Preliminary

Drainage Report

For

Palomar Crossing Specific Plan Amendment

Menifee, CA

April 2018

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Project # 30160

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any employees that have provided data and calculations upon which the recommendations, conclusions, and decisions are based.

Christopher F. Lenz, PE 63001

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1 INTRODUCTION

1.1. SITE DESCRIPTION

1.1.1. LOCATION

The *Palomar Crossing* project is located at the northeast corner of Palomar Road and Ethanac (HWY 74) in the City of Menifee. It is planning areas 11-14 of the Menifee North Specific Plan. Refer to the Figure 1 Vicinity Map.

1.1.2. EXISTING FEATURES

The project site consists of 77 gross acres of vacant land. The project is a proposed mixed use development of Very high density residential and commercial uses. The area drains from northeast to southwest at less than 2%. There is a concentration of flow, but not a defined wash, along the northern edge of the site that flows southerly to an existing wash along the southern edge of the property. This same wash intersects the eastern edge of the site and is relatively well formed and visible by aerial mapping. From there, runoff is carried by existing berms and channels southwesterly to Line A.

1.1.3. PROPOSED CONDITION

It is proposed that the subject property be developed via specific plan to have varying land uses, primarily retail, high density residential, and commercial uses at the request of the client. The site will contain 77 acres of relatively impervious uses. Access to the site will be provided from Palomar and Ethanac Roads. Refer to Figure 2 for the Land Use Plan.

1.2. PURPOSE OF REPORT

The purpose of this report is to analyze the hydrology of the landscape and develop solutions for the proposed project in support of the Specific Plan and EIR. This report will be used as the basis of drainage reports that will be submitted with the individual site plans. This report identifies the key conditions of the subject site, develops expected peak flow rates for existing conditions impacting the north and east property lines for interception and conveyance. The report also identifies onsite hydrology details and water quality volume, and identifies potential locations for facilities to be designed in conjunction with the Site Plans and TTM's.

1.3. FEMA INFORMATION

The Flood Insurance Rate Map for this subject property is Panel 06065C2060H, and a recently approved LOMR effective 3-15-18. The site has FEMA designations of X and A. zone X is described as "Area determined to be outside the 0.2% annual chance floodplain." The Zone A area is in the southeast corner of the site and includes the intersection of Menifee and

Ethanac. Zone A is a Special Flood Hazard Area without base flood elevations. Avoidance or protection and map revision will be required for any proposed development near this area.

2. EXISTING DRAINAGE PATTERNS

2.1. OFFSITE

There are two primary points of run-on flows or offsite flows that enter the site from the north and east. Both are the tributary flows for the proposed Line A-3 of the Homeland Romoland Area Drainage Plan. Both sources combine onsite and continue southwesterly. There is an existing concentration of flow along Ethanac that drains to the existing crossing and continues southwesterly.

2.2. ONSITE

The majority of the site is flat, with relatively no concentrations of flow. Western portions of the site have been graded and flattened by a history of agricultural activity. The exception is the southeastern corner of the site, which has two flow lines. One that runs southwesterly form the eastern edge and another that runs along the north side of Ethanac draining westerly to the crossing in Ethanac. Although the western portion of the site does not show evidence of flow paths, there is a concentration of flow along the northern edge of the site that sheet flows southerly before joining the existing channel and road crossing.

3. PROPOSED DRAINAGE PATTERNS

3.1. OFFSITE

The project will be required to reserve area for the Line A-3 channel along its northern edge, and there will be a box culvert in Palomar along the western edge. The northern channel will protect the subject site from flows originating from the north (point 106) in the interim and ultimate condition. Channel A-3 will eventually protect the site from the majority of flows originating from the east (point 206) when it is extended easterly. In both the existing and ultimate conditions there will remain a concentration of flow at the southeast corner of the property (point 206) with the ultimate condition being a significantly reduced flow from just the areas south of Line A-3. The flows in the ultimate condition for the line along the northern edge of the site are 525 cfs along the eastern half (to point 106) and then 641 cfs for the western half of the northern channel. Along the western edge of the site, the channel will carry 749 cfs. There will be two outlets from the subject site. The existing outlet under Ethanac will remain in both the interim and ultimate conditions. In the ultimate condition it will function as an outfall location for the overflow and bleed off flows for

onsite treatment and storage basins. There will be other smaller areas that will be addressed with individual planning area mapping and reports.

3.2. ONSITE

The project must be considered in both the interim or existing condition, and the ultimate condition.

In either scenario the projects infiltration rates may be less than the 1.6 inches per hour required to consider infiltration treatment and discharge of storm water. Therefore, there will be an increase in downstream runoff volume. However, the project is within the Homeland Romoland ADP and will discharge developed flows into lines of the ADP. The project will provide bio retention basins with underdrains to treat the volume required to meet water quality standards. The increased runoff will continue to the south eventually joining the Line A system. The discharged water, while increased in volume, shall be cleaned through the system of basins as to not degrade the water quality of Canyon Lake.

With the existing condition outlet at the midpoint of the southern boundary (point 107) the interim condition could be allowed to discharge to that same point, but would require detention basins of sufficient size to mitigate the increased runoff from the developed property. These basins would be temporary until the ADP is implemented. Upstream facilities will protect the site from offsite flows, and downstream facilities provide an outlet for project runoff, or a combination of the two.

