Appendix F

Hydrology and Hydraulic Calculations,
Collier Commercial Properties

Hydrology and Hydraulic Calculations

Collier Commercial Properties

City of Lake of Elsinore, CA 92530
APN(s) 377-190-02,03,04

Prepared For:

COLLIER COMMERCIAL PROPERTIES
29400 Enterprise Way
Lake Elsinore, CA 92530
Phone No. (949) 275-8880

Prepared by:



1-16-2023

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January 16, 2023

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A. Introduction

1.1 Purpose & Scope

The following Hydrology & Hydraulics Study has been prepared for the development of the Lake Elsinore Rentals site in the City of Lake Elsinore, CA to satisfy the City of Lake Elsinore per Riverside County Flood Control and Conservation District Hydrology requirements for developments of this type.

The scope of this Study is as follows:

- Identification of existing conditions tributary drainage areas and calculation of total peak flow rates and run-on/run-off volumes impacting the project site.
- Identification of existing conditions on-site drainage areas and calculation of peak flow rates and runoff volumes for these areas.
- Identification of proposed on-site hydrologic conditions and site/drainage plan.
- Identification of Water Quality Best Management Practices (BMPs) proposed for the project.
- Summary of Findings and Conclusions.

1.2 Project Overview

The proposed project entails the construction of two new industrial buildings in the City of Lake Elsinore. Total Building A= 3,000 s.f. and Building B= 8,975 s.f. in a 121,966 s.f. lot in a zoning of Limited Manufacturing (M-1). The project will be operating an equipment rental and trucking operations business which also include outside storage of equipment and trucks. To the north boundary of the project site is Collier Avenue, to the south is Minthorn Street, to the west is a vacant lot and to the east is a commercial development with block wall fence.

A. Introduction



VICINITY MAP/N.T.S.

SITE LOCATION

A. Introduction

1.3 Existing Conditions Off-Site Areas

The project site is surrounded by existing streets to the north and to the south, a commercial building to the east and vacant lot to the west.

Photo 1- Minthorn Street looking Northeast



A. Introduction

Photo 1- Collier Avenue looking Northwest



A. Introduction

1.4 Existing Conditions On-Site Areas

The existing on-site project area is generally flat with poorly covered native soil that has been disturbed from past use. It was noted that most of the site surface material is lightly covered with native vegetation (weeds).



A. Introduction

1.5 References

The following documents have been made part of this Study by reference:

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

2.) Site Plans provided to NM Civil Engineering, Inc. by Jonathan Zane Architecture, January 2019.

B. Methodology

1.1 General Methodology

The requirements and recommendations found in the Riverside County Flood Control and Water Conservation Rational Hydrology was used as the basis for the methodology and calculations found in this Study. On-site calculations were performed using the rational method per requirements for the San Jacinto River watershed.

The site incorporates water quality bmp volumes into the gravel open areas and a bioretention areas, thereby satisfying the Regional Water Quality Control Board. The Riverside County Flood Control and Water Conservation District approved software applications provided by Advance Engineering Software were used for all study calculations.

Rainfall Data: Standard intensity-duration curve data generated from Plate D-4.1 of the Riverside County Flood Control and Water Conservation Rational Hydrology Manual for Elsinore area was used.

Soil Type Data: The soil type was obtained from the Hydrologic Soils Group Map Plate C-1.41 within the Riverside County Flood Control and Water Conservation Rational Hydrology Manual. A copy of this map is included within this report. The predominant soil type obtained from the Hydrologic Soils Group Map was determined to be type B.

Type of Development: Both existing and ultimate conditions were analyzed. For the existing condition, undeveloped land use was assumed to model current storm discharges.

The project site is planned for commercial facilities. Therefore, the hydrology report incorporates factors that generate discharges representing commercial type development throughout the site for the ultimate developed condition.

Runoff Index: Runoff Index factors for undeveloped and developed conditions were obtained from Plate E-6.1 of the Riverside County and Water Conservation Hydrology Manual.

Impervious Cover: Impervious Cover factors for developed conditions were obtained from Plate E-6.3 of the Riverside County and Water Conservation Hydrology Manual.

