HYDROLOGY REPORT

For

NORTH PENINSULA IMPROVEMENTS FOR PIRATE COVE RESORT & MARINA

SEPTEMBER, 2012

Prepared For:

Pirate Cove Resort and Marina
1100 London Bridge Road, Suite G102
Lake Havasu City, AZ 86404

Prepared By:

ARQ Engineering, LLC
Engineering & Survey
4440 S. Highway 95, Suite A
Fort Mohave, AZ 86426
(928) 758-3333

REGISTERED PROFESSIONAL ENGINEER
BARBARA DARLINGTON
C 042000
Exp. 3-31-14
CIVIL
STATE OF CALIFORNIA

9-20-12

JOB NO. 7316-09

P:\7316-09 Pirate Cove\Hydrology\Peninsula North\Hydrology Report Peninsula North 9-19-12.docx

TABLE OF CONTENTS

Contents Page

Introduction …….. 1
FEMA Floodplain ……. 1
Existing Conditions …….. 1
Proposed Conditions ……. 1
Hydrologic Parameters ……..... 1
Retention Calculations ……. 2
Conclusion …… 2

Appendices

Appendix A - Localized FIRMette
Appendix B – Drainage Basin Maps (Drainage Areas)
Appendix C - NOAA Precipitation Data
Appendix D - Pre/Post Drainage Calculations (AES HydroWIN 2012)

Exhibits

Exhibit 1 - Pirate Cove Resort & Marina Location Map

Exhibit 2 - Pirate Cove Resort & Marina South Peninsula Location Map

Introduction

This analysis was performed in support of the Pirate Cove Peninsula Master Development Plan for assessor's parcel no. 0650-16-02-0000 and portions of 0650-15-01-0000 and 0650-15-08-0000, located in Sections 5 and 6, Township 27 North, Range 24 East, San Bernardino County, California. The project is within 1/2 mile to the north of Old Highway Route 66. Please see Vicinity Map on next page for more detail on site location.

FEMA Floodplain

According to the Federal Emergency Management Agency (FEMA), the Flood Insurance Rate Map indicates that the proposed project is located within Zone "X". It is adjacent to Zone AE, which has a 100-year high water elevation of 464. The subject site is within FIRM Map No. 06071C5685H, revised August 28, 2008 (See Appendix A).

Existing Conditions

The subject area of interest currently is a developed recreational park with a paved road leading to the east end of the peninsula and several small structures. The property currently drains from southwest to northeast with few low areas to the northerly. The current drainage is not restrained from flowing Northeasterly to the Colorado River. The soils on the North Peninsula consist of very sandy to slightly silty sands and show no signs of riling or concentrated flows erosion. The Permeability of the soils is very high. Pavement and hard surface such as restroom structures, roadway, etc. present the only impervious surfaces.

Proposed Conditions

Proposed conditions will include reconfigured recreational vehicle pads, and relocation of the paved roadway, along with unpaved areas allocated for open space. The open space will include, but is not limited to, localized areas for retention/detention purposes. No significant increase in impervious area will result with the Redevelopment of the North Peninsula. See Drainage Basin Maps in Appendix B for more description. Some of the drainage will continue to sheet flow in a Northerly direction toward the Colorado River. Approximately 47% of the proposed total drainage will be collected at several low points and directed into retention basins to reduce the overall runoff, and volumes to far less than existing conditions.

Hydrologic Parameters

The San Bernardino County Hydrology Manual along with the Advanced Engineering Systems (AES) HydroWIN 2012, Computer Model Rational Method Analysis was used to calculate the flows. The San Bernardino County Hydrology Manual was used to calculate volumes for this development. The San Bernardino County Hydrology Manual, NOAA Atlas 14, Vol. 6 was used to obtain the precipitation depth for a 100-Year, 1 hour duration storm event. The 100-year, 1-hour duration precipitation used was 1.98 inches for this analysis. Initial Time of Concentration and intensity were calculated per AES Software. The NOAA precipitation data and San Bernardino Hydrology figures are found in Appendix C. The pre and post run-off calculations along with Table 1 that summarizes the overall pre/post drainage calculation results are found in Appendix D.

Retention Calculations (bottom 1.00' of Basins)

Retention volumes were calculated using the San Bernardino Hydrology Manual. Six retention basins were incorporated into the grading plan to reduce developed peak flows, and volumes to significantly less than existing conditions. The post-developed and pre-developed peak flows were calculated using the San Bernardino Hydrology Manual as detailed in Appendix D. The retention volume summary is shown on Table 1 and is located in Appendix D.

Conclusions

Redevelopment of the site and the proposed grading plan allowed for the inclusion of several retention basins. The total retention volume proposed is 1.456 Acre feet will be provided in an effort to significantly reduce direct runoff into the Colorado River. This design will reduce peak flow, volume, velocities, as well as implement silt and debris control.

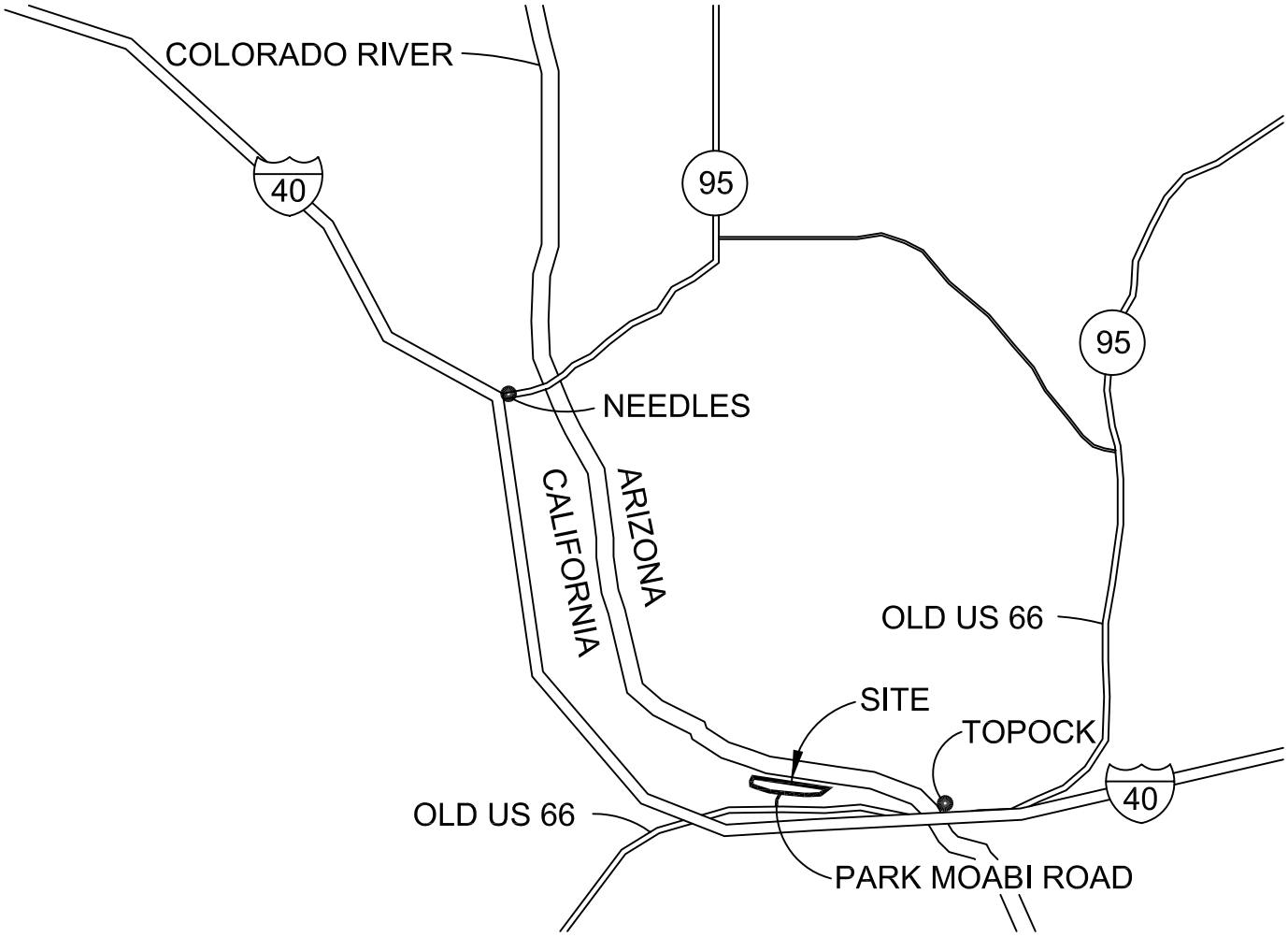
The existing condition has no provisions for retention of storm waters. The proposed redevelopment of the North Peninsula incorporates retention basins into the plan to reduce runoff to substantially less than what currently exists.