In the ultimate condition, the Line A-3 channel along the northern boundary would accept and route offsite flows to the west where it would be carried by box culvert to Line A. The subject site would only be required to mitigate onsite water quality requirements, and developed flows could outlet to Line A-3.

At time of tract and siteplan design, detailed analysis of existing conditions should be prepared, as well as confirmation of what ADP facilities may have been or will be installed by others or the subject property.

4. HYDROLOGIC CONDITIONS

The Rationale Method has been employed to determine peak runoff amounts. The Riverside County Flood Control and Water Conservation District (RCFCD & WCD) Hydrology Manual (reference 1) was used to develop the hydrological parameters for the Rationale 100 year peak runoff events. Refer to Appendix A for detail.

4.1. Offsite

There are two main contributing areas that impact the subject site totaling roughly 1050 acres that originate in the hills to the northeast. The flow

paths are relatively undefined and historically have moved, due to development and agricultural activity. The flow that hits the northern border (points 101 to 106) has a peak flow of 688 cfs and a time of concentration of 30 minutes when it crosses the northern property line. The flow that hits the eastern border (points 201 to 206) has a peak flow of 1037 cfs and a time of concentration of 27 minutes when it crosses the eastern property line. Refer to Figure 3 and Appendix A for detailed calculations. There will be other smaller areas that will be addressed with individual planning area mapping and reports. The following is a summary of the hydrologic review:

Nodal Point	Q100 [cfs]	Tc [min]
102	13.5	12.8
103	57.2	14.3
104	171	17.1
105	338	21.7
106	688	30.1
107	760	33.3
202	19.0	9.8
203	69.0	11.3
204	314	14.5
205	576	19.9
206	1037	26.9
107	1068	29.5
107 confluence	1742	29.5

4.2. Onsite

As indicated above, the individual planning areas, or project will have choices of how to implement drainage protection. In all scenarios the project will be required to comply with Low Impact Development and Water Quality Treatment rules. Refer to the below water quality section for volumes required of each planning area.
There is currently one existing major outlet on the subject site, the crossing of Ethanc near the middle of the southern border. That crossing (point 107) is one possible outlet. The other is the extension of the Line A-3 box culvert along the western edge of the site. This line if connected to Line A, approximately 2400 linear feet would provide another potential outlet for the subject site. Both outlets would be limited to a certain flow capacity. The crossing (point 107) would be limited by its capacity and existing flow rate of 1,742 cfs. The western box culvert would be limited to the design flow of the ADP at 843 cfs. The outlet capacity will serve as the basis of the onsite design. The site should be designed to pass the offsite flows without mixing with the onsite flows. So the options for development of the planning areas is to mitigate increased development flows by providing

detention basins of sufficient size to mitigate the 10-year, 24-hr change by detaining the volume required to hold the difference in the post development volume to less than the existing during the 10-year, 24-hr event. Or to build enough of the ADP system to allow the developed flows to discharge into the Line A-3 culvert and into line A as called for in the ADP. Refer to Appendix A and Figure 3 for additional detail.

At time of final design detailed basin routing will be required to demonstrate attenuation of post project peak runoff. At time of final design, additional hydrologic and hydraulic design will be required.

5. WATER QUALITY

The subject site has mixed soil types, but based on preliminary review, the site should exhibit inadequate infiltration rates (0.2-1.98in/hr). As such bio-retention basins will be the preferred method of water quality treatment. Note the required minimum for infiltration is 1.6 in/hr, so the site will need to prepare detailed infiltration testing at the proposed locations of basins with site design to confirm viability of infiltration.

The site drains to the southwest into the Flood Control maintained "Homeland Romoland Line A". From there it flows into the San Jacinto River Reach 3, Canyon Lake (Pollutants – Nutrients and Pathogens), into the San Jacinto River Reach 1, and finally into Lake Elsinore (Pollutants – Nutrients, Organics, PCB's-Sediment Toxicity, Unknown Toxicity).

The Palomar Crossing project will use a combination of detention and bio-retention basins with underdrains to detain, treat, and safely outlet the projects post development runoff. The following is the impervious ratio and the resultant C_{bmp} for each land use;

- Residential Very High Density - Impervious Ratio – 80%; $C_{BMP} = 0.60$
- Commercial - Impervious Ratio – 90%; $C_{BMP} = 0.73$
- Roads and Right of Way - Impervious Ratio – 95%; $C_{BMP} = 0.81$

Using the above, the following is the resulting required treatment volume per acre for each of the proposed land uses;

- Design Storm Depth = 0.58"
- V_0 = Area * C_{BMP} * 0.58"/12
    - $V_{R\text{-}VHD}$ = 43,560sf * 0.60 * 0.58"/12 = 1,264 cf/ac
    - V_C = 43,560sf * 0.73 * 0.58"/12 = 1,537 cf/ac
    - V_{ROADS} = 43,560sf * 0.81 * 0.58"/12 = 1,706 cf/ac

Applying those to the individual planning areas yields the following total water quality volume required for each area;

PA's	Land Use	Area [ac]	Vol [cf]
11	R-VHD	20.17	25,495
12	C	12.31	18,920
13	C	15.79	24,269
14	C	9.18	14,110
All	ROADS	19.55	33,352

At time of final site design Drainage Management Areas (DMA) and basins will be analyzed and designed using the above criteria. It can be assumed that basins will be placed along the southern border of the site, and possibly the planning areas, with ultimate outlets at the existing crossing of Ethanac in the middle of the southern border, and the southwestern corner into Line A-3.