1.2 Sources of Topography

For the existing condition on-site area, topographic contours provided by Jim Williams, License Surveyor were used. For the developed conditions on-site areas, site layout provided by Jonathan Zane Architecture and grades provided by NM Civil Engineering, Inc. were used.

B. Methodology

1.3 Watershed Precipitation

Precipitation values used in this report for Elsinore-Wildomar areas are tabulated below.

Table 1- Precipitation Values (Rational Method Calculations)

STORM	PRECIPITATION
10- YEAR, 1-HOUR	0.98
100- YEAR, 1-HOUR	1.50

1.4 Rational Hydrology Method Calculations

The Riverside County Flood Control and Water Conservation Rational Method (RATRV) software applications provided by Advance Engineering Software was used for the rational method calculations include in this report.

E. Summary & Conclusions

1.1 Summary

The following table provides a clear comparison of the existing and developed condition rational method storm flows for the 10-year and 100-year storm events. Based on the storm quantities calculated and shown below, there is an increase in storm flow due to the development. In accordance with Riverside County policy for drainage tributary to Lake Elsinore, the increased developed condition runoff quantity will not be retained or detained in order to provide the most quantity of runoff to the lake ('Highest and Best Use' policy).

	10-YEAR EVENT CFS	100-YEAR EVENT CFS
EXISTING	2.17	3.83
DEVELOPED	5.86	8.93
DIFFERENCE	3.69 CFS INCREASE	5.10 CFS INCREASE

1.2 Bioretention Water Quality BMP

The Riverside County Stormwater Quality Best Management Practice Design Handbook was utilized in generating capacity requirements for the project. The design procedure for BMP design volume was applied to calculate the site requirement. The design calculations are in the Project Specific Water Quality Management Plan (WQMP) for this project. As shown in the WQMP, the total BMP volume required is 3,560 cubic feet. The design capacity of the bioretention BMPs is 3,750 cubic feet, to satisfy the water quality requirement.

1.3 Conclusion

With the above mitigation measure the development of the Lake Elsinore Rentals will not have a negative impact on downstream properties of facilities. Refer to project specific WQMP for additional requirements.

(END)

EXHIBIT “A”

Project Watershed
Aerial Orthophoto



EXHIBIT "A" Project Watershed Aerial Orthophoto

EXHIBIT "B"

