

Appendix M.2

Preliminary Drainage Study

HYDROLOGY STUDY
FOR
McCROMETER PARKING LOT
PARCEL 4, PARCEL MAP NO. 37421

Prepared By:

Blaine A. Womer Civil Engineering
41555 East Florida Avenue, Suite G
Hemet, CA 92544



April 2, 2018

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McCrometer Parking Lot

Hydrology Study

Narrative:

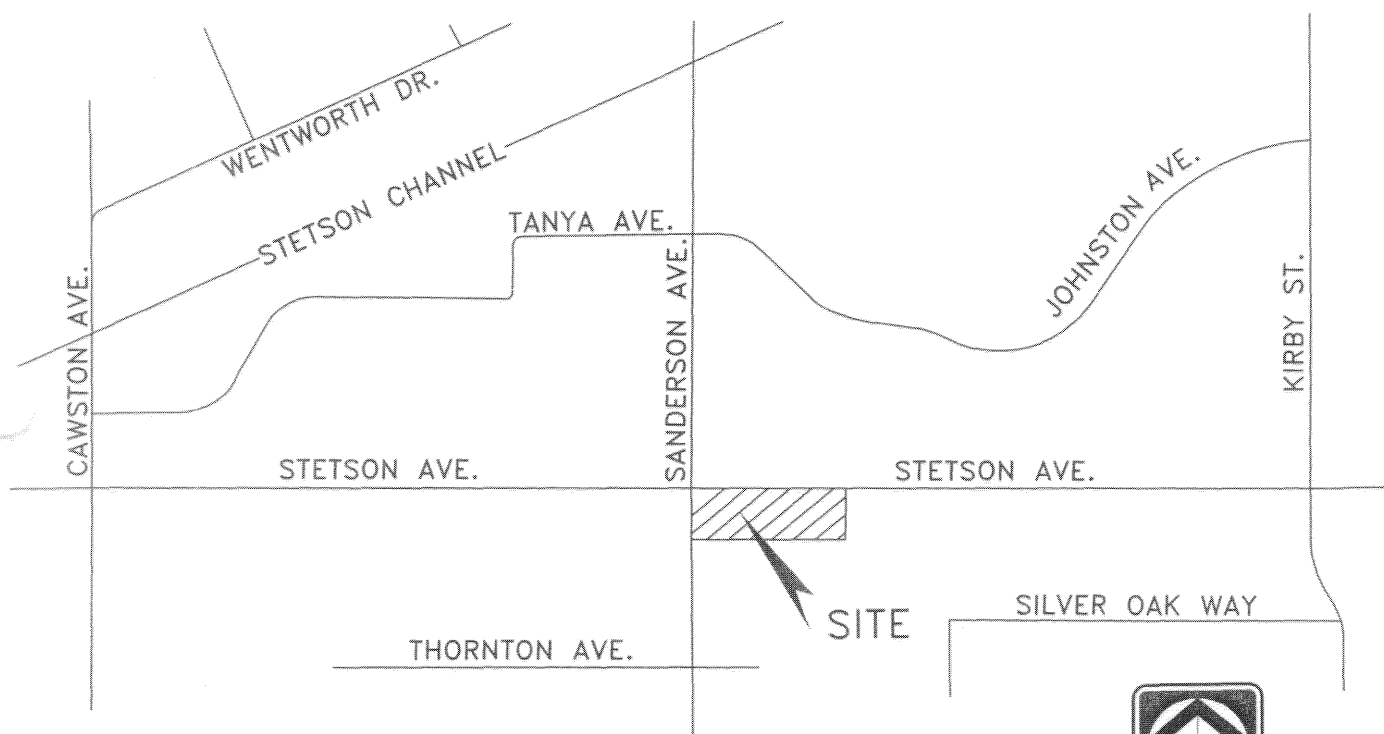
The McCrometer Parking Lot project is a 2.3 acre employee parking lot located at 3145 West Stetson Avenue in Hemet. The site is currently vacant and proposed improvements include asphalt parking stalls and drive aisles, planters and perimeter landscaping. The property has a natural gradient to the northwest of approximately 0.5 percent. The site is surrounded by development and block walls and is not subject to offsite flows.