6. MAINTENANCE

It is proposed that the majority of the site will be maintained by the Homeowner Associations, Private Property Associations, or combination of public easement with community maintenance. Palomar Crossings will have easements over the drainage facilities allowing the City and County access. All of the temporary facilities, placed to handle offsite flows before the regional system is completed, will be placed in City and County easements, but will be maintained by the Property Associations. Maintenance of the onsite basins and onsite conveyance to Line A-3 is proposed to be maintained privately, through an HOA, Landscape Maintenance District, or equivalent. At time of site design additional areas will be determined with the City of Menifee review process and will determine who best to maintain.

REFERENCES

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

FIGURE 1

Vicinity Map

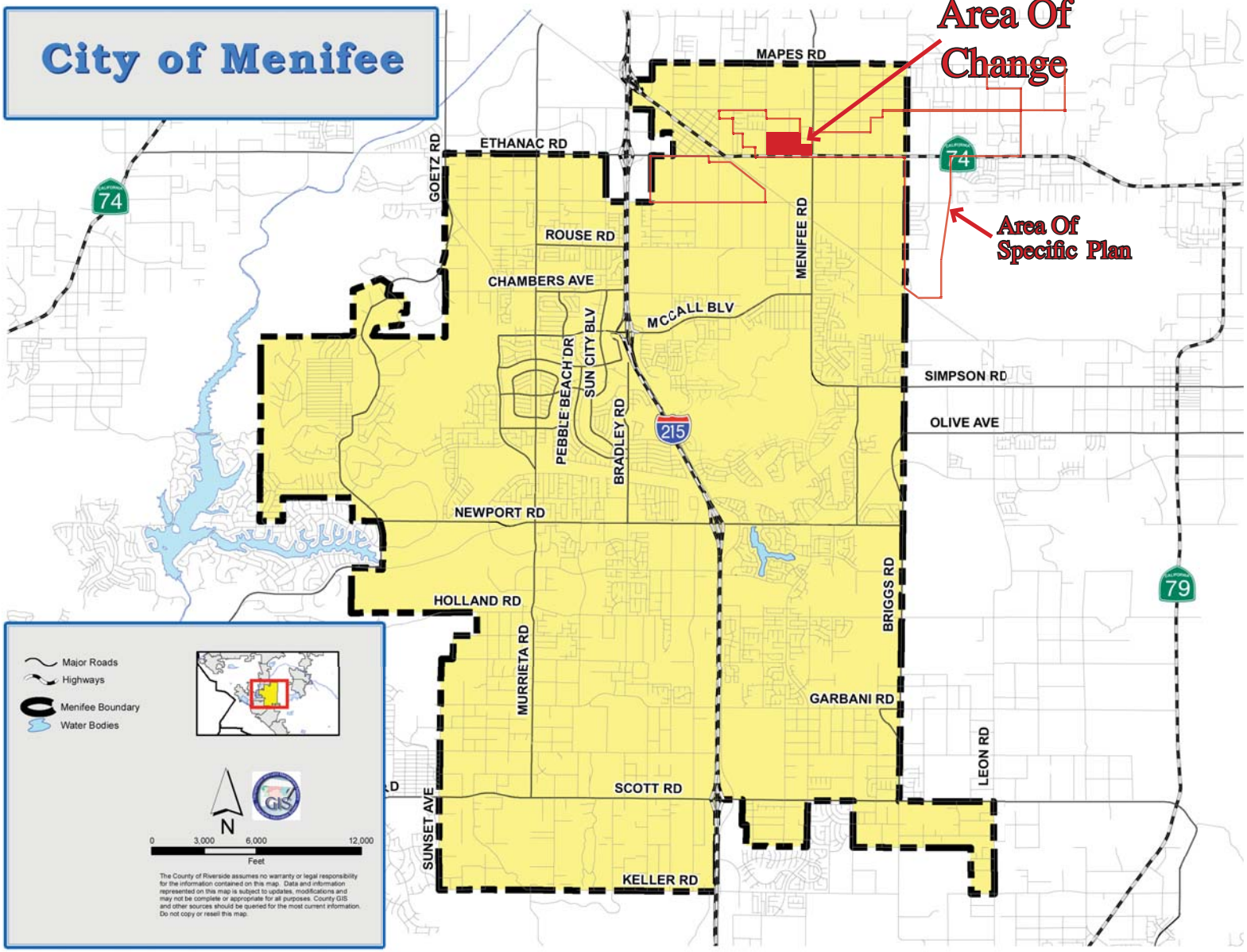


FIGURE III-B

City of Menifee Boundary Map

FIGURE 2

Specific Plan Land Use Plan

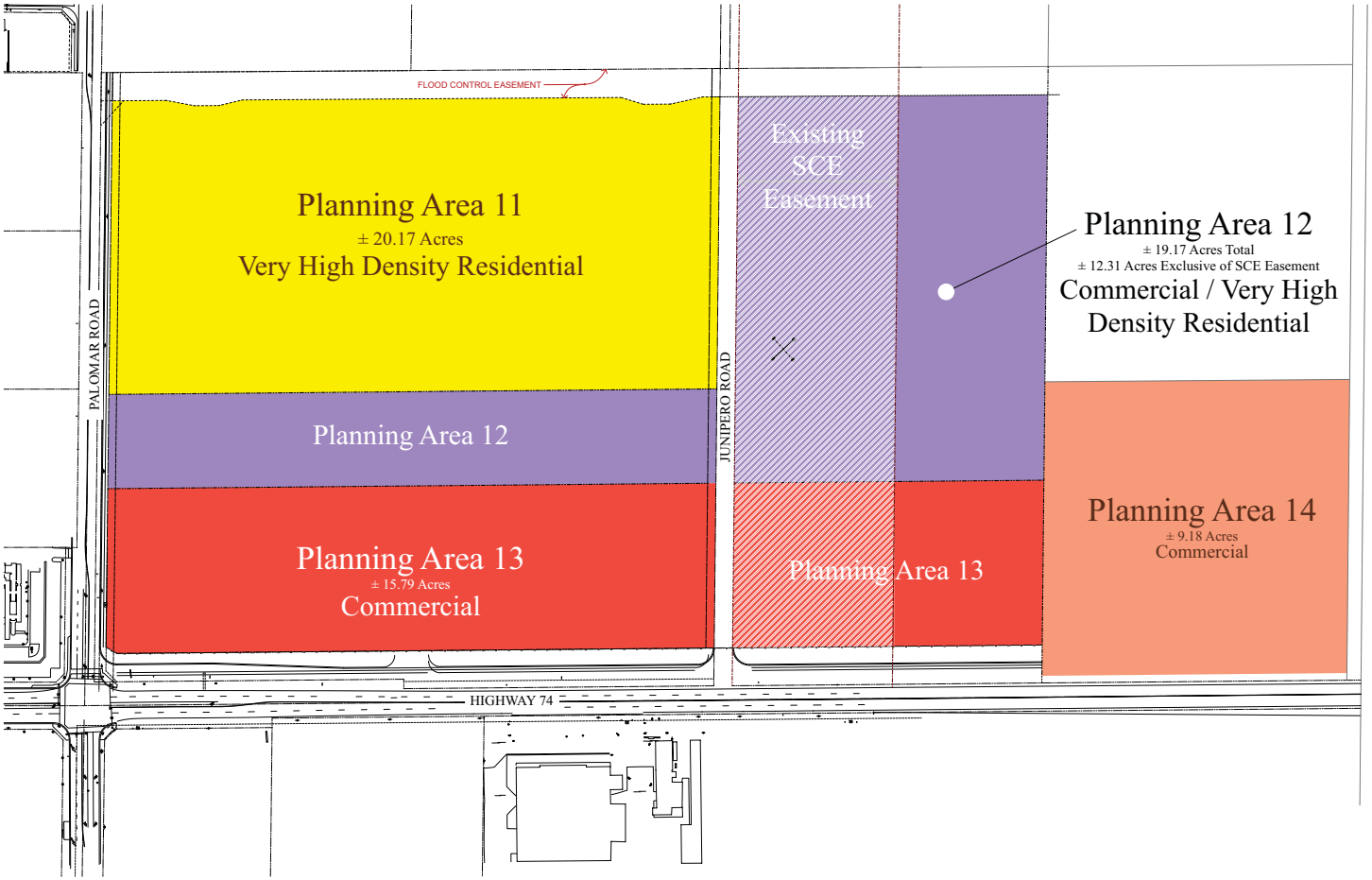


FIGURE III-1A

Proposed Land Use Plan

Planning Area 11

Planning Area 12

Planning Area 13

Planning Area 14

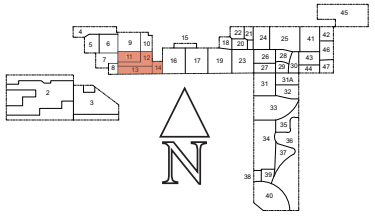
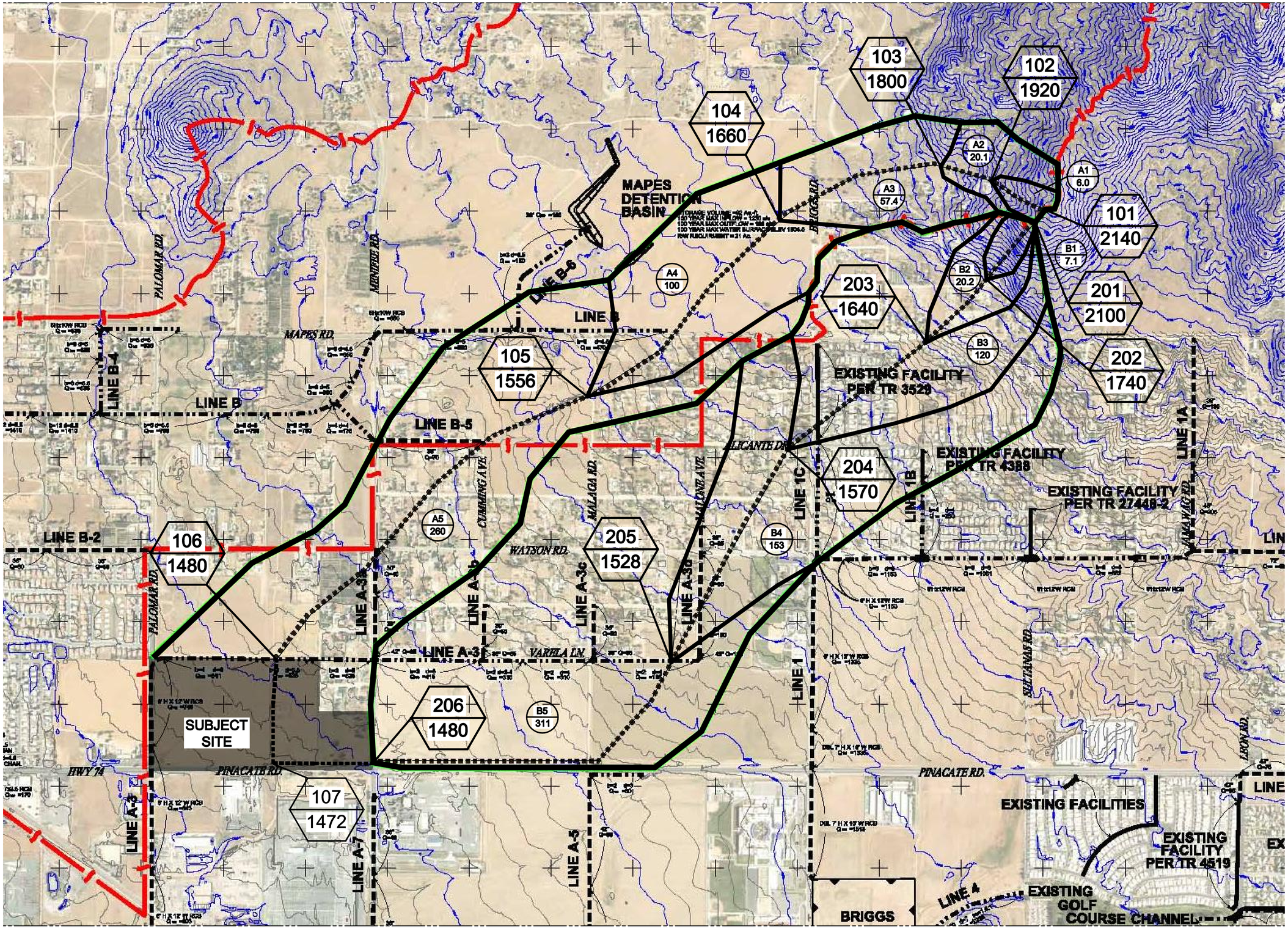


FIGURE 3

Drainage Exhibit

MENIFEE NORTH SPECIFIC PLAN - DRAINAGE EXHIBIT



