date: 07/01/2016 License ID 1452

Analysis prepared by:
Pasco Laret Suiter & Associates

******************************************************************************************

FILE NAME: 2882P100.DAT
TIME/DATE OF STUDY: 13:44 09/25/2020

******************************************************************************************

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500
SPECIFIED MINIMUM PIPE SIZE(INCH) = 3.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
FOR ALL DOWNSTREAM ANALYSES

*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*

<table>
<thead>
<tr>
<th>NO.</th>
<th>HALF-CROWN</th>
<th>STREET-CROSSFALL</th>
<th>CURB GUTTER-GEOMETRIES</th>
<th>MANNING</th>
<th>WIDTH</th>
<th>CROSSFALL</th>
<th>IN-/ OUT-/ PARK-</th>
<th>HEIGHT</th>
<th>WIDTH</th>
<th>LIP</th>
<th>HIKE</th>
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<td>0.67</td>
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<td>0.0150</td>
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</tbody>
</table>

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.*

******************************************************************************************

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

******************************************************************************************

>>> RATIONAL METHOD INITIAL SUBAREA ANALYSIS

*USER SPECIFIED(SUBAREA):*
USER-SPECIFIED RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(Feet) = 168.00
UPSTREAM ELEVATION(Feet) = 73.20
DOWNSTREAM ELEVATION(Feet) = 70.50
ELEVATION DIFFERENCE(Feet) = 2.70
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 10.859
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 69.11

Hydrology Study La Costa Hotel October 2020
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.994
SUBAREA RUNOFF (CFS) = 0.11
TOTAL AREA (ACRES) = 0.11 TOTAL RUNOFF (CFS) = 0.11

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 52

>>> COMPUTE NATURAL VALLEY CHANNEL FLOW<<<
>>> TRAVEL TIME THRU SUBAREA <<<

ELEVATION DATA: UPSTREAM (FEET) = 70.50 DOWNSTREAM (FEET) = 65.50
CHANNEL LENGTH THRU SUBAREA (FEET) = 155.00 CHANNEL SLOPE = 0.0323
NOTE: CHANNEL FLOW OF 1.0 CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA (CFS) = 0.11
FLOW VELOCITY (FEET/SEC) = 2.69 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME (MIN) = 0.96 Tc (MIN) = 11.82
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 323.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW <<<

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.782
*USER SPECIFIED (SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .2500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2500
SUBAREA AREA (ACRES) = 0.15 SUBAREA RUNOFF (CFS) = 0.14
TOTAL AREA (ACRES) = 0.3 TOTAL RUNOFF (CFS) = 0.25
Tc (MIN) = 11.82

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 31

>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<
>>> USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW) <<<

ELEVATION DATA: UPSTREAM (FEET) = 64.80 DOWNSTREAM (FEET) = 62.01
FLOW LENGTH (FEET) = 98.00 MANNING'S N = 0.009
DEPTH OF FLOW IN 6.0 INCH PIPE IS 1.8 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 5.14
ESTIMATED PIPE DIAMETER (INCH) = 6.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 0.25
PIPE TRAVEL TIME (MIN) = 0.32 Tc (MIN) = 12.14
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 421.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 81

>>> ADDITION OF SUBAREA TO MAINLINE PEAK FLOW <<<

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.718
*USER SPECIFIED (SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .5100
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.2857
SUBAREA AREA (ACRES) = 0.04 SUBAREA RUNOFF (CFS) = 0.08
TOTAL AREA (ACRES) = 0.3 TOTAL RUNOFF (CFS) = 0.33
Tc (MIN) = 12.14
FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 52

>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<

ELEVATION DATA: UPSTREAM(FEET) = 62.01 DOWNSTREAM(FEET) = 62.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 66.00 CHANNEL SLOPE = 0.0002
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
NOTE: CHANNEL SLOPE OF .001 WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.33
FLOW VELOCITY(FEET/SEC) = 0.47 (PER LACFCD/RCFC&WC HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 2.32 Tc(MIN.) = 14.45
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 487.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.321
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3800
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3524
SUBAREA AREA(ACRES) = 0.74 SUBAREA RUNOFF(CFS) = 0.93
TOTAL AREA(ACRES) = 1.0 TOTAL RUNOFF(CFS) = 1.22
Tc(MIN.) = 14.45