The purpose of this study is to quantify the onsite generated storm water runoff for the 10-year and 100-year recurrence intervals. The study includes rational hydrology calculations for both the undeveloped and developed condition. Calculations were based on the rational method as stipulated in the Riverside County Flood Control and Water Conservation District Hydrology Manual dated 1978. Calculations were performed using CIVILCADD/CIVILDESIGN Engineering software. Onsite soils are categorized as Type 'B' per the hydrology manual.

The site was designed to honor the existing drainage pattern of the property. A comparison of undeveloped versus developed runoff flows is summarized as follows:

Runoff Summary			
Drainage Area Designation	Area (Ac)	Q₁₀(cfs)	Q₁₀₀(cfs)
Undeveloped	2.31	2.4	4.0
A	0.98	1.7	2.6
B	0.91	1.6	2.5

APPENDIX 'A'



VICINITY MAP



RAINFALL INTENSITY—INCHES PER HOUR

HEMET			HIGHGROVE			HOMELAND—WINCHESTER			IDYLLWILD			LAKEVIEW		
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	2.84	4.40	5	3.02	4.37	5	2.91	4.37	5	4.91	7.28	5	2.77	4.16
6	2.58	4.00	6	2.75	3.97	6	2.65	3.97	6	4.47	6.62	6	2.53	3.79
7	2.37	3.68	7	2.54	3.67	7	2.44	3.67	7	4.13	6.11	7	2.34	3.51
8	2.21	3.43	8	2.37	3.42	8	2.28	3.42	8	3.85	5.70	8	2.19	3.29
9	2.08	3.23	9	2.23	3.22	9	2.15	3.22	9	3.62	5.36	9	2.07	3.10
10	1.96	3.05	10	2.11	3.05	10	2.03	3.05	10	3.43	5.08	10	1.96	2.94
11	1.87	2.90	11	2.01	2.90	11	1.93	2.90	11	3.26	4.83	11	1.87	2.80
12	1.78	2.77	12	1.92	2.77	12	1.85	2.77	12	3.12	4.62	12	1.79	2.68
13	1.71	2.65	13	1.84	2.66	13	1.77	2.66	13	2.99	4.43	13	1.72	2.58
14	1.64	2.55	14	1.77	2.56	14	1.71	2.56	14	2.88	4.26	14	1.66	2.48
15	1.58	2.46	15	1.71	2.47	15	1.64	2.47	15	2.78	4.11	15	1.60	2.40
16	1.53	2.38	16	1.65	2.39	16	1.59	2.39	16	2.68	3.98	16	1.55	2.32
17	1.48	2.30	17	1.60	2.31	17	1.54	2.31	17	2.60	3.85	17	1.50	2.25
18	1.44	2.23	18	1.55	2.24	18	1.50	2.24	18	2.52	3.74	18	1.46	2.19
19	1.40	2.17	19	1.51	2.18	19	1.45	2.18	19	2.45	3.64	19	1.42	2.13
20	1.36	2.11	20	1.47	2.12	20	1.42	2.12	20	2.39	3.54	20	1.39	2.08
22	1.29	2.01	22	1.40	2.02	22	1.35	2.02	22	2.27	3.37	22	1.32	1.98
24	1.24	1.92	24	1.34	1.93	24	1.29	1.93	24	2.17	3.22	24	1.26	1.90
26	1.18	1.84	26	1.28	1.85	26	1.24	1.85	26	2.09	3.09	26	1.22	1.82
28	1.14	1.77	28	1.23	1.78	28	1.19	1.78	28	2.01	2.97	28	1.17	1.76
30	1.10	1.70	30	1.19	1.72	30	1.15	1.72	30	1.94	2.87	30	1.13	1.70
32	1.06	1.65	32	1.15	1.66	32	1.11	1.66	32	1.87	2.77	32	1.10	1.64
34	1.03	1.59	34	1.12	1.61	34	1.07	1.61	34	1.81	2.69	34	1.06	1.59
36	1.00	1.55	36	1.08	1.57	36	1.04	1.57	36	1.76	2.61	36	1.03	1.55
38	.97	1.50	38	1.05	1.52	38	1.01	1.52	38	1.71	2.54	38	1.01	1.51
40	.94	1.46	40	1.02	1.48	40	.99	1.48	40	1.67	2.47	40	.98	1.47
45	.89	1.37	45	.96	1.39	45	.93	1.39	45	1.57	2.32	45	.92	1.39
50	.84	1.30	50	.91	1.32	50	.88	1.32	50	1.48	2.20	50	.88	1.31
55	.80	1.24	55	.87	1.26	55	.84	1.26	55	1.41	2.09	55	.84	1.25
60	.76	1.18	60	.83	1.20	60	.80	1.20	60	1.35	2.00	60	.80	1.20
65	.73	1.13	65	.80	1.15	65	.77	1.15	65	1.29	1.92	65	.77	1.15
70	.70	1.09	70	.77	1.11	70	.74	1.11	70	1.25	1.85	70	.74	1.11
75	.68	1.05	75	.74	1.07	75	.71	1.07	75	1.20	1.78	75	.72	1.07
80	.65	1.01	80	.71	1.03	80	.69	1.03	80	1.16	1.72	80	.69	1.04
85	.63	.98	85	.69	1.00	85	.67	1.00	85	1.13	1.67	85	.67	1.01
SLOPE = .530			SLOPE = .520			SLOPE = .520			SLOPE = .520			SLOPE = .500		