The existing condition total runoff volume is 1.038 ac-ft, all which is being discharged directly into the Colorado River system. Post-developed total runoff volume is 1.148 ac-ft, approximately 0.606 ac-ft of which will continue to be discharged to the Colorado River. Proposed run-off to be retained is 0.542 ac-ft. This amounts to a 42% reduction of runoff into the Colorado River over the existing condition, including the nominal increase from the redevelopment of the North Peninsula. Proposed retention is 1.792 ac-ft.

PIRATE COVE RESORT AND MARINA

AT MOABI REGIONAL PARK

LOCATION MAP



N.T.S.

EXHIBIT 1

ARQ ENGINEERING LLC
Engineering and Survey

DECEMBER 16, 2011
P:\7316-09 pirate cove\Hydrology\LOCATION.DWG

PIRATE COVE RESORT AND MARINA
NORTH PENINSULA

AT MOABI REGIONAL PARK

LOCATION MAP

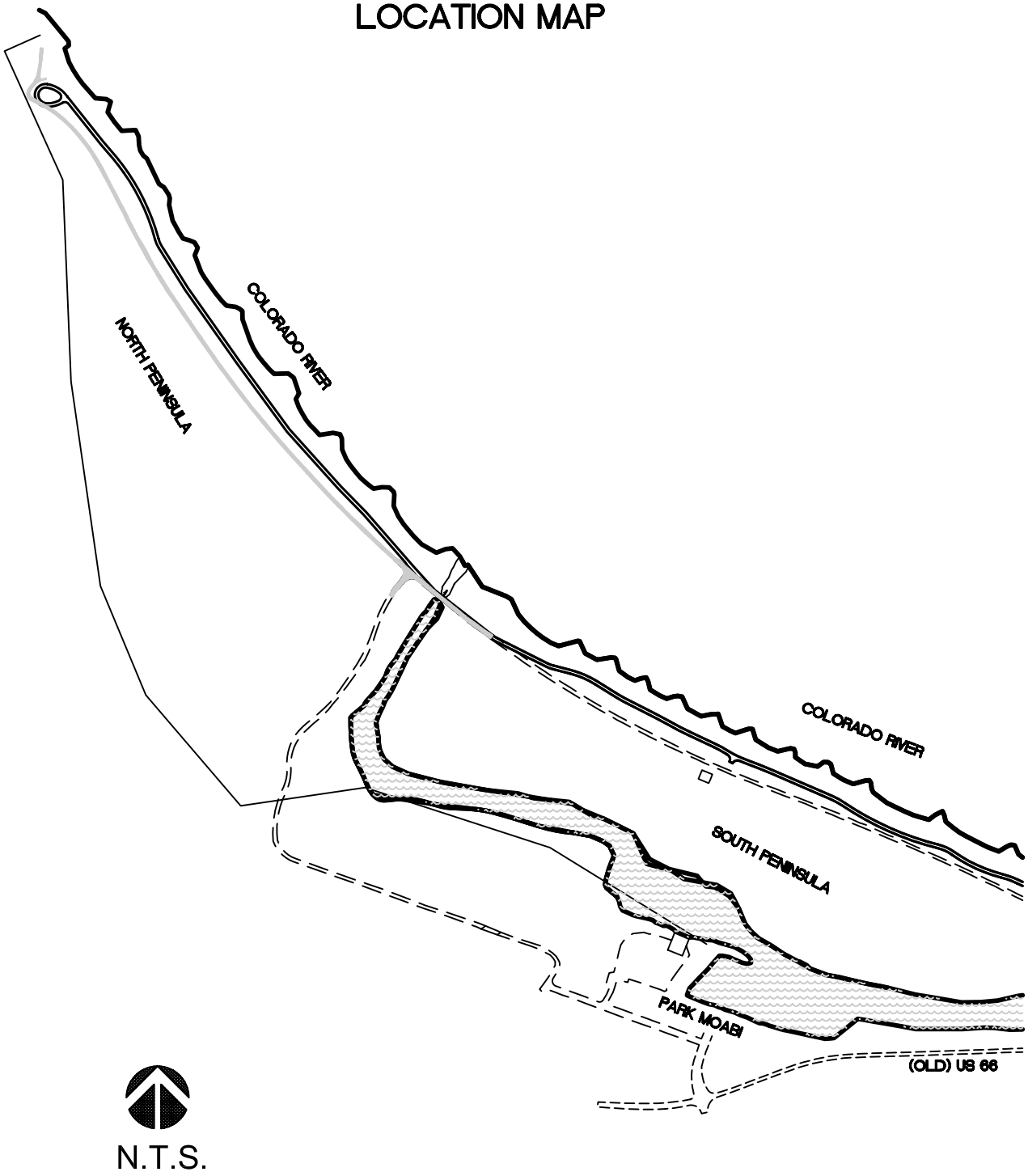


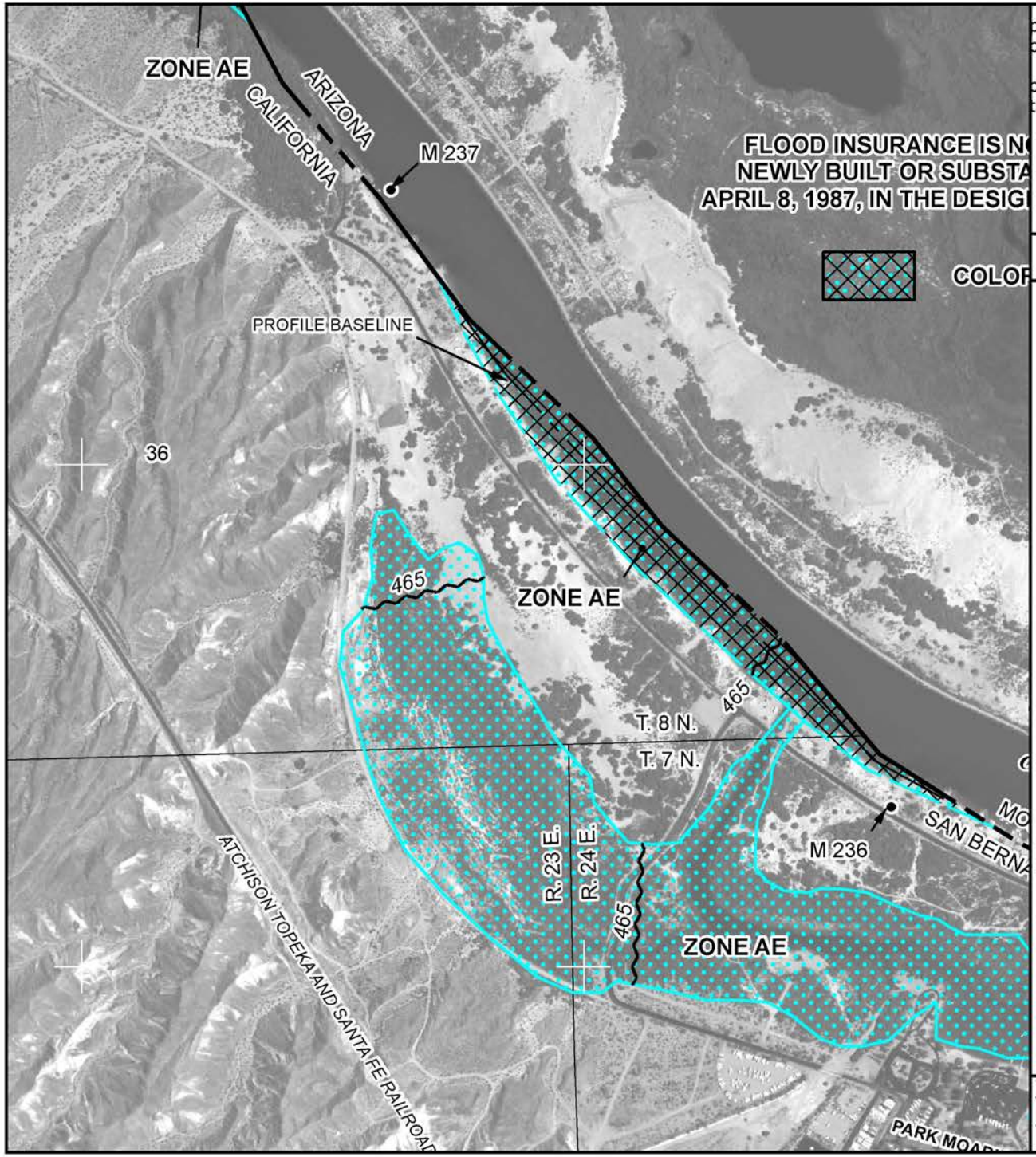
EXHIBIT 2

