JAPATUL LOW FLOW
DESILTING POND
HYDROLOGY CALCULATIONS

April 23, 2018
PDS 2002-2700-14369
23137 Japatul Valley Road
APN 523-120-28 & 32

I. Allan Cooper, P. E. 4/24/18 RCE 16685

Prepared by:

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(858) 277-0441

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

ENGINEER OF WORK

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I. Allan Cooper 4/24/18

I. ALLAN COOPER DATE

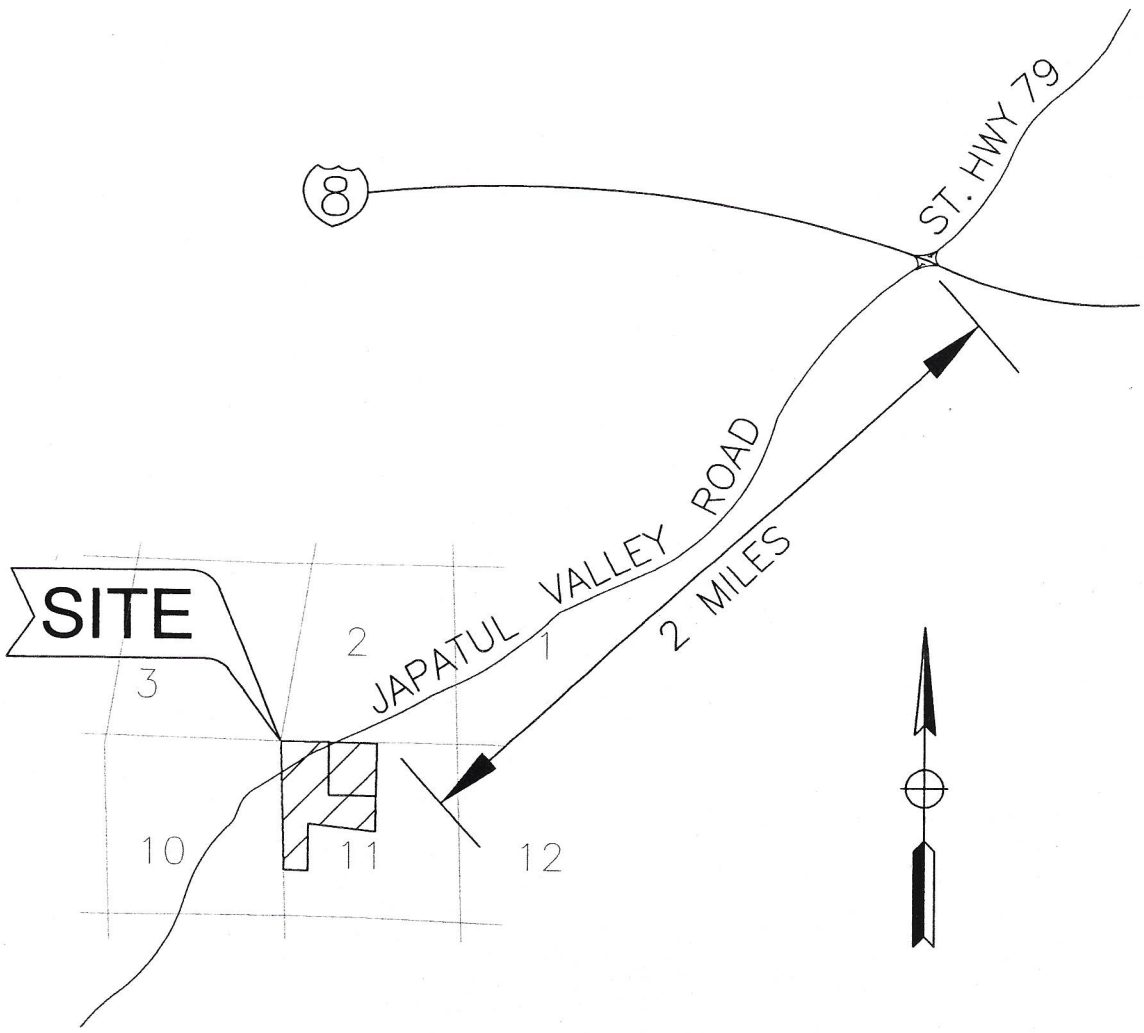
R.C.E. 16685 EXP. 06-30-19

JAPATUL DESILT BASIN
TABLE OF CONTENTS

SECTION 1.

Scope of Work

The scope of work for this project is to install a low flow desilting pond on the east side of the existing ranch to limit silt and pollutants leaving the ranch into the nearby Horse Thief Canyon. The property is located at 23137 Japatul Valley Road.



VICINITY MAP

NO SCALE

SECTION 2.