RCFC & WCD
HYDROLOGY MANUAL

STANDARD
INTENSITY—DURATION
CURVES DATA

APPENDIX 'B'

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 04/02/18 File: MCCROMETERUNDEV10YR.out

MCCROMETER PARKING LOT
UNDEVELOPED CONDITION
10 YEAR STORM

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4061

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Hemet] area used.

10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 10.0

Calculated rainfall intensity data:

1 hour intensity = 0.760(In/Hr)
Slope of intensity duration curve = 0.5300

Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 480.000(Ft.)
Top (of initial area) elevation = 30.000(Ft.)
Bottom (of initial area) elevation = 27.500(Ft.)
Difference in elevation = 2.500(Ft.)
Slope = 0.00521 s(percent)= 0.52
 $TC = k(0.530)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 17.924 min.
Rainfall intensity = 1.442(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.714
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 2.377(CFS)
Total initial stream area = 2.310(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 2.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 78.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2005 Version 7.1

Rational Hydrology Study

Date: 04/02/18 File: MCCROMETERUNDEV100YR.out

MCCROMETER PARKING LOT
UNDEVELOPED CONDIDITION
100 YEAR STORM

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4061

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Hemet] area used.

10 year storm 10 minute intensity = 1.960(In/Hr)

10 year storm 60 minute intensity = 0.760(In/Hr)

100 year storm 10 minute intensity = 3.050(In/Hr)

100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.180(In/Hr)

Slope of intensity duration curve = 0.5300

Process from Point/Station 1.000 to Point/Station 2.000

**** INITIAL AREA EVALUATION ****

Initial area flow distance = 480.000(Ft.)

Top (of initial area) elevation = 30.000(Ft.)

Bottom (of initial area) elevation = 27.500(Ft.)

Difference in elevation = 2.500(Ft.)

Slope = 0.00521 s(percent)= 0.52

$TC = k(0.530)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 17.924 min.

Rainfall intensity = 2.239(In/Hr) for a 100.0 year storm

UNDEVELOPED (poor cover) subarea

Runoff Coefficient = 0.771

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 1.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 78.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.985(CFS)
Total initial stream area = 2.310 (Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 2.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 1.000
Area averaged RI index number = 78.0

APPENDIX 'C'

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 04/02/18 File: MCCROMETERAREA10YR.out

MCCROMETER PARKING LOT
AREA A
10 YEAR STORM

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4061

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Hemet] area used.

10 year storm 10 minute intensity = 1.960 (In/Hr)
10 year storm 60 minute intensity = 0.760 (In/Hr)
100 year storm 10 minute intensity = 3.050 (In/Hr)
100 year storm 60 minute intensity = 1.180 (In/Hr)

Storm event year = 10.0

Calculated rainfall intensity data:

1 hour intensity = 0.760 (In/Hr)

Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 523.000 (Ft.)
Top (of initial area) elevation = 31.700 (Ft.)
Bottom (of initial area) elevation = 28.200 (Ft.)
Difference in elevation = 3.500 (Ft.)
Slope = 0.00669 s(percent) = 0.67
 $TC = k(0.300) * [(length^3) / (elevation\ change)]^{0.2}$
Initial area time of concentration = 9.986 min.
Rainfall intensity = 1.966 (In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.674(CFS)
Total initial stream area = 0.980(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.98 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 56.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 04/02/18 File:MCCROMETERAREAB10YR.out

MCCROMETER PARKING LOT
AREA B
10 YEAR

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4061

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Hemet] area used.