Standard Intensity-Duration Curves
Data, Plate D-4.1

RAINFALL INTENSITY—INCHES PER HOUR

CATHEDRAL CITY			CHERRY VALLEY			CORONA			DESERT HOT SPRINGS			ELSINORE - WILDOMAR		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	4.14	6.76	5	3.65	5.49	5	3.10	4.78	5	4.39	6.76	5	3.23	4.94
6	3.73	6.08	6	3.30	4.97	6	2.84	4.38	6	3.95	6.08	6	2.96	4.53
7	3.41	5.56	7	3.03	4.56	7	2.64	4.07	7	3.62	5.56	7	2.75	4.21
8	3.15	5.15	8	2.82	4.24	8	2.47	3.81	8	3.35	5.15	8	2.58	3.95
9	2.95	4.81	9	2.64	3.97	9	2.34	3.60	9	3.13	4.81	9	2.44	3.73
10	2.77	4.52	10	2.49	3.75	10	2.22	3.43	10	2.94	4.52	10	2.32	3.54
11	2.62	4.28	11	2.36	3.56	11	2.12	3.27	11	2.78	4.28	11	2.21	3.39
12	2.49	4.07	12	2.25	3.39	12	2.04	3.14	12	2.65	4.07	12	2.12	3.25
13	2.38	3.88	13	2.16	3.25	13	1.96	3.02	13	2.53	3.88	13	2.04	3.13
14	2.28	3.72	14	2.07	3.12	14	1.89	2.92	14	2.42	3.72	14	1.97	3.02
15	2.19	3.58	15	1.99	3.00	15	1.83	2.82	15	2.32	3.58	15	1.91	2.92
16	2.11	3.44	16	1.92	2.90	16	1.77	2.73	16	2.24	3.44	16	1.85	2.83
17	2.04	3.32	17	1.86	2.80	17	1.72	2.66	17	2.16	3.32	17	1.80	2.75
18	1.97	3.22	18	1.80	2.71	18	1.68	2.58	18	2.09	3.22	18	1.75	2.67
19	1.91	3.12	19	1.75	2.64	19	1.63	2.52	19	2.03	3.12	19	1.70	2.60
20	1.85	3.03	20	1.70	2.56	20	1.59	2.46	20	1.97	3.03	20	1.66	2.54
22	1.75	2.86	22	1.61	2.43	22	1.52	2.35	22	1.86	2.86	22	1.59	2.43
24	1.67	2.72	24	1.54	2.32	24	1.46	2.25	24	1.77	2.72	24	1.52	2.33
26	1.59	2.60	26	1.47	2.22	26	1.40	2.17	26	1.69	2.60	26	1.46	2.24
28	1.52	2.49	28	1.41	2.13	28	1.36	2.09	28	1.62	2.49	28	1.41	2.16
30	1.46	2.39	30	1.36	2.05	30	1.31	2.02	30	1.55	2.39	30	1.37	2.09
32	1.41	2.30	32	1.31	1.98	32	1.27	1.96	32	1.50	2.30	32	1.33	2.03
34	1.36	2.22	34	1.27	1.91	34	1.23	1.90	34	1.45	2.22	34	1.29	1.97
36	1.32	2.15	36	1.23	1.85	36	1.20	1.85	36	1.40	2.15	36	1.25	1.92
38	1.28	2.09	38	1.20	1.80	38	1.17	1.81	38	1.36	2.09	38	1.22	1.87
40	1.24	2.02	40	1.16	1.75	40	1.14	1.76	40	1.32	2.02	40	1.19	1.82
45	1.16	1.89	45	1.09	1.64	45	1.08	1.66	45	1.23	1.89	45	1.13	1.72
50	1.09	1.78	50	1.03	1.55	50	1.03	1.58	50	1.16	1.78	50	1.07	1.64
55	1.03	1.68	55	.98	1.47	55	.98	1.51	55	1.09	1.68	55	1.02	1.56
60	.98	1.60	60	.93	1.40	60	.94	1.45	60	1.04	1.60	60	.98	1.50
65	.94	1.53	65	.89	1.34	65	.90	1.40	65	.99	1.53	65	.94	1.44
70	.90	1.46	70	.85	1.29	70	.87	1.35	70	.95	1.46	70	.91	1.39
75	.86	1.41	75	.82	1.24	75	.84	1.30	75	.91	1.41	75	.88	1.35
80	.83	1.35	80	.79	1.20	80	.82	1.26	80	.88	1.35	80	.85	1.31
85	.80	1.31	85	.77	1.16	85	.80	1.23	85	.85	1.31	85	.83	1.27
SLOPE = .580			SLOPE = .550			SLOPE = .480			SLOPE = .580			SLOPE = .480		

STANDARD INTENSITY-DURATION CURVES DATA

EXHIBIT "C"

Runoff Index Numbers for Pervious Areas

Plate E-6.1

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

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RUNOFF INDEX NUMBERS FOR PERVIOUS AREAS

PLATE E-6.1 (1 of 2)

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

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RUNOFF INDEX NUMBERS FOR PERVIOUS AREAS

PLATE E-6.1 (2of 2)

EXHIBIT "D"