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 1.0 Tc(MIN.) = 14.45
PEAK FLOW RATE(CFS) = 1.22

END OF RATIONAL METHOD ANALYSIS
RUN DATE   9/25/2020
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 14 MIN.
6 HOUR RAINFALL 2.5 INCHES
BASIN AREA 1 ACRES
RUNOFF COEFFICIENT 0.35
PEAK DISCHARGE 1.22 CFS

TIME (MIN) = 0  DISCHARGE (CFS) = 0
TIME (MIN) = 14  DISCHARGE (CFS) = 0.1
TIME (MIN) = 28  DISCHARGE (CFS) = 0.1
TIME (MIN) = 42  DISCHARGE (CFS) = 0.1
TIME (MIN) = 56  DISCHARGE (CFS) = 0.1
TIME (MIN) = 70  DISCHARGE (CFS) = 0.1
TIME (MIN) = 84  DISCHARGE (CFS) = 0.1
TIME (MIN) = 98  DISCHARGE (CFS) = 0.1
TIME (MIN) = 112 DISCHARGE (CFS) = 0.1
TIME (MIN) = 126 DISCHARGE (CFS) = 0.1
TIME (MIN) = 140 DISCHARGE (CFS) = 0.1
TIME (MIN) = 154 DISCHARGE (CFS) = 0.1
TIME (MIN) = 168 DISCHARGE (CFS) = 0.1
TIME (MIN) = 182 DISCHARGE (CFS) = 0.1
TIME (MIN) = 196 DISCHARGE (CFS) = 0.1
TIME (MIN) = 210 DISCHARGE (CFS) = 0.2
TIME (MIN) = 224 DISCHARGE (CFS) = 0.2
TIME (MIN) = 238 DISCHARGE (CFS) = 0.3
TIME (MIN) = 252 DISCHARGE (CFS) = 1.22
TIME (MIN) = 266 DISCHARGE (CFS) = 0.2
TIME (MIN) = 280 DISCHARGE (CFS) = 0.1
TIME (MIN) = 294 DISCHARGE (CFS) = 0.1
TIME (MIN) = 308 DISCHARGE (CFS) = 0.1
TIME (MIN) = 322 DISCHARGE (CFS) = 0.1
TIME (MIN) = 336 DISCHARGE (CFS) = 0.1
TIME (MIN) = 350 DISCHARGE (CFS) = 0.1
TIME (MIN) = 364 DISCHARGE (CFS) = 0.1
TIME (MIN) = 378 DISCHARGE (CFS) = 0
Hyd. No. 1

100 Year Proposed Condition

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 14 min

Peak discharge = 1.220 cfs
Time to peak = 4.20 hrs
Hyd. volume = 3,545 cuft
3.3 Hydraulic Calculations
Channel Report
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Sep 25 2020

4 inch PVC at 2%

Circular
Diameter (ft) = 0.33
Invert Elev (ft) = 100.00
Slope (%) = 2.00
N-Value = 0.009

Highlighting
Depth (ft) = 0.30
Q (cfs) = 0.405
Area (sqft) = 0.08
Velocity (ft/s) = 4.95
Wetted Perim (ft) = 0.83
Crit Depth, Yc (ft) = 0.32
Top Width (ft) = 0.19
EGL (ft) = 0.68

Calculations
Compute by: Known Depth
Known Depth (ft) = 0.30

Elev (ft)

Section

Reach (ft)
6 inch PVC at 1.5%

**Circular**
- Diameter (ft) = 0.50
- Invert Elev (ft) = 62.00
- Slope (%) = 1.50
- N-Value = 0.009

**Highlighted**
- Depth (ft) = 0.20
- Q (cfs) = 0.330
- Area (sqft) = 0.07
- Velocity (ft/s) = 4.50
- Wetted Perim (ft) = 0.68
- Crit Depth, Yc (ft) = 0.30
- Top Width (ft) = 0.49
- EGL (ft) = 0.51

**Calculations**
- Compute by: Known Q
- Known Q (cfs) = 0.33

---

<table>
<thead>
<tr>
<th>Elev (ft)</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>63.00</td>
<td></td>
</tr>
<tr>
<td>62.75</td>
<td></td>
</tr>
<tr>
<td>62.50</td>
<td></td>
</tr>
<tr>
<td>62.25</td>
<td></td>
</tr>
<tr>
<td>62.00</td>
<td></td>
</tr>
<tr>
<td>61.75</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
8 inch PVC at 1%