10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 10.0

Calculated rainfall intensity data:

1 hour intensity = 0.760(In/Hr)
Slope of intensity duration curve = 0.5300

Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 467.000(Ft.)
Top (of initial area) elevation = 31.700(Ft.)
Bottom (of initial area) elevation = 28.360(Ft.)
Difference in elevation = 3.340(Ft.)
Slope = 0.00715 s(percent)= 0.72
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 9.418 min.
Rainfall intensity = 2.028(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = $\frac{1.604 \text{ (CFS)}}{0.910 \text{ (Ac.)}}$
Total initial stream area = 0.910 (Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.91 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 56.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 04/02/18 File: MCCROMETERAREA100YR.out

MCCROMETER PARKING LOT
AREA A
100 YEAR STORM

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4061

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Hemet] area used.

10 year storm 10 minute intensity = 1.960 (In/Hr)
10 year storm 60 minute intensity = 0.760 (In/Hr)
100 year storm 10 minute intensity = 3.050 (In/Hr)
100 year storm 60 minute intensity = 1.180 (In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.180 (In/Hr)

Slope of intensity duration curve = 0.5300

Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 523.000 (Ft.)
Top (of initial area) elevation = 31.700 (Ft.)
Bottom (of initial area) elevation = 28.200 (Ft.)
Difference in elevation = 3.500 (Ft.)
Slope = 0.00669 s(percent) = 0.67
 $TC = k(0.300) * [(length^3) / (elevation\ change)]^{0.2}$
Initial area time of concentration = 9.986 min.
Rainfall intensity = 3.052 (In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.623(CFS)
Total initial stream area = 0.980 (Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 0.98 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 56.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 04/02/18 File:MCCROMETERAREAB100YR.out

MCCROMETER PARKING LOT
AREA B
100 YEAR STORM

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4061

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Hemet] area used.

10 year storm 10 minute intensity = 1.960(In/Hr)
10 year storm 60 minute intensity = 0.760(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.180(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.180(In/Hr)
Slope of intensity duration curve = 0.5300