ARQ ENGINEERING LLC
Engineering and Survey

August 20, 2012
P:\7316-09 pirate cove\Hydrology\Penninsula North\SITE.DWG

APPENDIX A

LOCALIZED FIRMette



o revision history prior to countywide mapping, refer to the Co
ocated in the Flood Insurance Study report for this jurisdiction.

ood insurance is available in this community, contact your
tional Flood Insurance Program at 1-800-638-6620.

FEET
METERS
300 0 300 600

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 5685H

FIRM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY, CALIFORNIA
AND INCORPORATED AREAS
PANEL 5685 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN BERNARDINO COUNTY	060270	5685	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06071C5685H

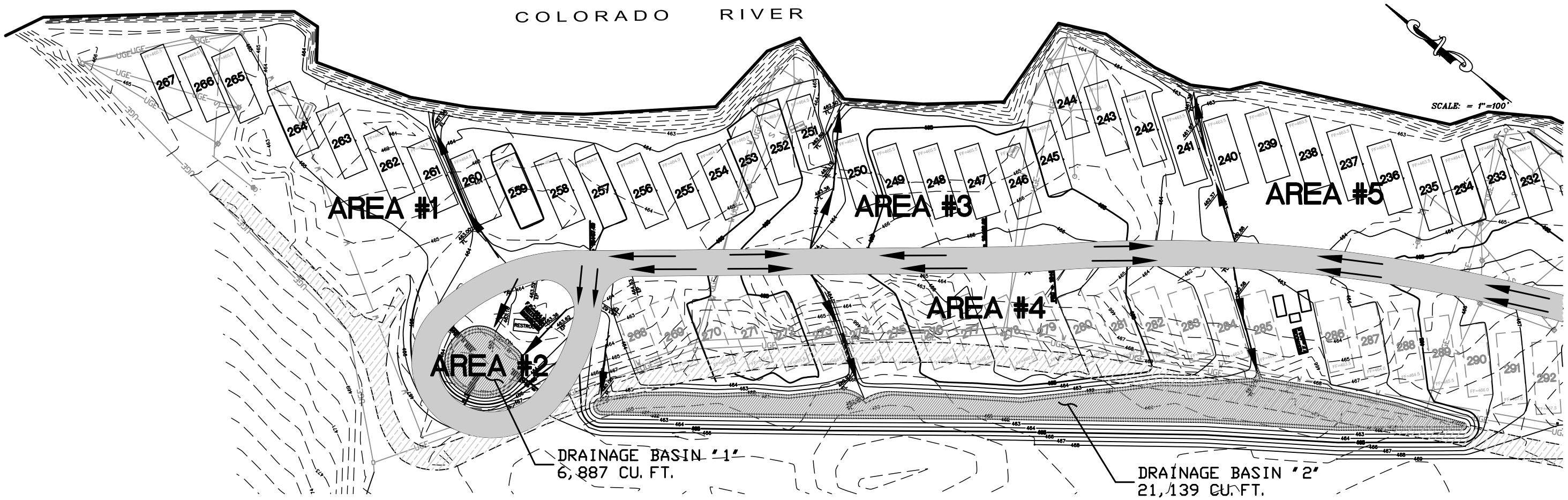
MAP REVISED
AUGUST 28, 2008

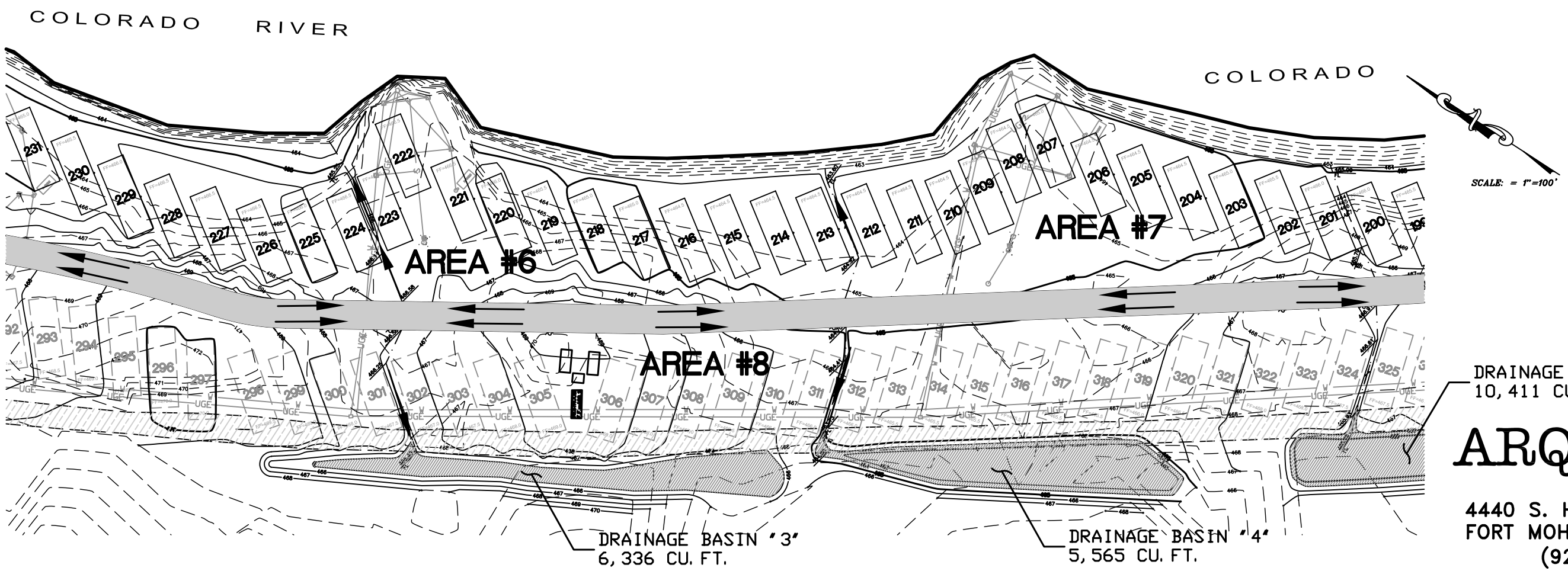
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