**Circular**
- Diameter (ft) = 0.67
- Invert Elev (ft) = 57.50
- Slope (%) = 1.00
- N-Value = 0.009

**Highlighted**
- Depth (ft) = 0.41
- Q (cfs) = 1.220
- Area (sqft) = 0.23
- Velocity (ft/s) = 5.38
- Wetted Perim (ft) = 1.21
- Crit Depth, Yc (ft) = 0.53
- Top Width (ft) = 0.65
- EGL (ft) = 0.86

**Calculations**
- Compute by: Known Q
- Known Q (cfs) = 1.22
3.4 Volume Sizing Requirements

Basin Sizing

<table>
<thead>
<tr>
<th>DMA Name</th>
<th>DMA Area (square feet)</th>
<th>Post-project surface type</th>
<th>DMA Runoff factor</th>
<th>DMA Area x runoff factor</th>
<th>Soil Type</th>
<th>IMP Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7004</td>
<td>Roof</td>
<td>1.0</td>
<td>7,004</td>
<td>B</td>
<td>BMP A</td>
</tr>
<tr>
<td>2</td>
<td>262</td>
<td>PCC</td>
<td>1.0</td>
<td>262</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>7,215</td>
<td>PP</td>
<td>0.1</td>
<td>722</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>14,498</td>
<td>L</td>
<td>0.1</td>
<td>1450</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>628</td>
<td>DG</td>
<td>0.1</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>15,449</td>
<td>PP</td>
<td>0.1</td>
<td>1545</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11,045</td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
<td>332</td>
</tr>
</tbody>
</table>

Volume Sizing Requirement

Design Capture Volume (Per City of Encinitas BMP Design Manual Appendix B.1, February 2016):

\[
DCV = R_F \times d \times A \times 1/12 \text{ in/ft}
\]

\[
R_F = \text{Runoff factor (unitless)}
\]

\[
d = 85^{th} \text{ percentile, 24-hour storm event rainfall depth (inches)}
\]

\[
A = \text{Tributary area (sf)}
\]

\[
R_F = \frac{[(7,266 \times 0.9) + (15,126 \times 0.3) + (22,664 \times 0.1)]}{45,056}
\]

\[
R_F = 0.30
\]

\[
d = 0.56 \text{ inches}
\]

\[
A = 45,056 \text{ sf} = 1.03 \text{ acres}
\]

\[
DCV = 0.30 \times 0.56 \times 45,056 \text{ sf} \times 1/12 \text{ in/ft}
\]

\[
= 631 \text{ CF Required}
\]

100-Year Storage volume required to infiltrate = 3,545 cf ← Governs

Paver Parking & Drive Aisle Area Volume Proposed

Area = 15,449 sf
Gravel Layers = 12 inch (1’)
Gravel Void Ratio Factor = 0.4
Factor of Safety = 2

Paver Volume Proposed = (15,449 sf * 1 ft * 0.4) / 2
= 3,089 cf
**Basin Volume Proposed**

- **Area**: 453 sf
- **Ponding Depth**: 6 inch (0.5’)
- **Engineered Soil Layer**: 18 inch (1.5’)
- **Soil Void Ratio**: 0.2
- **Gravel Layers**: 18 inch (1.5’)
- **Gravel Void Ratio Factor**: 0.4

\[
\text{Basin Volume Proposed} = (453 \text{ sf} \times 0.5 \text{ ft}) + (453 \text{ sf} \times 1.5 \text{ ft} \times 0.2) + (453 \text{ sf} \times 1.5 \text{ ft} \times 0.4) \\
= 226 \text{ cf} + 136 \text{ cf} + 271 \text{ cf} \\
= 633 \text{ cf}
\]

**Maxwell IV Drywell Storage**

\[
= 2 \times 584 \text{ cf} \\
= 1,169 \text{ cf (See attached calculations from Torrent Resources)}
\]

**Total Proposed Storage Volume**

\[
= \text{Paver Parking Volume} + \text{Basin Volume} + \text{Drywell Storage} \\
= 3,089 \text{ cf} + 633 \text{ cf} + 1,169 \text{ cf} \\
= 4,891 \text{ cf}
\]
NOTES:
1. DEPTH TO GROUNDWATER > 20 FEET.