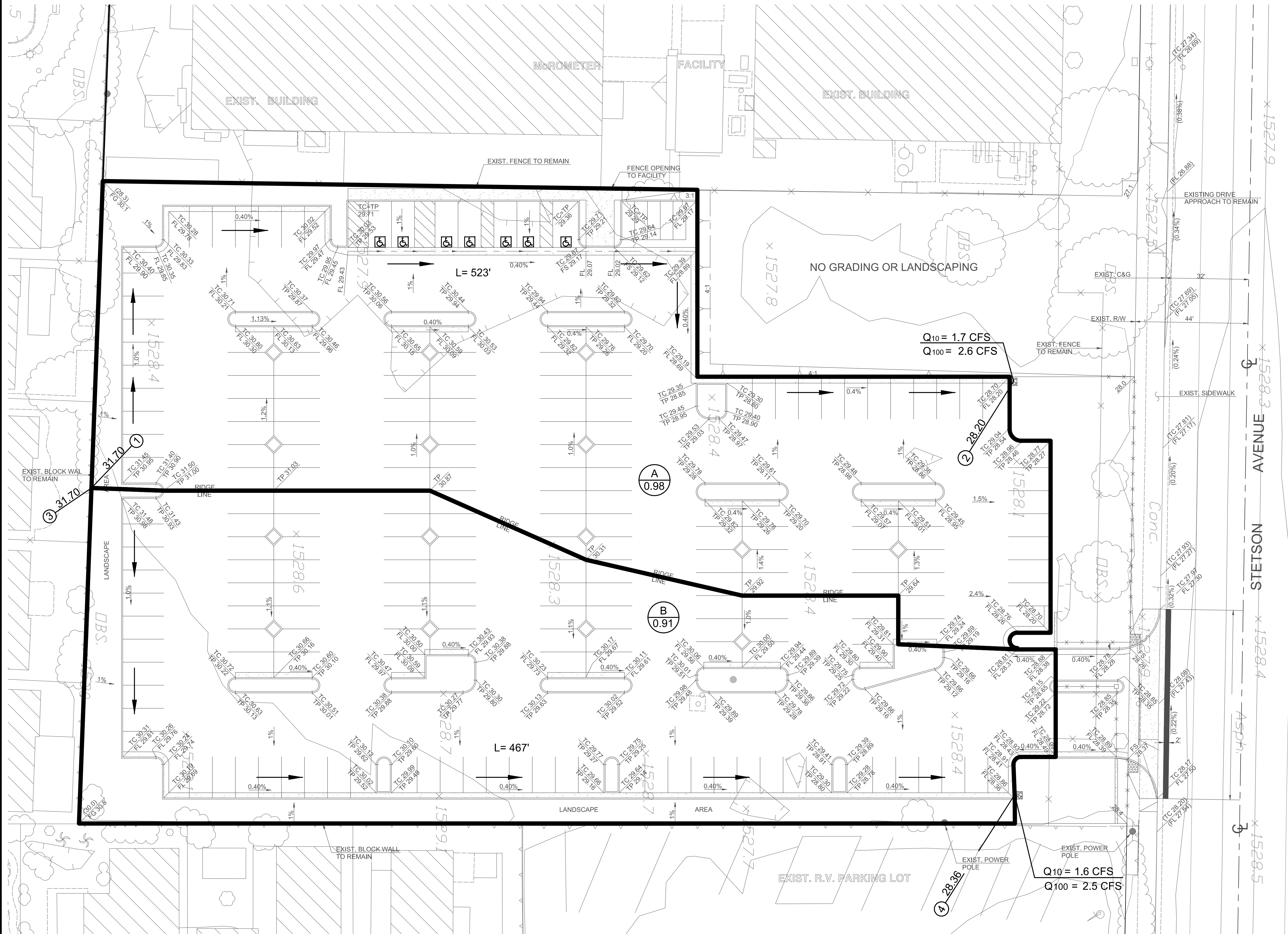
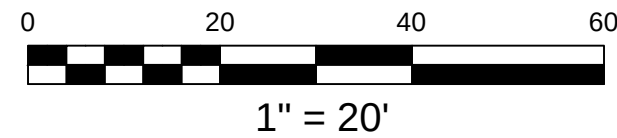
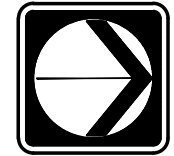
+++++
Process from Point/Station 3.000 to Point/Station 4.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 467.000(Ft.)
Top (of initial area) elevation = 31.700(Ft.)
Bottom (of initial area) elevation = 28.360(Ft.)
Difference in elevation = 3.340(Ft.)
Slope = 0.00715 s(percent)= 0.72
 $TC = k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 9.418 min.
Rainfall intensity = 3.148(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = $\frac{2.514 \text{ (CFS)}}{0.910 \text{ (Ac.)}}$
Total initial stream area =
Pervious area fraction = 0.100
End of computations, total study area = 0.91 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 56.0

APPENDIX 'D'



LEGEND

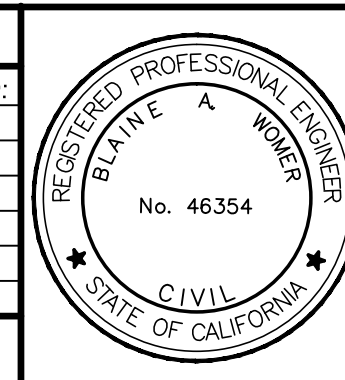
- Ⓐ SUB AREA DESIGNATION
0.98 AREA (AC)
① NODE NUMBER
→ FLOW PATH

Underground Service Alert

Call: TOLL FREE
811

TWO WORKING DAYS BEFORE YOU DIG

REVISIONS:			APPROVED:
NO.	DATE:	BY:	
DESIGNED BY:	DRAWN BY:	CHECKED BY:	



BLAINE A. WOMER
CIVIL ENGINEERING

- PLANNING
- SURVEYING
- CIVIL ENGINEERING
- PUBLIC WORKS

W.D.

PREPARED UNDER THE SUPERVISION OF:	
RCE NO. 46354	DATE:
SCALE: 1" = 20'	BENCHMARK:
DATE: SEPTEMBER, 2017	SEE SHEET 1

RECOMMENDED BY:	
CITY ENGINEER	DATE:



City of Hemet
ENGINEERING DEPARTMENT
510 E. Florida Ave.
HEMET, CA 92543
(951) 765-2360

City of Hemet
PARCEL 4, PARCEL MAP No. 37421
McCROMETER PARKING LOT
HYDROLOGY EXHIBIT
DEVELOPED CONDITION