LEGEND

102 / 1740 — NODE ELEVATION

A1 / 4.5 — SUB AREA ACRES

DRAINAGE GENERAL NOTES

1. FLOWS HAVE BEEN ANALYZED BASED ON THE HOMELAND ROMOLAND AREA DRAINAGE PLAN.
2. SOILS FOR THE SUBJECT SITE ARE TYPE B. AND SOILS FOR THE CONTRIBUTING AREA ARE TYPES B AND C.

HYDROLOGY DATA

NODAL POINT	Q100 [CFS]	Tc [MIN]
102	13.5	12.8
103	57.2	14.3
104	171	17.1
105	338	21.7
106	688	30.1
107	760	33.3
202	19.0	9.8
203	69.0	11.3
204	314	14.5
205	576	19.9
206	1037	26.9
107	1068	29.5
*107	1742	29.5

*DENOTES CONFLUENCE FLOW

N

400' 0' 400' 800'
GRAPHIC SCALE: 1"=400'

SUBMITTALS:	REVISIONS NO.	DESCRIPTION	DATE
DESIGNED BY:			
DRAWN BY:			
CHECKED BY:			

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER F. LENZ NO. 63001 EXP. 6/30/18 CIVIL STATE OF CALIFORNIA

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MENIFEE NORTH SP

DRAINAGE EXHIBIT
APRIL 2018

APRIL 2018
SHEET 1 OF 1
PROJECT NUMBER
CA-30136

Appendix A

Hydrology Calculations

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                  Riverside County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2012 Version
8.0
            Rational Hydrology Study        Date: 04/12/18
File:PALOMAR.out
      ------------------------------------------------------------------
------
      PALOMAR CROSSINGS OFFSITE
      EXISTING CONDITIONS
      RATIONALE METHOD
      100 YR EVENT
      ------------------------------------------------------------------
------
       *********   Hydrology Study Control Information **********

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

      ------------------------------------------------------------------
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      Program License Serial Number 6232

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

      Storm event (year) =  100.00 Antecedent Moisture Condition = 3

      Standard intensity-duration curves data (Plate D-4.1)
      For the [ Homeland-Winchester ] area used.
      10 year storm 10 minute intensity =  2.030(In/Hr)
      10 year storm 60 minute intensity =  0.800(In/Hr)
      100 year storm 10 minute intensity =  3.050(In/Hr)
      100 year storm 60 minute intensity =  1.200(In/Hr)

      Storm event year = 100.0
      Calculated rainfall intensity data:
      1 hour intensity =  1.200(In/Hr)
      Slope of intensity duration curve = 0.5200




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++++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
____
      Initial area flow distance =   751.000(Ft.)
      Top (of initial area) elevation =  2140.000(Ft.)
      Bottom (of initial area) elevation =  1920.000(Ft.)
      Difference in elevation =   220.000(Ft.)
```