<table>
<thead>
<tr>
<th>POTENTIAL POLLUTANT SOURCE</th>
<th>SOURCE CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON SITE STORM DRAIN INLETS</td>
<td>MARK ALL INLETS WITH THE WORDS &quot;NO DUMPING FLOWS TO OCEAN&quot; OR SIMILAR. MAINTAIN AND PERIODICALLY REPAINT OR REPLACE INLET MARKINGS. PROVIDE STORM WATER POLLUTION PREVENTION INFORMATION TO NEW SITE OWNERS, LEASEES OR OPERATORS. INCLUDE THE FOLLOWING IN LEASE AGREEMENT: TENANT SHALL NOT ALLOW ANYONE TO DISCHARGE ANYTHING TO STORM DRAINING OR TO STORE OR DEPOSIT MATERIALS SO AS TO CREATE A POTENTIAL DISCHARGE TO STORM DRAINING.</td>
</tr>
<tr>
<td>LANDSCAPE/OUTDOOR PESTICIDE USE</td>
<td>FINAL LANDSCAPE PLANS SHALL PRODUCE EXISTING DROUGHT TOLERANT TREES, SHRUBS, AND GROUND COVER TO THE MAXIMUM EXTENT POSSIBLE. BE DESIGNED TO MINIMIZE IRRIGRATION AND RUNOFF, PROMOTE SURFACE DILUTION WHERE APPROPRIATE AND MINIMIZE THE USE OF FERTILIZERS AND PESTICIDES. SPECIFY PLANTS THAT ARE TOLERANT OR PERIODIC SATURATED SOIL CONDITIONS FOR AREAS TO RETAIN OR DETAIN STORMWATER. CONSIDER THE USE OF RESISTANT PLANTS, ESPECIALLY ADJACENT TO HARDSCAPE. SELECT PLANTS APPROPRIATE TO SITE SOILS, CLIMATE, SUN, WIND, RAIN, LAND USE AND MOVEMENT, ECOLOGICAL CONSIDERATIONS, AND PLANT INTERACTIONS. MAINTAIN LANDSCAPING USING MINIMUM OR NO PESTICIDES.</td>
</tr>
<tr>
<td>PLAZA, SIDEWALKS, AND PARKING LOTS</td>
<td>PLAZAS, SIDEWALKS, AND PARKING LOTS SHALL BE MAINTAINED REGULARLY TO PREVENT THE ACCUMULATION OF LITTER AND DEBRIS. DEBRIS FROM PRESSURE WASHING SHALL BE COLLECTED TO PREVENT ENTRY INTO THE STORM DRAIN SYSTEM. WASHWATER CONTAINING ANY CLEANING AGENT OR DEGREASER SHALL BE COLLECTED AND DISCHARGED TO THE SANITARY SEWER AND NOT DISCHARGED TO A STORM DRAIN.</td>
</tr>
</tbody>
</table>

BASIN A WQQ SIZING

<table>
<thead>
<tr>
<th>DMA NAME</th>
<th>DMA AREA</th>
<th>PPS1</th>
<th>DMA RF</th>
<th>RF * AREA</th>
<th>SOIL TYPE</th>
<th>IMP NAME</th>
<th>IMP A AREA</th>
<th>SP AREA</th>
<th>SP AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.004</td>
<td>1.004</td>
<td>0.004</td>
<td>1.004</td>
<td>0.004</td>
<td></td>
<td>B</td>
<td>1.045</td>
<td>0.03</td>
<td>352</td>
</tr>
</tbody>
</table>

SCALE: 1"=40'
3.5 Hydromodification Analysis

See project Storm Water Quality Management Plan (SWQMP) prepared by Pasco Laret Suiter & Associates, dated October 2020 for HydroCAD Modeling for Hydromodification Compliance and general cross section of the HMP Biofiltration Basin and supporting calculations.
4.0 ATTACHMENTS
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 Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

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

Date(s) aerial images were photographed: Nov 3, 2014—Nov 22, 2014

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.
Hydrologic Soil Group

<table>
<thead>
<tr>
<th>Map unit symbol</th>
<th>Map unit name</th>
<th>Rating</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIC</td>
<td>Marina loamy coarse sand, 2 to 9 percent slopes</td>
<td>B</td>
<td>1.5</td>
<td>99.8%</td>
</tr>
<tr>
<td>TeF</td>
<td>Terrace escarpments</td>
<td></td>
<td>0.0</td>
<td>0.2%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td></td>
<td><strong>1.5</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