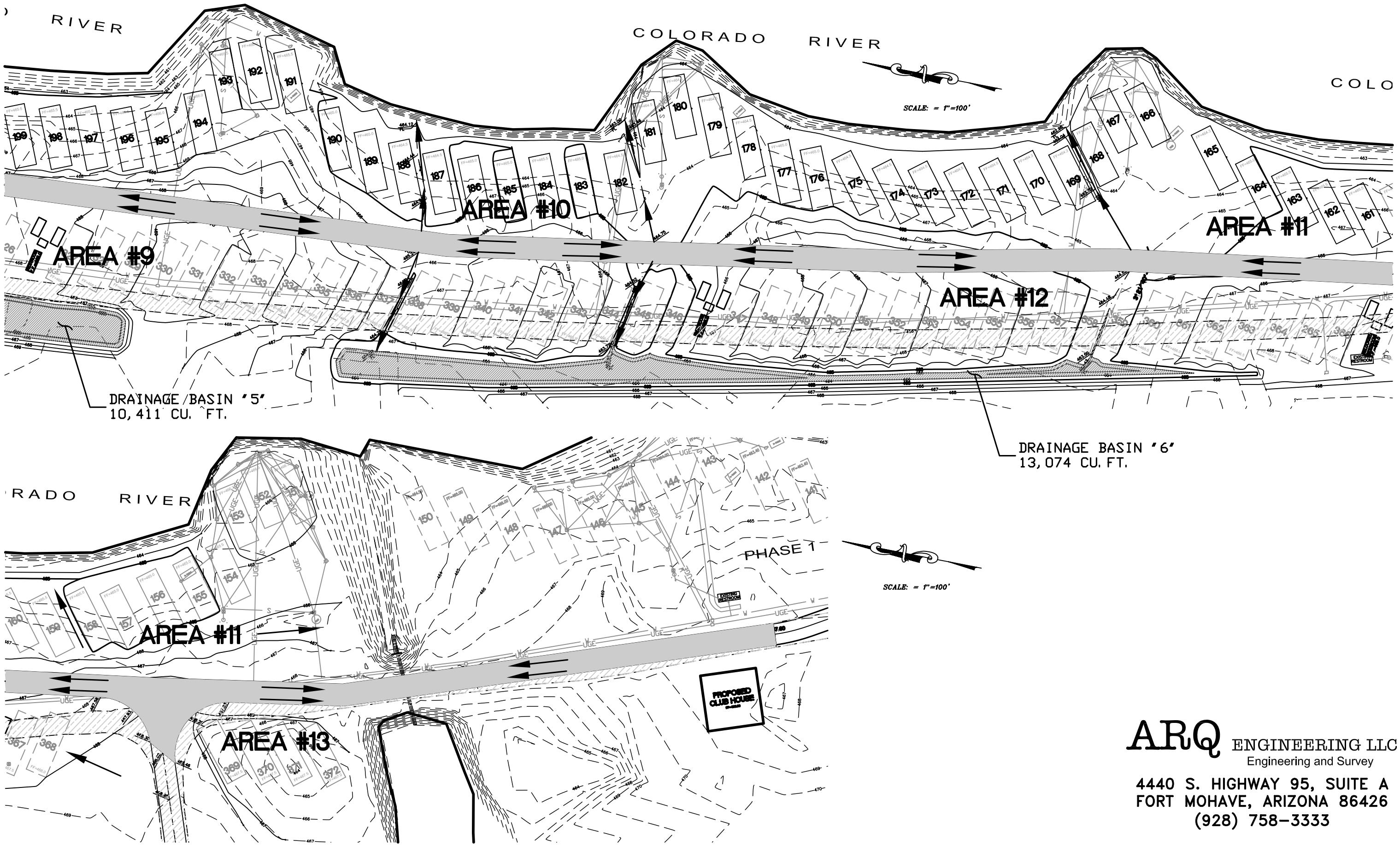
APPENDIX B

DRAINAGE BASINS MAPS



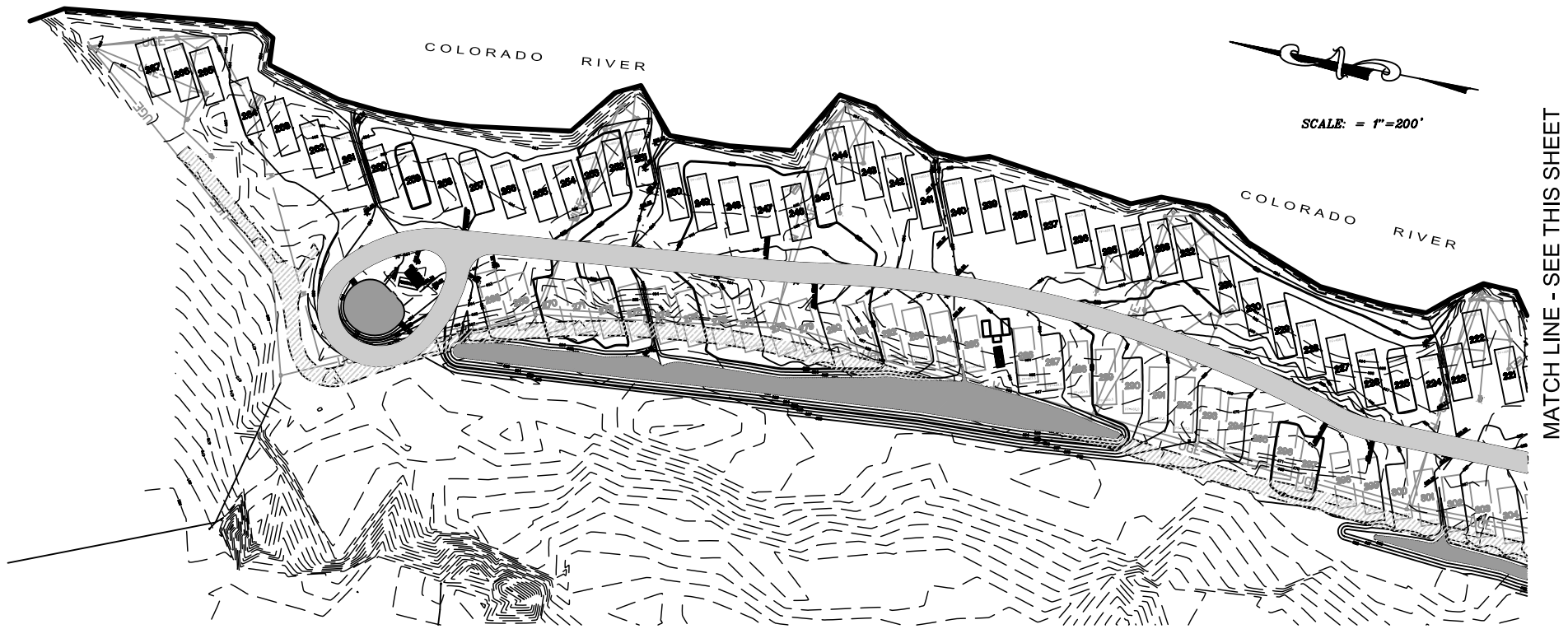


ARQ ENGINEERING LLC
Engineering and Survey
4440 S. HIGHWAY 95, SUITE A
FORT MOHAVE, ARIZONA 86426
(928) 758-3333



ARQ ENGINEERING LLC
Engineering and Survey
4440 S. HIGHWAY 95, SUITE A
FORT MOHAVE, ARIZONA 86426
(928) 758-3333

LAND USE

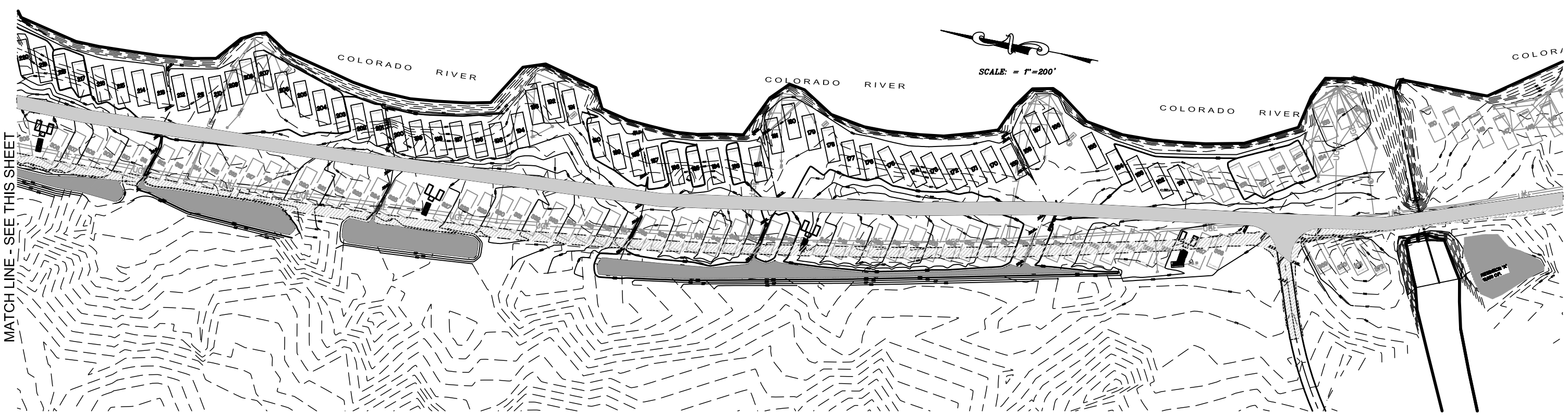


LAND USE

EXISTING - INTERMITTENT CAMPING/RECREATIONAL AREA

PROPOSED - RECREATIONAL VEHICLE CAMP GROUND

ARQ ENGINEERING LLC
Engineering and Survey
4440 S. HIGHWAY 95, SUITE A
FORT MOHAVE, ARIZONA 86426
(928) 758-3333