Impervious Cover for Developed Areas

Plate E-6.3

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

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

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

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

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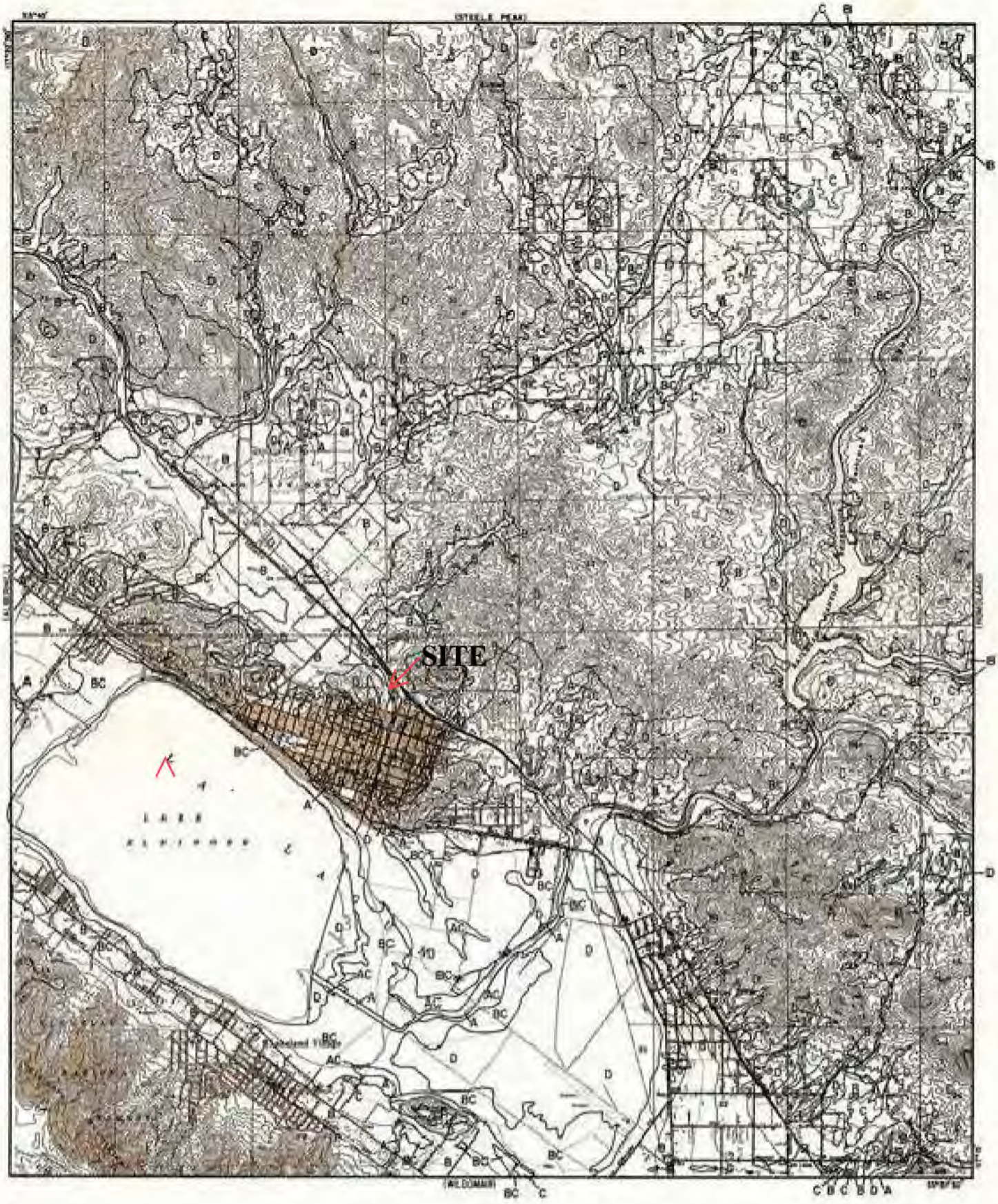
IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE E-6.3

EXHIBIT "E"