Hydrologic Setting

2.1 Topography

The project site is at APN 523-120-28 on 23137 Japatul Valley Road. The site is located within the Cleveland National Forest. Elevation within the project site ranges from 2500 feet to 3500 feet above mean sea level (MSL). The desilting basin is situated in an existing agriculture pasture.

2.2 Climate

The climate for the project is moderate with an average annual rainfall of 20 inches.

2.3 Precipitation

The average annual rainfall for the project site ranges from 15 to 20 inches. The rainfall intensity adjustment factor was taken into account by the manual input of time versus intensity values.

2.4 Runoff

The runoff for the desilting basin flows into an existing natural swale downstream of the basin. The watershed for this desilting basin is **not** a blue-line on a USGS map. The watershed for this project is characterized as an agricultural area. The runoff coefficients used to prepare these calculations are summarized below.

Development	Soil	Rational Method "C"
Rural (lots greater than ½ acre)	D	.45
Single Family	D	.55
Multi-Units	D	.70
Commercial - 80% Impervious	D	.85
Industrial - 90% Impervious	D	.95

These runoff coefficients meet the requirements listed in the City of San Diego Drainage Design Manual, 2017 Edition.

2.5 Soil Type

The hydrologic soil types found within the project area are D soils as shown in the County Of San Diego Drainage Design Manual, 2005.

SECTION 3.

Hydrologic Analysis

3.1 Design Criteria

The design criteria used for hydrologic calculations are taken from the County of San Diego Drainage Design Manual, dated January, 2005.

The specified design criteria for underground storm drain systems shall be as follows:

Storm Frequency Event = 100 year
Specified Minimum Pipe Size = 18 inches
Specified Percent of Gradients To Use For Friction Slope = 95 %
San Diego Hydrology Manual "C"-Values Used
Time of Concentration determined using combination of "Nomograph for Natural Watersheds and "Rainfall Intensity/Duration/Frequency Curves"

3.2 Methodology

The Rational Method was used to calculate the discharge from all drainage basins, since the drainage area is located in a rural watershed and is less than one square mile in size.

For the calculations, the time of concentration was determined from the "Nomograph for Natural Watersheds" and the average rainfall intensity (I) was determined using the "Rainfall Intensity/Duration/Frequency Curves". Both of these tables are from the County of San Diego Hydrology Manual, 2003, and can be found in Appendix A.2 and A.4, respectively, of this report.

The numbering and nodes for each basin can be found on the drainage map.

3.3 Computation of Peak Discharge

RATIONAL METHOD

The rational method formula is given below:

$Q = C * I * A$

Q = Peak discharge in cubic feet per second (cfs)
C = Runoff factor
I = Average rainfall intensity in inches per hour
A = Area of the drainage basin in acres

SECTION 4.

Conclusion

The calculations meet all design criteria specified by the County of San Diego Hydrology Manual, 2003 Edition.

The property is not in a County or FEMA mapped flood plain. See attached FIRM (Flood Insurance Rate Map) in Appendix A.3

The drainage basin for the desilting basin is **not** a blue-line on a USGS 7.5 Quad Map.

The area of construction of the desilting basin is on a existing pasture. There is a four foot freeboard to the rock spillway.

The existing conditions generated a 100-year peak flow rate of 256.49 cfs. According to calculations, the proposed desilting pond will reduce the 100-year peak flow rate to 11.76 cfs.

Water Quality

1. Rip-rap energy dissipaters were utilized upstream of the desilting basin to reduce silt and erosion.
2. The desilting basin was utilized to settle out pollutants or silt from storm water runoff leaving the existing pasture.
3. The desilt pond has natural vegetation to filter out pollutants and infiltration of the storm water.

	Unmitigated Q_{100}	Mitigated Q_{100}
Pre-development Node 104	122.82 cfs	122.82 cfs
Post-development Node 104	122.82 cfs	55.55 cfs (2.8+6.75+46.0)*

*Outlet pipe flow from Desilt pond = 2.8 cfs
Subarea runoff (area 103) = 6.75 cfs
Subarea runoff (area 104) = 46.0 cfs

SECTION 5.1
HYDROLOGY CALCULATIONS
EXISTING CONDITIONS

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2005 Advanced Engineering Software (aes)
              Ver. 2.0 Release Date: 06/01/2005  License ID 1278

                              Analysis prepared by:

                                 CEA ENGINEERING
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                                SAN DIEGO, CA. 92111
                           (858)277-0441, FAX (858) 277-0496

 ************************** DESCRIPTION OF STUDY **************************
* Japatul Desilt Pond                                                     *
* April 23, 2018                                                          *
* Existing Condition                                                      *
 **************************************************************************