APPENDIX C

NOAA PRECIPITATION DATA
&
SAN BERNARDINO COUNTY HYROLOGY MANUAL FIGURES

NOAA Atlas 14, Volume 6, Version 2
Location name: Needles, California, US*
Coordinates: 34.7234, -114.5149
Elevation: 553 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.088 (0.075-0.104)	0.145 (0.124-0.173)	0.227 (0.192-0.271)	0.299 (0.251-0.360)	0.406 (0.328-0.507)	0.495 (0.391-0.633)	0.593 (0.456-0.780)	0.702 (0.523-0.952)	0.862 (0.613-1.23)	1.06 (0.726-1.56)
10-min	0.126 (0.107-0.150)	0.208 (0.177-0.247)	0.325 (0.276-0.388)	0.429 (0.360-0.516)	0.582 (0.470-0.726)	0.710 (0.561-0.908)	0.850 (0.653-1.12)	1.01 (0.749-1.36)	1.24 (0.879-1.75)	1.52 (1.04-2.24)
15-min	0.153 (0.130-0.181)	0.252 (0.214-0.299)	0.393 (0.334-0.469)	0.518 (0.435-0.624)	0.703 (0.569-0.879)	0.859 (0.678-1.10)	1.03 (0.790-1.35)	1.22 (0.906-1.65)	1.50 (1.06-2.12)	1.84 (1.26-2.71)
30-min	0.210 (0.179-0.249)	0.346 (0.295-0.411)	0.541 (0.459-0.645)	0.713 (0.599-0.858)	0.968 (0.783-1.21)	1.18 (0.933-1.51)	1.41 (1.09-1.86)	1.67 (1.25-2.27)	2.06 (1.46-2.92)	2.53 (1.73-3.73)
60-min	0.293 (0.249-0.347)	0.483 (0.411-0.574)	0.755 (0.640-0.900)	0.995 (0.835-1.20)	1.35 (1.09-1.69)	1.65 (1.30-2.11)	1.97 (1.52-2.59)	2.33 (1.74-3.17)	2.87 (2.04-4.07)	3.53 (2.41-5.20)
2-hr	0.406 (0.345-0.481)	0.630 (0.536-0.748)	0.942 (0.798-1.12)	1.21 (1.02-1.46)	1.60 (1.29-2.00)	1.92 (1.51-2.45)	2.25 (1.73-2.96)	2.62 (1.95-3.55)	3.15 (2.24-4.47)	3.58 (2.45-5.29)
3-hr	0.471 (0.401-0.559)	0.712 (0.605-0.846)	1.04 (0.885-1.24)	1.33 (1.11-1.60)	1.73 (1.40-2.16)	2.06 (1.63-2.63)	2.41 (1.85-3.16)	2.78 (2.07-3.77)	3.32 (2.36-4.71)	3.75 (2.57-5.54)
6-hr	0.580 (0.494-0.688)	0.843 (0.716-1.00)	1.20 (1.02-1.43)	1.51 (1.27-1.81)	1.94 (1.57-2.42)	2.29 (1.81-2.93)	2.65 (2.04-3.49)	3.05 (2.27-4.13)	3.60 (2.56-5.12)	4.06 (2.78-5.99)
12-hr	0.670 (0.571-0.795)	0.946 (0.804-1.12)	1.32 (1.12-1.58)	1.65 (1.39-1.99)	2.12 (1.71-2.64)	2.49 (1.97-3.19)	2.89 (2.22-3.80)	3.32 (2.48-4.51)	3.94 (2.80-5.60)	4.45 (3.04-6.56)
24-hr	0.856 (0.754-0.990)	1.18 (1.03-1.36)	1.62 (1.43-1.89)	2.01 (1.75-2.35)	2.58 (2.18-3.11)	3.05 (2.53-3.75)	3.55 (2.88-4.46)	4.10 (3.24-5.29)	4.90 (3.73-6.57)	5.57 (4.11-7.70)
2-day	0.975 (0.860-1.13)	1.30 (1.15-1.51)	1.77 (1.55-2.05)	2.18 (1.90-2.55)	2.78 (2.35-3.35)	3.29 (2.73-4.04)	3.83 (3.11-4.82)	4.44 (3.51-5.73)	5.33 (4.06-7.15)	6.09 (4.49-8.43)
3-day	1.05 (0.925-1.22)	1.38 (1.22-1.60)	1.86 (1.63-2.16)	2.28 (1.99-2.67)	2.91 (2.46-3.51)	3.44 (2.85-4.22)	4.01 (3.26-5.05)	4.66 (3.69-6.01)	5.61 (4.27-7.52)	6.42 (4.74-8.89)
4-day	1.12 (0.984-1.29)	1.46 (1.28-1.69)	1.95 (1.71-2.26)	2.38 (2.08-2.79)	3.03 (2.57-3.66)	3.58 (2.98-4.41)	4.19 (3.40-5.27)	4.87 (3.85-6.28)	5.88 (4.47-7.88)	6.74 (4.97-9.32)
7-day	1.19 (1.05-1.38)	1.53 (1.34-1.77)	2.01 (1.77-2.33)	2.45 (2.13-2.86)	3.11 (2.63-3.75)	3.67 (3.05-4.51)	4.30 (3.49-5.41)	5.02 (3.97-6.48)	6.10 (4.65-8.18)	7.04 (5.20-9.74)
10-day	1.25 (1.10-1.45)	1.60 (1.41-1.85)	2.10 (1.84-2.44)	2.55 (2.22-2.98)	3.22 (2.73-3.89)	3.81 (3.16-4.68)	4.46 (3.62-5.60)	5.20 (4.11-6.70)	6.31 (4.81-8.46)	7.29 (5.38-10.1)
20-day	1.44 (1.27-1.67)	1.84 (1.62-2.13)	2.38 (2.10-2.77)	2.86 (2.50-3.35)	3.56 (3.01-4.29)	4.14 (3.44-5.09)	4.78 (3.88-6.01)	5.50 (4.35-7.10)	6.59 (5.01-8.83)	7.52 (5.55-10.4)
30-day	1.63 (1.43-1.88)	2.12 (1.86-2.45)	2.76 (2.43-3.21)	3.30 (2.88-3.86)	4.06 (3.43-4.89)	4.67 (3.88-5.74)	5.33 (4.33-6.70)	6.05 (4.79-7.81)	7.11 (5.41-9.53)	8.01 (5.91-11.1)
45-day	1.83 (1.61-2.11)	2.45 (2.16-2.84)	3.24 (2.85-3.77)	3.88 (3.38-4.54)	4.72 (4.00-5.70)	5.37 (4.46-6.61)	6.05 (4.91-7.60)	6.76 (5.35-8.73)	7.78 (5.92-10.4)	8.61 (6.35-11.9)
60-day	2.00 (1.76-2.32)	2.76 (2.43-3.19)	3.69 (3.24-4.28)	4.41 (3.84-5.16)	5.34 (4.51-6.44)	6.02 (5.00-7.40)	6.71 (5.44-8.43)	7.43 (5.88-9.58)	8.41 (6.40-11.3)	9.20 (6.79-12.7)