*Aggregation Method: Dominant Condition*
Component Percent Cutoff: None Specified
Tie-break Rule: Higher
### Table 3-1
**RUNOFF COEFFICIENTS FOR URBAN AREAS**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Runoff Coefficient “C”</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRCS Elements</td>
<td>County Elements</td>
<td>% IMPER.</td>
</tr>
<tr>
<td>Undisturbed Natural Terrain (Natural)</td>
<td>Permanent Open Space</td>
<td>0*</td>
</tr>
<tr>
<td>Low Density Residential (LDR)</td>
<td>Residential, 1.0 DU/A or less</td>
<td>10</td>
</tr>
<tr>
<td>Low Density Residential (LDR)</td>
<td>Residential, 2.0 DU/A or less</td>
<td>20</td>
</tr>
<tr>
<td>Low Density Residential (LDR)</td>
<td>Residential, 2.9 DU/A or less</td>
<td>25</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>Residential, 4.3 DU/A or less</td>
<td>30</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>Residential, 7.3 DU/A or less</td>
<td>40</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>Residential, 10.9 DU/A or less</td>
<td>45</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>Residential, 14.5 DU/A or less</td>
<td>50</td>
</tr>
<tr>
<td>High Density Residential (HDR)</td>
<td>Residential, 24.0 DU/A or less</td>
<td>65</td>
</tr>
<tr>
<td>High Density Residential (HDR)</td>
<td>Residential, 43.0 DU/A or less</td>
<td>80</td>
</tr>
<tr>
<td>Commercial/Industrial (N. Com)</td>
<td>Neighborhood Commercial</td>
<td>80</td>
</tr>
<tr>
<td>Commercial/Industrial (G. Com)</td>
<td>General Commercial</td>
<td>85</td>
</tr>
<tr>
<td>Commercial/Industrial (O.P. Com)</td>
<td>Office Professional/Commercial</td>
<td>90</td>
</tr>
<tr>
<td>Commercial/Industrial (Limited I.)</td>
<td>Limited Industrial</td>
<td>90</td>
</tr>
<tr>
<td>Commercial/Industrial (General I.)</td>
<td>General Industrial</td>
<td>95</td>
</tr>
</tbody>
</table>

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre
NRCS = National Resources Conservation Service
Given:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured Infiltration Rate</td>
<td>9.50 in/hr</td>
</tr>
<tr>
<td>Safety Factor</td>
<td>3.00</td>
</tr>
<tr>
<td>Design Infiltration Rate</td>
<td>3.17 in/hr</td>
</tr>
<tr>
<td>Mitigated Volume</td>
<td>3,570 ft³</td>
</tr>
<tr>
<td>Required Drawdown Time</td>
<td>96 hours</td>
</tr>
<tr>
<td>Min. Depth to Infiltration</td>
<td>10 ft</td>
</tr>
<tr>
<td>Groundwater Depth for Design</td>
<td>62 ft</td>
</tr>
</tbody>
</table>

Proposed:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drywell Rock Shaft Diameter</td>
<td>6 ft</td>
</tr>
<tr>
<td>Drywell Chamber Depth</td>
<td>15 ft</td>
</tr>
<tr>
<td>Rock Porosity</td>
<td>40 %</td>
</tr>
<tr>
<td>Depth to Infiltration</td>
<td>11 ft</td>
</tr>
<tr>
<td>Drywell Bottom Depth</td>
<td>50 ft</td>
</tr>
</tbody>
</table>

Apply Safety Factor to get Design Rate.

\[
\frac{9.50 \text{ in/hr}}{3} = \frac{3.17 \text{ in/hr}}{3}
\]

Convert Design Rate from in/hr to ft/sec.

\[
3.17 \left( \frac{\text{in}}{\text{hr}} \right) \times \left( \frac{1 \text{ ft}}{12 \text{ in}} \right) \times \left( \frac{1 \text{ hr}}{3600 \text{ sec}} \right) = 0.000073 \left( \frac{\text{ft}}{\text{sec}} \right)
\]

A 6 foot diameter drywell provides 18.85 SF of infiltration area per foot of depth, plus 28.27 SF at the bottom.