```
      Slope =    0.29294  s(percent)=      29.29
      TC = k(0.710)*[(length^3)/(elevation change)]^0.2
      Initial area time of concentration =   12.828 min.
      Rainfall intensity =      2.677(In/Hr) for a   100.0 year storm
      UNDEVELOPED (fair cover) subarea
      Runoff Coefficient = 0.840
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  87.40
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Initial subarea runoff =     13.485(CFS)
      Total initial stream area =        6.000(Ac.)
      Pervious area fraction = 1.000


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++++
      Process from Point/Station      102.000 to Point/Station
103.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ------------------------------------------------------------------------
____
      Top of natural channel elevation =   1920.000(Ft.)
      End of natural channel elevation =   1800.000(Ft.)
      Length of natural channel  =   642.000(Ft.)
      Estimated mean flow rate at midpoint of channel =     36.072(CFS)

      Natural mountain channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity = 5.48(q^.33)(slope^.492)
      Velocity using mean channel flow =   7.11(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.1869
      Corrected/adjusted channel slope =  0.1535
      Travel time =    1.50 min.     TC =   14.33  min.


       Adding area flow to channel
      UNDEVELOPED (poor cover) subarea
      Runoff Coefficient = 0.862
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  92.20
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Rainfall intensity =      2.527(In/Hr) for a   100.0 year storm
      Subarea runoff =     43.753(CFS) for     20.100(Ac.)
      Total runoff =     57.238(CFS)      Total area =      26.100(Ac.)


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++++
      Process from Point/Station      103.000 to Point/Station
104.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
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____
      Top of natural channel elevation =   1800.000(Ft.)
      End of natural channel elevation =   1660.000(Ft.)
      Length of natural channel  =  2121.000(Ft.)
      Estimated mean flow rate at midpoint of channel =    120.179(CFS)

      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =  12.89(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0660
      Corrected/adjusted channel slope =  0.0660
      Travel time =    2.74 min.     TC =   17.07  min.


       Adding area flow to channel
      UNDEVELOPED (poor cover) subarea
      Runoff Coefficient = 0.858
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  92.20
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Rainfall intensity =      2.307(In/Hr) for a   100.0 year storm
      Subarea runoff =    113.611(CFS) for     57.400(Ac.)
      Total runoff =    170.850(CFS)      Total area =      83.500(Ac.)


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      Process from Point/Station      104.000 to Point/Station
105.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
____
      Top of natural channel elevation =   1660.000(Ft.)
      End of natural channel elevation =   1556.000(Ft.)
      Length of natural channel  =  3210.000(Ft.)
      Estimated mean flow rate at midpoint of channel =    273.155(CFS)

      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =  11.63(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0324
      Corrected/adjusted channel slope =  0.0324
      Travel time =    4.60 min.     TC =   21.67  min.


       Adding area flow to channel
      UNDEVELOPED (fair cover) subarea
      Runoff Coefficient = 0.822
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```
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  87.40
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Rainfall intensity =      2.038(In/Hr) for a   100.0 year storm
      Subarea runoff =    167.586(CFS) for    100.000(Ac.)
      Total runoff =    338.436(CFS)      Total area =     183.500(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      105.000 to Point/Station
106.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ---------------------------------------------------------------------
____
      Top of natural channel elevation =   1556.000(Ft.)
      End of natural channel elevation =   1480.000(Ft.)
      Length of natural channel  =  5070.000(Ft.)
      Estimated mean flow rate at midpoint of channel =    578.200(CFS)

      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =  10.05(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0150
      Corrected/adjusted channel slope =  0.0150
      Travel time =    8.41 min.     TC =   30.08  min.


       Adding area flow to channel
      SINGLE FAMILY (1 Acre Lot)
      Runoff Coefficient = 0.783
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  80.00
      Pervious area fraction =  0.800; Impervious fraction =  0.200
      Rainfall intensity =      1.718(In/Hr) for a   100.0 year storm
      Subarea runoff =    349.805(CFS) for    260.000(Ac.)
      Total runoff =    688.241(CFS)      Total area =     443.500(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      106.000 to Point/Station
107.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ---------------------------------------------------------------------
____
      Top of natural channel elevation =   1480.000(Ft.)
      End of natural channel elevation =   1472.000(Ft.)
      Length of natural channel  =  1320.000(Ft.)
      Estimated mean flow rate at midpoint of channel =    730.916(CFS)
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```
      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =   6.89(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0061
      Corrected/adjusted channel slope =  0.0061
      Travel time =    3.19 min.     TC =   33.28  min.