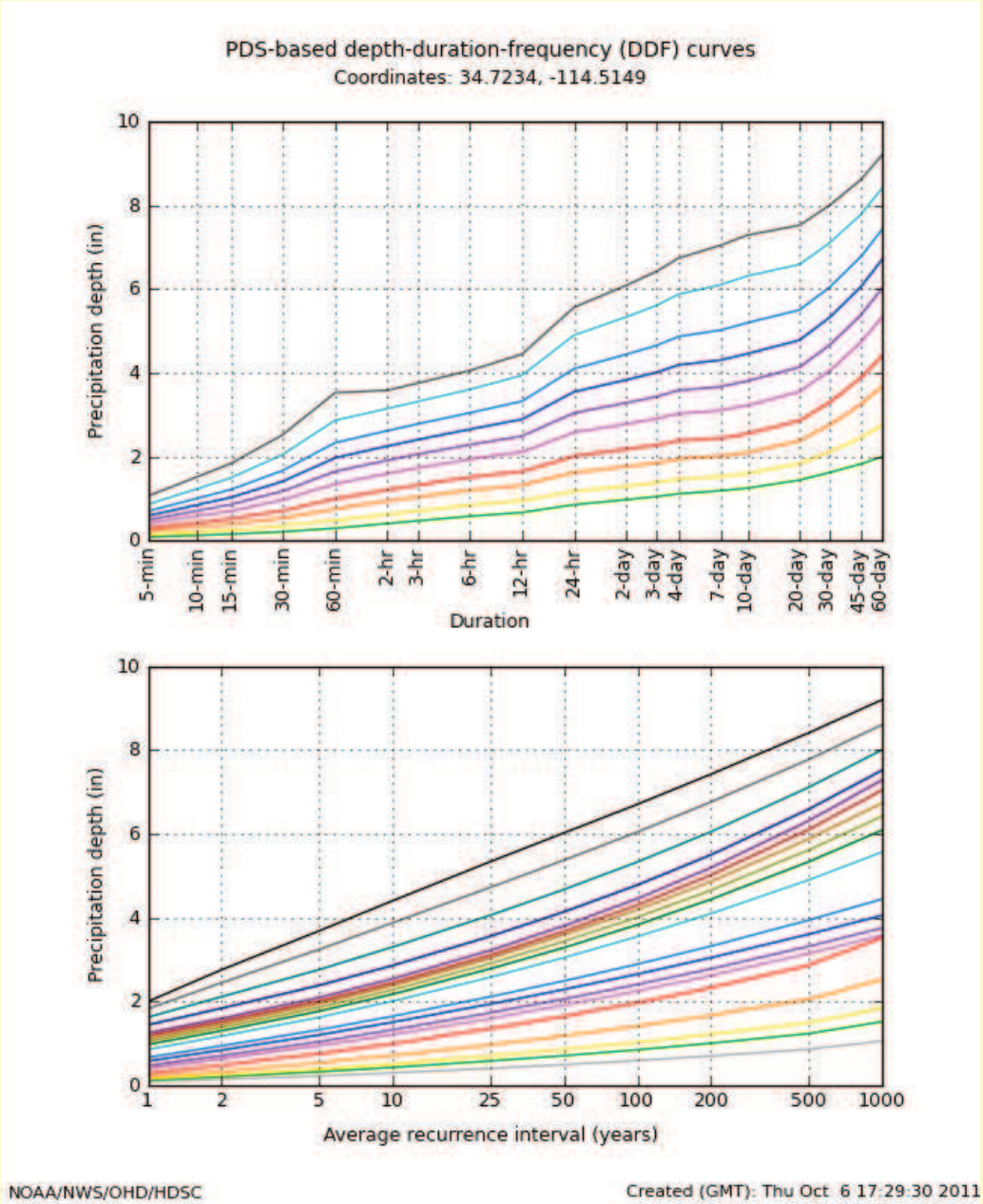
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



Back to Top

Maps & aerials

Small scale terrain

Large scale terrain

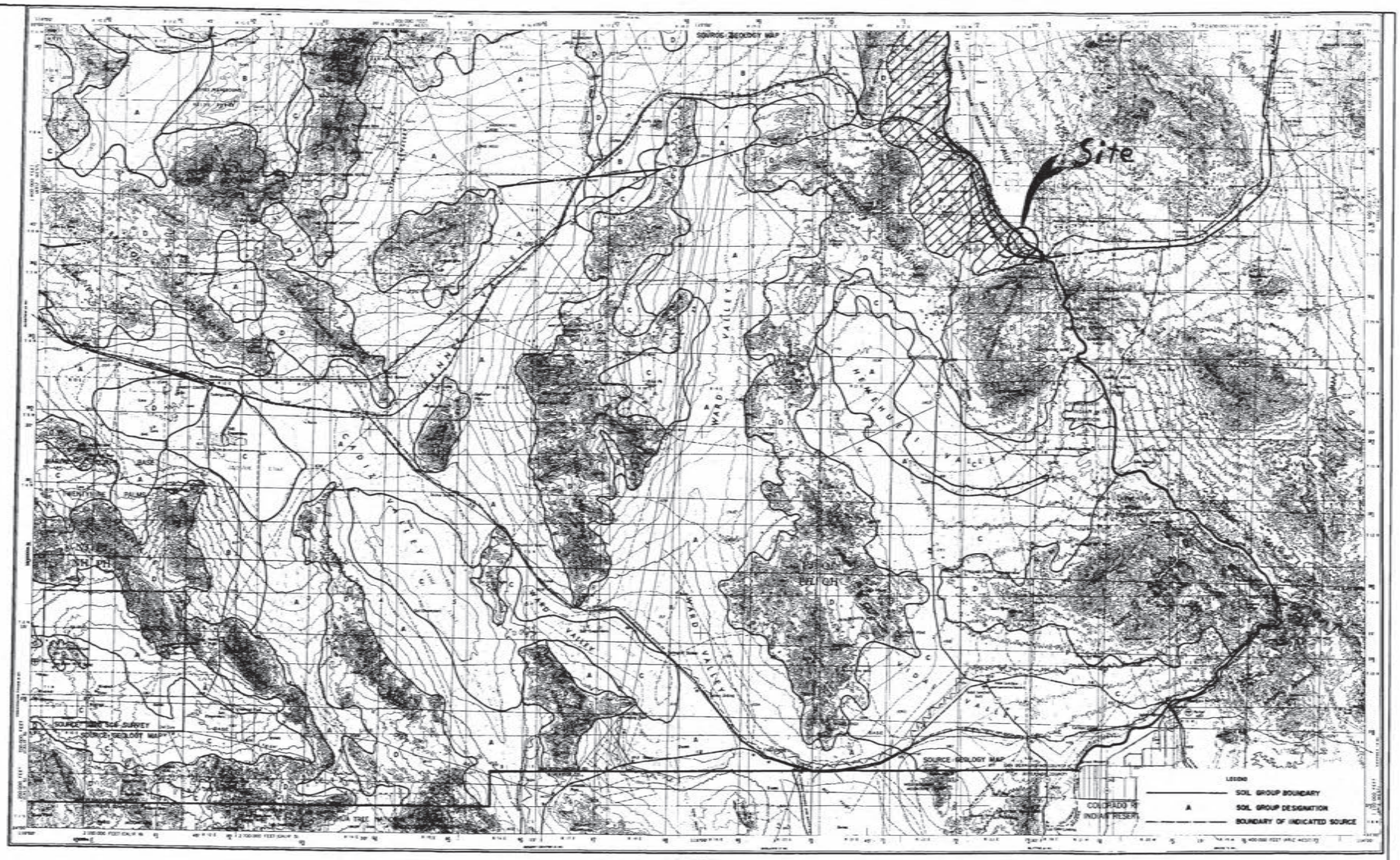
Large scale map

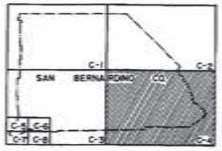
Large scale aerial

Back to Top

National Oceanic and Atmospheric Administration
National Weather Service
Office of Hydrologic Development
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer





INDEX MAP

Scale 1:250,000

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
TRANSVERSE MERCATOR PROJECTION