For a 50 foot deep drywell, infiltration occurs between 11 feet and 50 feet below grade. This provides 39 feet of infiltration depth in addition to the bottom area. Infiltration area per drywell is calculated below.

\[
39 \text{ ft} \times 18.85 \left( \frac{\text{ft}^2}{\text{ft}} \right) + 28.27 \left( \frac{\text{ft}^2}{\text{ft}} \right) = 763 \left( \frac{\text{ft}^2}{\text{ft}} \right)
\]

Combine design rate with infiltration area to get flow (disposal) rate for each drywell.

\[
0.000073 \left( \frac{\text{ft}}{\text{sec}} \right) \times 763 \left( \frac{\text{ft}^2}{\text{ft}} \right) = 0.05596 \left( \frac{\text{ft}^3}{\text{sec}} \right)
\]

Volume of disposal for each drywell based on various time frames are included below.

96 hrs: \(0.056 \text{ CFS} \times 96 \text{ hours} \times \frac{3600 \text{ sec}}{1 \text{ hr}} = 19,340 \text{ cubic feet of retained water disposed of.}\)

Chamber diameter = 4 feet. Drywell rock shaft diameter = 6 feet.

Volume provided in each drywell with chamber depth of 15 feet.

\[
15 \text{ ft} \times 12.57 \left( \frac{\text{ft}^2}{\text{ft}} \right) + 35 \text{ ft} \times 28.27 \left( \frac{\text{ft}^2}{\text{ft}} \right) \times 40 \% = 584 \left( \frac{\text{ft}^3}{\text{sec}} \right)
\]

The MaxWell System is composed of 2 drywell(s).

Total volume provided = 1,169 ft³
Total 96 hour infiltration volume = 38,679 ft³
Total infiltration flowrate = 0.11192 ft³/sec

Based on the total mitigated volume of 3570 CF, after subtracting the volume stored in the MaxWell System, the residual volume of 2401 CF could be stored in a separate detention system and connected to the drywell system.

For any questions, please contact Jason Dupre at 626-250-4724 or via email at JDupre@TorrentResources.com
ITEM NUMBERS

1. MANHOLE CONE - MODIFIED FLAT BOTTOM.
2. BOLTED RING & GRATE/Cover - DIAMETER & TYPE AS SHOWN. CLEAN CAST IRON WITH WORDING "STORM WATER ONLY" IN RAISED LETTERS. BOLTED IN 2 LOCATIONS AND SECURED TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
3. STABILIZED BACKFILL - TWO-SACK SLURRY MIX.
4. PRE-CAST LINER - 4000 PSI CONCRETE 48" ID. X 54" OD. CENTER IN HOLE AND ALIGN SECTIONS TO MAXIMIZE BEARING SURFACE.
5. INLET PIPE/OUTLET PIPE (BY OTHERS). SEE SEPARATE PLAN FOR INVERT ELEVATIONS.
6. GRADED BASIN OR PAVING (BY OTHERS).
7. COMPACTED BASE MATERIAL, IF REQUIRED (BY OTHERS).
8. FREEBOARD DEPTH VARIES WITH INLET PIPE ELEVATION. INCREASE SETTLING CHAMBER DEPTH AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE RISER PIPE.
9. NON-WOVEN GEOTEXTILE SLEEVE - MIRAFI 140 NL. MIN. 6 FT Ø. HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
10. PUREFLO® DEBRIS SHIELD - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL 0.265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. FUSION BONDED EPOXY COATED.
11. MIN. 6' Ø DRILLED SHAFT.
12. RISER PIPE - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
13. DRAINAGE PIPE - ADS HIGHWAY GRADE OR SCH. 40 PVC WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS. DIAMETER AS NOTED.
14. ROCK - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
15. FLOFAST® DRAINAGE SCREEN - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. OVERALL LENGTH VARIES, UP TO 120" WITH TRI-B COUPLER.
16. ABSORBENT - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, 2 PER CHAMBER.
17. FABRIC SEAL - U.V. RESISTANT GEOTEXTILE - TO BE REMOVED BY CUSTOMER AT PROJECT COMPLETION. GRATED ONLY.
18. MIN. 6' Ø DRILLED SHAFT.
19. BASE SEAL - CONCRETE SLURRY.
20. 6 PERFORATIONS MINIMUM PER FOOT, 2 ROWS MINIMUM.