       Adding area flow to channel
      UNDEVELOPED (fair cover) subarea
      Runoff Coefficient = 0.805
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  87.40
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Rainfall intensity =      1.630(In/Hr) for a   100.0 year storm
      Subarea runoff =     72.195(CFS) for     55.000(Ac.)
      Total runoff =    760.436(CFS)      Total area =     498.500(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      106.000 to Point/Station
107.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
____
      The following data inside Main Stream is listed:
      In Main Stream number: 1
      Stream flow area =    498.500(Ac.)
      Runoff from this stream =    760.436(CFS)
      Time of concentration =   33.28 min.
      Rainfall intensity =     1.630(In/Hr)
      Program is now starting with Main Stream No. 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      201.000 to Point/Station
202.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
____
      Initial area flow distance =   918.000(Ft.)
      Top (of initial area) elevation =  2100.000(Ft.)
      Bottom (of initial area) elevation =  1740.000(Ft.)
      Difference in elevation =   360.000(Ft.)
      Slope =    0.39216  s(percent)=      39.22
      TC = k(0.530)*[(length^3)/(elevation change)]^0.2
      Initial area time of concentration =    9.789 min.
      Rainfall intensity =      3.081(In/Hr) for a   100.0 year storm
      UNDEVELOPED (poor cover) subarea
      Runoff Coefficient = 0.868
```

```
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  92.20
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Initial subarea runoff =     18.990(CFS)
      Total initial stream area =        7.100(Ac.)
      Pervious area fraction = 1.000


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      202.000 to Point/Station
203.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ------------------------------------------------------------------------
____
      Top of natural channel elevation =   1740.000(Ft.)
      End of natural channel elevation =   1640.000(Ft.)
      Length of natural channel  =  1063.000(Ft.)
      Estimated mean flow rate at midpoint of channel =     46.004(CFS)

      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =  11.59(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0941
      Corrected/adjusted channel slope =  0.0941
      Travel time =    1.53 min.     TC =   11.32  min.


       Adding area flow to channel
      UNDEVELOPED (poor cover) subarea
      Runoff Coefficient = 0.866
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  92.20
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Rainfall intensity =      2.857(In/Hr) for a   100.0 year storm
      Subarea runoff =     49.963(CFS) for     20.200(Ac.)
      Total runoff =     68.954(CFS)      Total area =      27.300(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      203.000 to Point/Station
204.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ------------------------------------------------------------------------
____
      Top of natural channel elevation =   1640.000(Ft.)
      End of natural channel elevation =   1570.000(Ft.)
      Length of natural channel  =  2121.000(Ft.)
      Estimated mean flow rate at midpoint of channel =    220.500(CFS)
```

```
      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =  10.98(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0330
      Corrected/adjusted channel slope =  0.0330
      Travel time =    3.22 min.     TC =   14.54  min.


       Adding area flow to channel
      SINGLE FAMILY (1 Acre Lot)
      Runoff Coefficient = 0.816
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  80.00
      Pervious area fraction =  0.800; Impervious fraction =  0.200
      Rainfall intensity =      2.508(In/Hr) for a   100.0 year storm
      Subarea runoff =    245.456(CFS) for    120.000(Ac.)
      Total runoff =    314.409(CFS)      Total area =     147.300(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      204.000 to Point/Station
205.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ---------------------------------------------------------------------
____
      Top of natural channel elevation =   1570.000(Ft.)
      End of natural channel elevation =   1528.000(Ft.)
      Length of natural channel  =  2948.000(Ft.)
      Estimated mean flow rate at midpoint of channel =    477.697(CFS)

      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =   9.21(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0142
      Corrected/adjusted channel slope =  0.0142
      Travel time =    5.33 min.     TC =   19.87  min.


       Adding area flow to channel
      SINGLE FAMILY (1 Acre Lot)
      Runoff Coefficient = 0.803
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  80.00
      Pervious area fraction =  0.800; Impervious fraction =  0.200
```

```
      Rainfall intensity =      2.132(In/Hr) for a   100.0 year storm
      Subarea runoff =    261.800(CFS) for    153.000(Ac.)
      Total runoff =    576.209(CFS)      Total area =     300.300(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      205.000 to Point/Station
206.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ------------------------------------------------------------------------
____
      Top of natural channel elevation =   1528.000(Ft.)
      End of natural channel elevation =   1480.000(Ft.)
      Length of natural channel  =  4221.000(Ft.)
      Estimated mean flow rate at midpoint of channel =    874.580(CFS)

      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =  10.00(Ft/s)

      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0114
      Corrected/adjusted channel slope =  0.0114
      Travel time =    7.03 min.     TC =   26.90  min.


       Adding area flow to channel
      UNDEVELOPED (fair cover) subarea
      Runoff Coefficient = 0.814
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  87.40
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Rainfall intensity =      1.821(In/Hr) for a   100.0 year storm
      Subarea runoff =    461.058(CFS) for    311.000(Ac.)
      Total runoff =   1037.267(CFS)      Total area =     611.300(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      206.000 to Point/Station
107.000
      **** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
      ------------------------------------------------------------------------
____
      Top of natural channel elevation =   1480.000(Ft.)
      End of natural channel elevation =   1472.000(Ft.)
      Length of natural channel  =  1240.000(Ft.)
      Estimated mean flow rate at midpoint of channel =   1055.932(CFS)

      Natural valley channel type used
      L.A. County flood control district formula for channel velocity:
       Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
      Velocity using mean channel flow =   8.01(Ft/s)
```

```
      Correction to map slope used on extremely rugged channels with
      drops and waterfalls (Plate D-6.2)
            Normal channel slope =  0.0065
      Corrected/adjusted channel slope =  0.0065
      Travel time =    2.58 min.     TC =   29.48  min.