  FILE NAME: 490-7T.DAT
  TIME/DATE OF STUDY: 13:25 04/23/2018
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  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: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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
  2   10.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0130

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1990.00
```

```
 UPSTREAM ELEVATION(FEET) =   3432.38
 DOWNSTREAM ELEVATION(FEET) =   3070.00
 ELEVATION DIFFERENCE(FEET) =    362.38
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.765
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.893
 SUBAREA RUNOFF(CFS) =    144.90
 TOTAL AREA(ACRES) =     39.74   TOTAL RUNOFF(CFS) =    144.90

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    101.10 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3070.00  DOWNSTREAM(FEET) =  3068.50
 FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  45.0 INCH PIPE IS  31.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  17.50
 ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =    144.90
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   5.83
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    101.10 =  2060.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    101.10 TO NODE    101.20 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3068.50  DOWNSTREAM(FEET) =   3045.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.1175
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.531
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  82
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    159.18
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.52
 AVERAGE FLOW DEPTH(FEET) =   1.13   TRAVEL TIME(MIN.) =   0.32
 Tc(MIN.) =   6.15
 SUBAREA AREA(ACRES) =     8.17       SUBAREA RUNOFF(CFS) =   28.58
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
 TOTAL AREA(ACRES) =     47.91         PEAK FLOW RATE(CFS) =     167.58

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.16   FLOW VELOCITY(FEET/SEC.) =  10.58
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    101.20 =  2260.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    101.20 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
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```
 ELEVATION DATA: UPSTREAM(FEET) =   3045.00  DOWNSTREAM(FEET) =   2985.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   790.00   CHANNEL SLOPE =  0.0759
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.359
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  82
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    182.26
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.32
 AVERAGE FLOW DEPTH(FEET) =   1.38   TRAVEL TIME(MIN.) =   1.58
 Tc(MIN.) =   7.73
 SUBAREA AREA(ACRES) =     9.73       SUBAREA RUNOFF(CFS) =   29.36
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
 TOTAL AREA(ACRES) =     57.64         PEAK FLOW RATE(CFS) =     173.92

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.36   FLOW VELOCITY(FEET/SEC.) =   8.25
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =  3050.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.10 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   2985.00  DOWNSTREAM(FEET) =   2948.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   692.00   CHANNEL SLOPE =  0.0535
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.630
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  82
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    222.36
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.49
 AVERAGE FLOW DEPTH(FEET) =   1.52   TRAVEL TIME(MIN.) =   1.36
 Tc(MIN.) =   9.09
 SUBAREA AREA(ACRES) =     35.63       SUBAREA RUNOFF(CFS) =   96.85
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
 TOTAL AREA(ACRES) =     93.27         PEAK FLOW RATE(CFS) =     253.53

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.61   FLOW VELOCITY(FEET/SEC.) =   8.75
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.10 =  3742.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.10 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   2948.00  DOWNSTREAM(FEET) =   2925.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   365.00   CHANNEL SLOPE =  0.0630
 CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.369
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
 SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    257.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.44
  AVERAGE FLOW DEPTH(FEET) =   2.03   TRAVEL TIME(MIN.) =   0.58
  Tc(MIN.) =   9.67
  SUBAREA AREA(ACRES) =     2.86       SUBAREA RUNOFF(CFS) =    7.47
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
  TOTAL AREA(ACRES) =     96.13         PEAK FLOW RATE(CFS) =     253.53

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.02   FLOW VELOCITY(FEET/SEC.) =  10.42
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =  4107.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2925.00  DOWNSTREAM(FEET) =   2875.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.0833
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.035
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    279.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.85
  AVERAGE FLOW DEPTH(FEET) =   1.98   TRAVEL TIME(MIN.) =   0.84
  Tc(MIN.) =  10.52
  SUBAREA AREA(ACRES) =    21.24       SUBAREA RUNOFF(CFS) =   52.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
  TOTAL AREA(ACRES) =    117.37         PEAK FLOW RATE(CFS) =     290.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.01   FLOW VELOCITY(FEET/SEC.) =  11.99
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =  4707.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =    117.37  TC(MIN.) =     10.52
  PEAK FLOW RATE(CFS)   =    290.40
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

SECTION 5.2
HYDROLOGY CALCULATIONS
PROPOSED CONDITION

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2005 Advanced Engineering Software (aes)
              Ver. 2.0 Release Date: 06/01/2005  License ID 1278

                              Analysis prepared by:

                                 CEA ENGINEERING
                               8369 VICKERS ST., STE. C
                                SAN DIEGO, CA. 92111
                            (858)277-0441, FAX (858) 277-0496

 ************************** DESCRIPTION OF STUDY **************************
* Japatul Desilt Pond                                                     *
* April 23, 2018                                                          *
* Proposed Conditions 100year                                             *
 **************************************************************************