Hydrologic Soils Group Map for Elsinore

Plate C-1.41



LEGEND

SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 2000

HYDROLOGIC SOILS GROUP MAP FOR ELSINORE

PLATE C-1.41

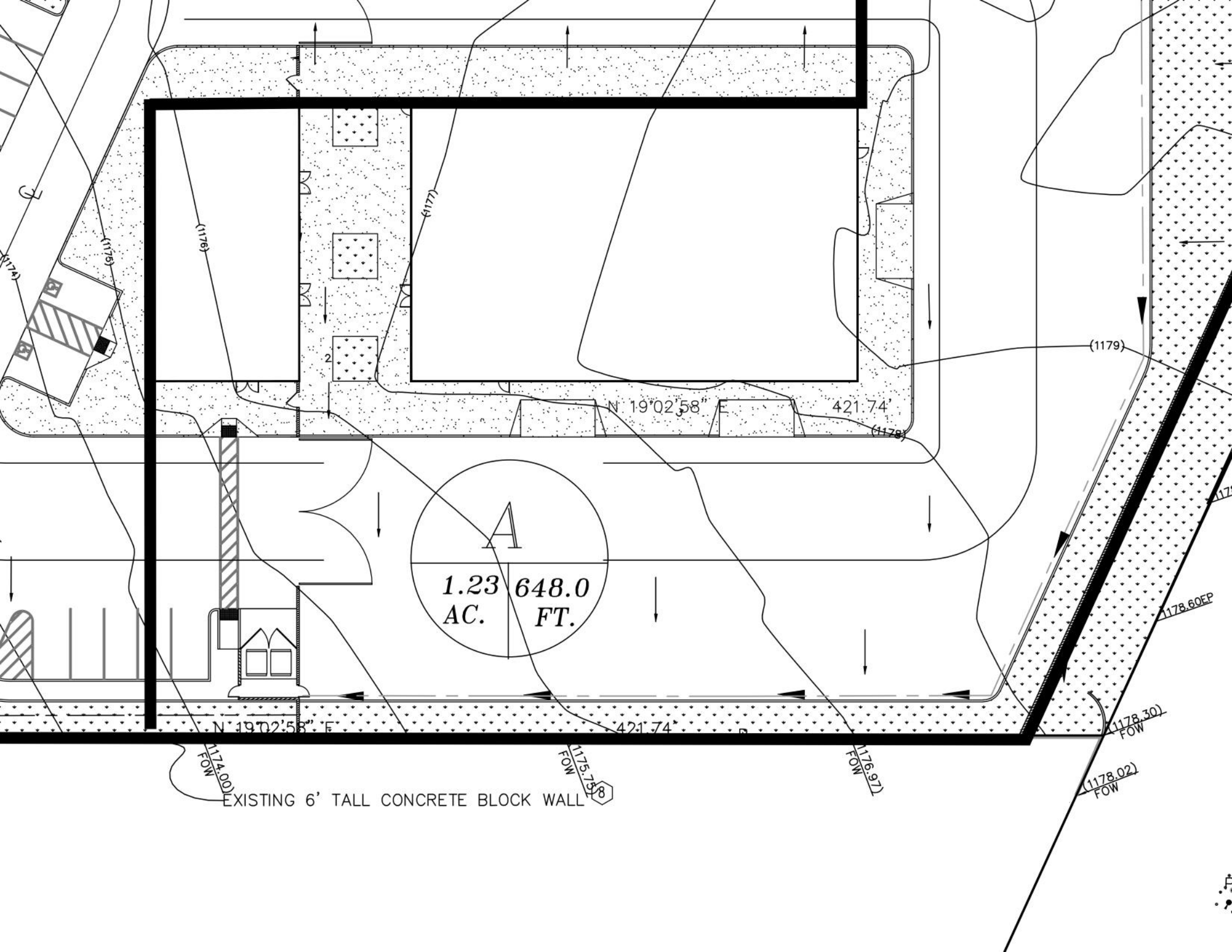
EXHIBIT “F”

Existing Hydrologic Conditions Study Map


N 19°02'58" E
421.74'
1177
1178
1179
A
2.80
AC.
880.0
FT.
N 19°02'58" E
421.74'

EXHIBIT “G”

Developed Hydrologic Conditions Study Map (On-Site)


(1174)
(1175)
(1176)
(1177)
(1179)
(1178)
N 19°02'58" E
421.74'
A
1.23 AC.
648.0 FT.
N 19°02'58" E
421.74'
1178.60EP
(1178.30) FOW
(1178.02) FOW
1174.00 FOW
1175.78 FOW
1176.97 FOW
8
EXISTING 6' TALL CONCRETE BLOCK WALL

ATTACHMENT 1

Existing Conditions
100-Year, 1-Hour
Rational Method Calculations

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
         RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                      (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                      (Rational Tabling Version 23.0)
                  Release Date: 07/01/2016  License ID 1360

                              Analysis prepared by:

                             NM CIVIL ENGINEERING INC
                              22880 VAN BUREN STREET
                             GRAND TERRACE, CA 92313
                                  (951) 712-0623

  ************************* DESCRIPTION OF STUDY ***********************
 * HYDROLOGY STUDY FOR COLLIER PROPERTIES
*
 * 100 YR STORM, UNDEVELOPED CONDITION
*
 * NOVEMEMBER 2,2022 BY NMM
**************************************************************************

   FILE NAME: HAMUD.DAT
   TIME/DATE OF STUDY: 15:14 11/01/2022
 --------------------------------------------------------------------------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 --------------------------------------------------------------------------
   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
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.320
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.540
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.500
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4809628
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4792280
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.500
   SLOPE OF INTENSITY DURATION CURVE = 0.4792
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW
MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE
FACTOR
 NO.   (FT)   (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
```

```
 ===  =====  =========  =================  ======  ===== ====== ===== ==
   1   30.0  20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

   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 =  0.1 (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<<<<<
============================================================================
           ASSUMED INITIAL SUBAREA UNIFORM
           DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   880.00
   UPSTREAM ELEVATION(FEET) =   1180.50
   DOWNSTREAM ELEVATION(FEET) =   1170.50
   ELEVATION DIFFERENCE(FEET) =     10.00
   TC = 0.709*[(  880.00**3)/(    10.00)]**.2 =   26.157
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.233
   UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6126
   SOIL CLASSIFICATION IS "B"
   SUBAREA RUNOFF(CFS) =      3.83
   TOTAL AREA(ACRES) =      2.80   TOTAL RUNOFF(CFS) =      3.83

============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =        2.8  TC(MIN.) =     26.16
   PEAK FLOW RATE(CFS)   =       3.83
============================================================================

============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT 2

Developed Conditions
100-Year, 1-Hour
Rational Method Calculations

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
         RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                      (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
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                                 (951) 712-0623

  ********************** DESCRIPTION OF STUDY *************************
 * HYDROLOGY STUDY FOR LAKE ELSINORE RENTALS
*
 * 100 YR STORM, DEVELOPED CONDITION
*
 * JANUARY 18,2023 BY NMM
*

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

   FILE NAME: HAMUD.DAT
   TIME/DATE OF STUDY: 18:02 01/18/2023
 --------------------------------------------------------------------------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 --------------------------------------------------------------------------
   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
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.320
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.540
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.500
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4809628
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4792280
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.500
   SLOPE OF INTENSITY DURATION CURVE = 0.4792
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW
MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
```

```
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE
FACTOR
 NO.   (FT)   (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
 ===  =====  =========  ================  ======  ===== ====== =====
   1   30.0  20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

   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 =  0.1 (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<<<<<

============================================================================
           ASSUMED INITIAL SUBAREA UNIFORM
           DEVELOPMENT IS COMMERCIAL
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   648.00
   UPSTREAM ELEVATION(FEET) =   1178.58
   DOWNSTREAM ELEVATION(FEET) =   1170.00
   ELEVATION DIFFERENCE(FEET) =      8.58
   TC = 0.303*[(  648.00**3)/(     8.58)]**.2 =    9.590
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.612
   COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8798
   SOIL CLASSIFICATION IS "B"
   SUBAREA RUNOFF(CFS) =      3.91
   TOTAL AREA(ACRES) =      1.23   TOTAL RUNOFF(CFS) =      3.91


****************************************************************************
   FLOW PROCESS FROM NODE    101.00 TO NODE    101.00 IS CODE =  81
 ----------------------------------------------------------------------------
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.612
   COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8798
   SOIL CLASSIFICATION IS "B"
   SUBAREA AREA(ACRES) =    1.58   SUBAREA RUNOFF(CFS) =    5.02
   TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       8.93
   TC(MIN.) =    9.59

============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =        2.8  TC(MIN.) =      9.59
   PEAK FLOW RATE(CFS)   =       8.93