BASE MAP REPRODUCED FROM U.S.G.S. "NEEDLES" TOPOGRAPHIC MAP

SCALE REDUCED BY 1/2

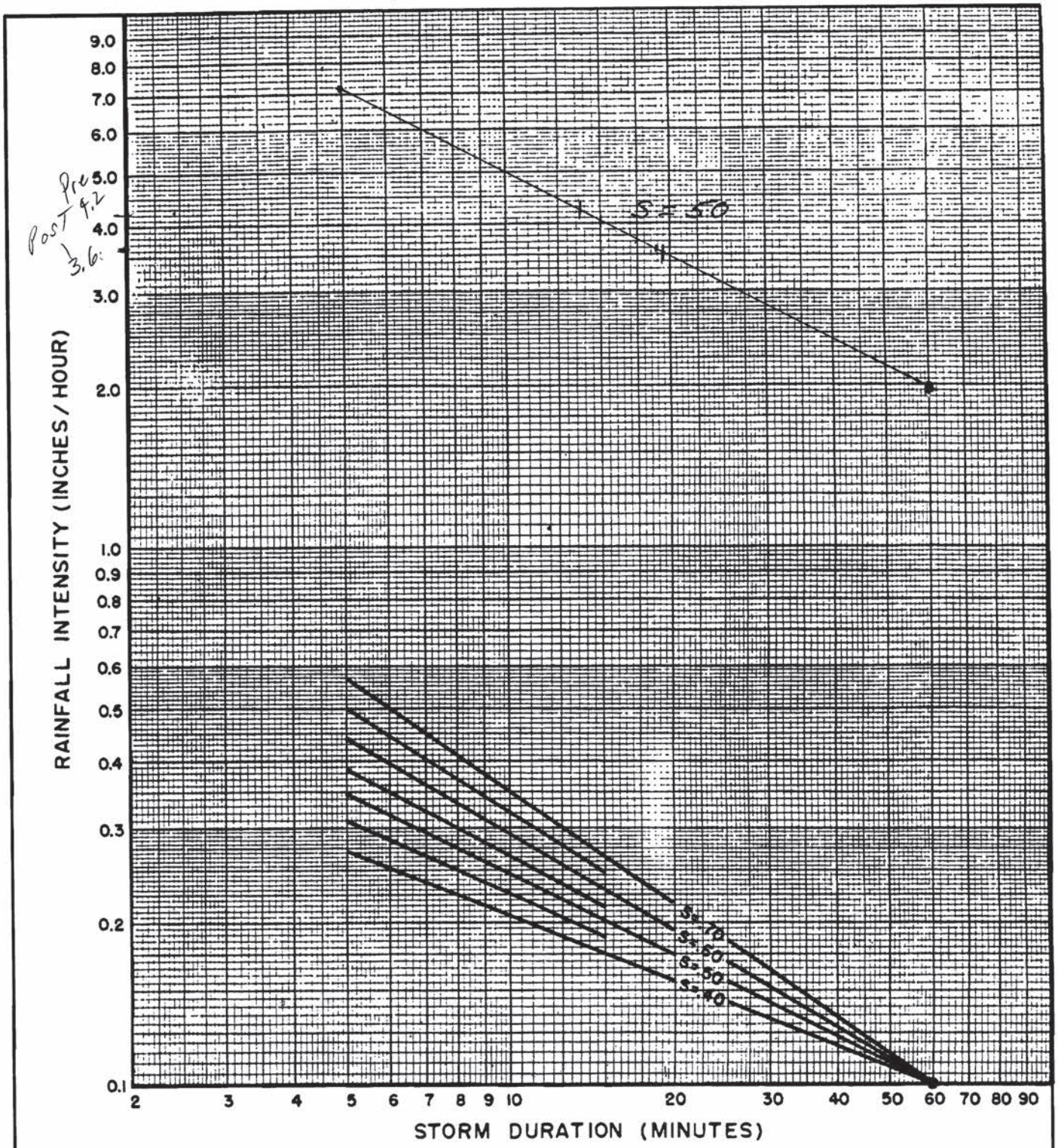
LOCATION DIAGRAM

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHEAST AREA

FIGURE C-12



DESIGN STORM FREQUENCY = 100 YEARS

ONE HOUR POINT RAINFALL = 1.97 INCHES

LOG-LOG SLOPE = 50

PROJECT LOCATION = Pirate Cove Peninsula

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3

APPENDIX D

PRE/POST RUN-OFF DRAINAGE CALCULATIONS
(AES HydroWIN)

PARK MOABI NORTH PENINSULA

PIRATE COVE REDEVELOPMENT PROJECT

PARK MOABI - SAN BERNARDINO PARKS DEPARTMENT

TABLE 1 - AES SOFTWARE USED FOR CFS CALCS - VOLUME PER SBC DRAINAGE MANUAL

BASIN ID	AREA	ELEV. TOP	ELEV. BOTTOM	LENGTH	PERV/PRE	IMP/PRE	PERV POST	IMP/POST	Q100/PRE	VOLUME	Q100/POST	VOLUME	PRE/POST	BASIN VOL.	BASIN VOL	POST VOL. TO COLO.	POST VOL. RETAINED
	(Ac.)			POST	ACRES	ACRES	ACRES	ACRES	CFS	PRE(AC-FT)	CFS	POST(AC-FT)	DIFFERENCE	CUBIC FEET	AC-FT	AC-FT	AC-FT
1	2.51	468.5	463.7	416.0	2.38	0.13	2.31	0.20	10.72	0.074	10.75	0.079	0.005	NONE	NONE	0.079	0.000
2	0.42	468.4	462.9	122.0	0.41	0.01	0.27	0.14	2.37	0.011	2.37	0.022	0.010	6887	0.158	0.000	0.022
3	0.87	468.5	466.0	307.0	0.87	0.00	0.76	0.11	3.81	0.022	3.85	0.031	0.009	NONE	NONE	0.031	0.000
4	4.56	467.9	463.0	205.0	4.03	0.53	4.07	0.49	24.83	0.158	24.81	0.154	-0.003	21139	0.485	0.000	0.154
5	2.52	467.9	463.0	345.0	2.52	0.00	2.24	0.27	11.43	0.064	11.50	0.085	0.021	NONE	NONE	0.085	0.000
6	1.24	466.2	460.0	275.0	1.24	0.00	1.11	0.13	6.23	0.032	6.28	0.042	0.010	NONE	NONE	0.042	0.000
7	3.07	468.0	464.0	483.0	3.07	0.00	2.69	0.39	12.15	0.078	12.35	0.108	0.030	NONE	NONE	0.108	0.000
8	3.86	467.0	462.5	358.0	3.40	0.47	3.47	0.39	17.37	0.135	17.29	0.129	-0.006	11901	0.273	0.000	0.129
9	1.55	467.0	462.5	286.0	1.39	0.17	1.41	0.14	7.54	0.053	7.48	0.050	-0.002	10411	0.239	0.000	0.050
10	2.68	467.0	463.0	325.0	2.68	0.00	2.41	0.27	12.13	0.068	12.24	0.089	0.021	NONE	NONE	0.089	0.000
11	4.13	464.5	463.5	435.0	4.13	0.00	3.71	0.43	14.45	0.106	14.66	0.139	0.033	NONE	NONE	0.139	0.000
12	5.50	479.0	462.0	428.0	4.72	0.78	4.89	0.61	27	0.200	26.93	0.187	-0.013	13074	0.300	0.000	0.187
13	0.81	467.2	462.0	286.0	0.61	0.21	0.66	0.15	4.02	0.037	4.00	0.032	-0.004	NONE	NONE	0.032	0.000
	41.09																

VOLUME PRE(AC-FT)	VOLUME POST(AC-FT)	PRE/POST DIFFERENCE	BASIN VOL. CF	BASIN VOL AC-FT	TOTAL VOL. TO COLO. AC-FT	TOTAL VOL RETAINED AC-FT
1.038	**1.148**	**0.110**	**63412**	**1.456**	**0.606**	**0.542**

PRE REDEVELOPMENT RUN-OFF DRAINAGE CALCULATIONS
(AES HydroWIN)

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 1

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH1PRE.DAT
  TIME/DATE OF STUDY: 13:06 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   416.00
  ELEVATION DATA: UPSTREAM(FEET) =    468.50  DOWNSTREAM(FEET) =    463.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.281
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.330
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        2.38      0.61     1.000    64   14.30
COMMERCIAL                 A        0.13      1.33     0.100    17    8.28
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.953
SUBAREA RUNOFF(CFS) =     10.72
TOTAL AREA(ACRES) =      2.51   PEAK FLOW RATE(CFS) =     10.72
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        2.5  TC(MIN.) =      8.28
EFFECTIVE AREA(ACRES) =      2.51  AREA-AVERAGED Fm(INCH/HR)=  0.59
AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.953
PEAK FLOW RATE(CFS)   =      10.72
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 2