       Adding area flow to channel
      UNDEVELOPED (fair cover) subarea
      Runoff Coefficient = 0.810
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
      Decimal fraction soil group C = 0.500
      Decimal fraction soil group D = 0.000
      RI index for soil(AMC 3)  =  87.40
      Pervious area fraction =  1.000; Impervious fraction =  0.000
      Rainfall intensity =      1.736(In/Hr) for a   100.0 year storm
      Subarea runoff =     30.955(CFS) for     22.000(Ac.)
      Total runoff =   1068.222(CFS)      Total area =     633.300(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      206.000 to Point/Station
107.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
____
      The following data inside Main Stream is listed:
      In Main Stream number: 2
      Stream flow area =    633.300(Ac.)
      Runoff from this stream =   1068.222(CFS)
      Time of concentration =   29.48 min.
      Rainfall intensity =     1.736(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                (In/Hr)


      1      760.436     33.28               1.630
      2     1068.222     29.48               1.736
      Largest stream flow has longer or shorter time of concentration
      Qp =   1068.222 + sum of
              Qa          Tb/Ta
             760.436 *    0.886 =    673.678
      Qp =   1741.900

      Total of 2 main streams to confluence:
      Flow rates before confluence point:
           760.436    1068.222
      Area of streams before confluence:
            498.500      633.300


      Results of confluence:
      Total flow rate =   1741.900(CFS)
      Time of concentration =    29.481 min.
      Effective stream area after confluence  =   1131.800(Ac.)
      End of computations, total study area =         1131.80 (Ac.)
```

The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.906
Area averaged RI index number = 69.3

Appendix B

Homeland Romoland ADP (cropped)

LINE A

CURRENT

MAPES DETENTION BASIN

STORAGE VOLUME =92 Ac.-ft.
100 YEAR MAX INFLOW = 1230 cfs
100 YEAR MAX OUTFLOW = 150 cfs
100 YEAR MAX WATER SURFACE ELEV 1604.5
R/W REQUIRMENT = 21 Ac.

36" Q_{100} =150

b=3 d=3.5
Q_{100} =150

LINE B-6

LINE B

5Hx10W RCB
Q_{100} =650

b=6 d=4.5
Q_{100} =650

b=6 d=4.5
Q_{100} =470

b=5 d=5
Q_{100} =550

5Hx10W RCB
Q_{100} =535

b=5 d=5
Q_{100} =535

b=8 d=5
Q_{100} =535

b=8 d=5.5
Q_{100} =535

LINE B-4

LINE B

b=6 d=5
Q_{100} =650

b=12 d=5.5
Q_{100} =1410

b=12 d=6.5
Q_{100} =1410

b=6 d=5.5
Q_{100} =790

b=6 d=6
Q_{100} =790

b=8 d=6
Q_{100} =790

b=4 d=4
Q_{100} =170

LINE B-5

39"
Q=70

LINE B-2

36"
Q=60

36"
Q=50

LINE A-3a

LINE A-1b

LINE A-3c

LINE A-3d

30"
Q=40

39"
Q=50

30"
Q=50

36"
Q=50

36"
Q=85

42"
Q=100

42" Q=65

LINE A-3

36" Q=65

VARELA LN.

36" Q=65

42" Q=10

b=4 d=6
Q_{100} =641

b=3 d=5.5
Q_{100} =525

b=3 d=5
Q_{100} =525

b=3 d=5
Q_{100} =415

b=2 d=3.4
Q_{100} =310

b=2 d=4
Q_{100} =310

b=2 d=4
Q_{100} =195

6' H X 12' W RCB
Q_{100} =749

x5.5 RCB
b=8 d=5.5
RECT. CHAN.
b=8 d=4.5
RECT. CHAN.

7x3.5 RCB
Q_{100} =170

6' H X 12' W RCB
Q_{100} =843

LINE A-3

6' H X 12' W RCB
Q_{100} =903

LINE A-7

36"
Q=40

LINE A-5

b=2 d=3
Q_{100} =80

42"
Q=80

36"

PALOMAR RD.

MENIFEE RD.

MAPES RD.

CUMMING AVE.

MALAGA RD.

MALONE AVE.

WATSON RD.

PALOMAR RD.

HWY 74

PINACATE RD.

PINACATE RD.

BRIGGS RD.

ALICANTE DR.

EXISTING FACILITY
PER TR 3529

LINE 1C

LINE 1B

b=4 d=4
Q_{100} =280

b=4 d=4
Q_{100} =250

EXISTING FACILITY
PER TR 4388

EXISTING FACILITY
PER TR 27448-2

LINE 1A

39"
Q=190

45"
Q=205

JUNIPER
FLATS
BASIN

LINE 1

72"
Q_{100} =493

b=6 d=8
Q_{100} =1153

b=6 d=8
Q_{100} =1061

b=6 d=8
Q_{100} =882

6'Hx12'W RCB

6'Hx12'W RCB

6'Hx12'W RCB

6' H X 12'W RCB
Q_{100} =1153

6' H X 12' W RCB
Q_{100} =1335

LINE 1

SULTANAS RD.

JUNIPER FLATS RD.

LEON RD.

DBL 7' H X 10' W RCB
Q_{100} =1335

DBL 7' H X 10' W RCB
Q_{100} =1513

42"
Q=75

42"
Q=95

LINE 3

EXISTING FACILITIES

EXISTING
FACILITY
PER TR 4519

EXISTING LINE 2

LINE 2

84"
Q=540

81"
Q=585

84"
Q=540

90"
Q=640

93"
Q=655

96"
Q=665

36"
Q=90

102"
Q=750

LINE 4

EXISTING
GOLF
COURSE CHANNEL

BRIGGS