============================================================================
```

ATTACHMENT 3

Existing Conditions
10-Year, 1-Hour
Rational Method Calculations

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
         RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                      (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                      (Rational Tabling Version 23.0)
                  Release Date: 07/01/2016  License ID 1360

                              Analysis prepared by:

                            NM CIVIL ENGINEERING INC
                             22880 VAN BUREN STREET
                            GRAND TERRACE, CA 92313
                                 (951) 712-0623

  ************************* DESCRIPTION OF STUDY **********************
 * HYDROLOGY STUDY FOR COLLIER PROPERTIES

* 10 YR STORM, UNDEVELOPED CONDITION
*
 * NOVEMBER 2,2022 BY NMM
**************************************************************************
   FILE NAME: HAMUD.DAT
   TIME/DATE OF STUDY: 09:18 11/01/2022
 --------------------------------------------------------------------------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 --------------------------------------------------------------------------
   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
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.320
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.540
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.500
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4809628
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4792280
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.990
   SLOPE OF INTENSITY DURATION CURVE = 0.4810
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW
MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE
FACTOR
 NO.   (FT)   (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  ================  ======  ===== ====== ===== ==
```

```
   1   30.0  20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

   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 =  0.1 (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<<<<<
============================================================================
           ASSUMED INITIAL SUBAREA UNIFORM
           DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   880.00
   UPSTREAM ELEVATION(FEET) =   1180.50
   DOWNSTREAM ELEVATION(FEET) =   1170.50
   ELEVATION DIFFERENCE(FEET) =     10.00
   TC = 0.709*[(  880.00**3)/(    10.00)]**.2 =   26.157
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.476
   UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5263
   SOIL CLASSIFICATION IS "B"
   SUBAREA RUNOFF(CFS) =      2.17
   TOTAL AREA(ACRES) =      2.80   TOTAL RUNOFF(CFS) =      2.17

============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =        2.8  TC(MIN.) =     26.16
   PEAK FLOW RATE(CFS)   =       2.17

============================================================================

============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT 4

Developed Conditions
10-Year, 1-Hour
Rational Method Calculations

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
         RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                      (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                      (Rational Tabling Version 23.0)
                  Release Date: 07/01/2016  License ID 1360

                              Analysis prepared by:

                             NM CIVIL ENGINEERING INC
                              22880 VAN BUREN STREET
                             GRAND TERRACE, CA 92313
                                  (951) 712-0623

  ********************** DESCRIPTION OF STUDY **************************
 * HYDROLOGY STUDY FOR LAKE ELSINORE RENTALS
*
 * 10 YR STORM, DEVELOPED CONDITION
*
 * JANUARY 18,2023 BY NMM

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

   FILE NAME: HAMUD.DAT
   TIME/DATE OF STUDY: 17:38 01/18/2023
 --------------------------------------------------------------------------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 --------------------------------------------------------------------------
   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
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.320
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.540
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.500
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4809628
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4792280
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.990
   SLOPE OF INTENSITY DURATION CURVE = 0.4810
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW
MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:
MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE
FACTOR
```

```
 NO.   (FT)  (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  ================  ======  ===== ====== ===== ===
   1   30.0  20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

   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 =  0.1 (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<<<<<

============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   648.00
   UPSTREAM ELEVATION(FEET) =   1178.58
   DOWNSTREAM ELEVATION(FEET) =   1170.00
   ELEVATION DIFFERENCE(FEET) =      8.58
   TC = 0.303*[(  648.00**3)/(     8.58)]**.2 =    9.590
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.391
   COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8726
   SOIL CLASSIFICATION IS "B"
   SUBAREA RUNOFF(CFS) =      2.57
   TOTAL AREA(ACRES) =      1.23   TOTAL RUNOFF(CFS) =      2.57


****************************************************************************
   FLOW PROCESS FROM NODE    101.00 TO NODE    101.00 IS CODE =  81
 ----------------------------------------------------------------------------
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

============================================================================
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.391
   COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8726
   SOIL CLASSIFICATION IS "B"
   SUBAREA AREA(ACRES) =    1.58   SUBAREA RUNOFF(CFS) =    3.30
   TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       5.86
   TC(MIN.) =    9.59

============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =        2.8  TC(MIN.) =      9.59
   PEAK FLOW RATE(CFS)   =       5.86

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