  FILE NAME: 490-7TP.DAT
  TIME/DATE OF STUDY: 13:29 04/23/2018
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  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: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *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
  2   10.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0130

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  5.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1990.00
```

```
 UPSTREAM ELEVATION(FEET) =   3432.38
 DOWNSTREAM ELEVATION(FEET) =   3070.00
 ELEVATION DIFFERENCE(FEET) =    362.38
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.765
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
         THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
         (Reference: Table 3-1B of Hydrology Manual)
         THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.893
 SUBAREA RUNOFF(CFS) =    144.90
 TOTAL AREA(ACRES) =     39.74   TOTAL RUNOFF(CFS) =    144.90

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    101.10 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3070.00  DOWNSTREAM(FEET) =  3068.50
 FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  45.0 INCH PIPE IS  31.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  17.50
 ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =    144.90
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   5.83
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    101.10 =  2060.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    101.10 TO NODE    101.20 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3068.50  DOWNSTREAM(FEET) =   3045.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.1175
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.600
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  82
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    159.30
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.85
 AVERAGE FLOW DEPTH(FEET) =   1.65   TRAVEL TIME(MIN.) =   0.24
 Tc(MIN.) =   6.07
 SUBAREA AREA(ACRES) =     8.17       SUBAREA RUNOFF(CFS) =   28.81
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
 TOTAL AREA(ACRES) =     47.91         PEAK FLOW RATE(CFS) =     168.93

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.70   FLOW VELOCITY(FEET/SEC.) =  14.02
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    101.20 =  2260.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    101.20 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   3048.00  DOWNSTREAM(FEET) =   2985.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   790.00   CHANNEL SLOPE =  0.0797
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.424
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  82
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    183.76
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.47
 AVERAGE FLOW DEPTH(FEET) =   1.38   TRAVEL TIME(MIN.) =   1.55
 Tc(MIN.) =   7.63
 SUBAREA AREA(ACRES) =     9.73       SUBAREA RUNOFF(CFS) =   29.62
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
 TOTAL AREA(ACRES) =     57.64         PEAK FLOW RATE(CFS) =     175.46

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.35   FLOW VELOCITY(FEET/SEC.) =   8.41
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =  3050.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.10 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   2985.00  DOWNSTREAM(FEET) =   2948.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   692.00   CHANNEL SLOPE =  0.0535
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.679
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  82
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    224.27
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.49
 AVERAGE FLOW DEPTH(FEET) =   1.53   TRAVEL TIME(MIN.) =   1.36
 Tc(MIN.) =   8.99
 SUBAREA AREA(ACRES) =    35.63       SUBAREA RUNOFF(CFS) =   97.57
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
 TOTAL AREA(ACRES) =     93.27         PEAK FLOW RATE(CFS) =     255.42

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.61   FLOW VELOCITY(FEET/SEC.) =   8.80
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.10 =  3742.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.10 TO NODE    102.10 IS CODE =   7
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN) =   9.13   RAIN INTENSITY(INCH/HOUR) =  6.61
 TOTAL AREA(ACRES) =    94.62   TOTAL RUNOFF(CFS) =      3.00

****************************************************************************
 FLOW PROCESS FROM NODE    102.10 TO NODE    102.20 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  2949.00  DOWNSTREAM(FEET) =  2945.00
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.011
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.58
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      3.00
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =   9.38
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.20 =  3842.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.20 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2945.00  DOWNSTREAM(FEET) =   2925.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   365.00   CHANNEL SLOPE =  0.0548
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.833
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.57
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   1.70
  Tc(MIN.) =  11.09
  SUBAREA AREA(ACRES) =     2.86       SUBAREA RUNOFF(CFS) =    6.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.017
  TOTAL AREA(ACRES) =     97.48         PEAK FLOW RATE(CFS) =       9.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   4.04
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =  4207.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2925.00  DOWNSTREAM(FEET) =   2875.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.0833
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.375
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     32.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.68
  AVERAGE FLOW DEPTH(FEET) =   0.71   TRAVEL TIME(MIN.) =   1.50
  Tc(MIN.) =  12.58
  SUBAREA AREA(ACRES) =    21.24       SUBAREA RUNOFF(CFS) =   46.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.087
  TOTAL AREA(ACRES) =    118.72         PEAK FLOW RATE(CFS) =      55.55
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.93   FLOW VELOCITY(FEET/SEC.) =   7.76
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =  4807.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =    118.72  TC(MIN.) =     12.58
  PEAK FLOW RATE(CFS)   =     55.55
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

SECTION 5.3
PROPOSED DESILT POND STORM WATER RUNOFF (ON-SITE)