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH2PRE.DAT
   TIME/DATE OF STUDY: 13:47 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   122.00
   ELEVATION DATA: UPSTREAM(FEET) =    468.40  DOWNSTREAM(FEET) =    462.90

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.859
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        0.41      0.61     1.000    64    6.67
  COMMERCIAL                 A        0.01      1.33     0.100    17    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.979
  SUBAREA RUNOFF(CFS) =      2.37
  TOTAL AREA(ACRES) =      0.42   PEAK FLOW RATE(CFS) =      2.37
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.42  AREA-AVERAGED Fm(INCH/HR)=  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.979
  PEAK FLOW RATE(CFS)   =       2.37
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 3

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH3PRE.DAT
   TIME/DATE OF STUDY: 13:51 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
   ELEVATION DATA: UPSTREAM(FEET) =    468.50  DOWNSTREAM(FEET) =    466.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.863
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.470
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        0.86      0.61     1.000    64   13.58
  COMMERCIAL                 A        0.01      1.33     0.100    17    7.86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.990
  SUBAREA RUNOFF(CFS) =      3.81
  TOTAL AREA(ACRES) =      0.87   PEAK FLOW RATE(CFS) =      3.81
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      7.86
  EFFECTIVE AREA(ACRES) =      0.87  AREA-AVERAGED Fm(INCH/HR)=  0.60
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.990
  PEAK FLOW RATE(CFS)   =       3.81
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 4

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                            Analysis prepared by:

                             ARQ Engineering, LLC
                            4440 S. Hwy 95, Ste. A
                            Fort Mohave, AZ 86426
                                (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH4PRE.DAT
   TIME/DATE OF STUDY: 13:55 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   205.00
   ELEVATION DATA: UPSTREAM(FEET) =    467.90  DOWNSTREAM(FEET) =    463.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.394
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.604
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        4.03      0.61     1.000    64    9.31
  COMMERCIAL                 A        0.53      1.33     0.100    17    5.39
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.895
  SUBAREA RUNOFF(CFS) =     24.83
  TOTAL AREA(ACRES) =      4.56   PEAK FLOW RATE(CFS) =     24.83
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.6  TC(MIN.) =      5.39
  EFFECTIVE AREA(ACRES) =      4.56  AREA-AVERAGED Fm(INCH/HR)=  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.895
  PEAK FLOW RATE(CFS)   =      24.83
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 5

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH5PRE.DAT
   TIME/DATE OF STUDY: 13:58 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   345.00
   ELEVATION DATA: UPSTREAM(FEET) =    467.90  DOWNSTREAM(FEET) =    463.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.371
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.649
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        2.51      0.61     1.000    64   12.73
  COMMERCIAL                 A        0.01      1.33     0.100    17    7.37
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.996
  SUBAREA RUNOFF(CFS) =     11.43
  TOTAL AREA(ACRES) =      2.52   PEAK FLOW RATE(CFS) =     11.43
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.5  TC(MIN.) =      7.37
  EFFECTIVE AREA(ACRES) =      2.52  AREA-AVERAGED Fm(INCH/HR)=  0.61
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.996
  PEAK FLOW RATE(CFS)   =      11.43
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 6

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                            Analysis prepared by:

                             ARQ Engineering, LLC
                            4440 S. Hwy 95, Ste. A
                            Fort Mohave, AZ 86426
                                (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH6.DAT
   TIME/DATE OF STUDY: 14:00 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
   ELEVATION DATA: UPSTREAM(FEET) =    466.20  DOWNSTREAM(FEET) =    460.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.138
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.191
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        1.23      0.61     1.000    64   10.60
  COMMERCIAL                 A        0.01      1.33     0.100    17    6.14
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.993
  SUBAREA RUNOFF(CFS) =      6.23
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      6.23
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      6.14
  EFFECTIVE AREA(ACRES) =      1.24  AREA-AVERAGED Fm(INCH/HR)=  0.61
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.993
  PEAK FLOW RATE(CFS)   =       6.23
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 7

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH7PRE.DAT
   TIME/DATE OF STUDY: 14:03 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   483.00
   ELEVATION DATA: UPSTREAM(FEET) =    468.00  DOWNSTREAM(FEET) =    464.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.394
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.004
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        3.06      0.61     1.000    64   16.22
  COMMERCIAL                 A        0.01      1.33     0.100    17    9.39
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.997
  SUBAREA RUNOFF(CFS) =     12.15
  TOTAL AREA(ACRES) =      3.07   PEAK FLOW RATE(CFS) =     12.15
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.1  TC(MIN.) =      9.39
  EFFECTIVE AREA(ACRES) =      3.07  AREA-AVERAGED Fm(INCH/HR)=  0.61
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.997
  PEAK FLOW RATE(CFS)   =      12.15
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 8

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH8PRE.DAT
   TIME/DATE OF STUDY: 14:06 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   358.00
   ELEVATION DATA: UPSTREAM(FEET) =    467.00  DOWNSTREAM(FEET) =    462.50

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.666
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.539
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        3.40      0.61     1.000    64   13.24
  COMMERCIAL                 A        0.47      1.33     0.100    17    7.67
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.891
  SUBAREA RUNOFF(CFS) =     17.37
  TOTAL AREA(ACRES) =      3.87   PEAK FLOW RATE(CFS) =     17.37
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.9  TC(MIN.) =      7.67
  EFFECTIVE AREA(ACRES) =      3.87  AREA-AVERAGED Fm(INCH/HR)=  0.55
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.891
  PEAK FLOW RATE(CFS)   =      17.37
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 9

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH9PRE.DAT
  TIME/DATE OF STUDY: 14:09 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   286.00
  ELEVATION DATA: UPSTREAM(FEET) =    467.00  DOWNSTREAM(FEET) =    462.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.700
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.925
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        1.39      0.61     1.000    64   11.57
COMMERCIAL                 A        0.17      1.33     0.100    17    6.70
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.902
SUBAREA RUNOFF(CFS) =      7.54
TOTAL AREA(ACRES) =      1.56   PEAK FLOW RATE(CFS) =      7.54
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        1.6  TC(MIN.) =      6.70
EFFECTIVE AREA(ACRES) =      1.56  AREA-AVERAGED Fm(INCH/HR)=  0.56
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.902
PEAK FLOW RATE(CFS)   =       7.54
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 10

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH10PRE.DAT
   TIME/DATE OF STUDY: 14:11 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   325.00
   ELEVATION DATA: UPSTREAM(FEET) =    467.00  DOWNSTREAM(FEET) =    463.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.406
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.636
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        2.67      0.61     1.000    64   12.79
  COMMERCIAL                 A        0.01      1.33     0.100    17    7.41
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.997
  SUBAREA RUNOFF(CFS) =     12.13
  TOTAL AREA(ACRES) =      2.68   PEAK FLOW RATE(CFS) =     12.13
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =      7.41
  EFFECTIVE AREA(ACRES) =      2.68  AREA-AVERAGED Fm(INCH/HR)=  0.61
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.997
  PEAK FLOW RATE(CFS)   =      12.13
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 11

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH11PRE.DAT
   TIME/DATE OF STUDY: 14:13 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   435.00
   ELEVATION DATA: UPSTREAM(FEET) =    464.50  DOWNSTREAM(FEET) =    463.50

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.640
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.495
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        4.12      0.61     1.000    64   20.10
  COMMERCIAL                 A        0.01      1.33     0.100    17   11.64
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.998
  SUBAREA RUNOFF(CFS) =     14.45
  TOTAL AREA(ACRES) =      4.13   PEAK FLOW RATE(CFS) =     14.45
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.1  TC(MIN.) =     11.64
  EFFECTIVE AREA(ACRES) =      4.13  AREA-AVERAGED Fm(INCH/HR)=  0.61
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.998
  PEAK FLOW RATE(CFS)   =      14.45
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 12

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH12PRE.DAT
   TIME/DATE OF STUDY: 14:16 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   428.00
   ELEVATION DATA: UPSTREAM(FEET) =    479.00  DOWNSTREAM(FEET) =    462.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.541
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.997
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        4.72      0.61     1.000    64   11.30
  COMMERCIAL                 A        0.78      1.33     0.100    17    6.54
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.872
  SUBAREA RUNOFF(CFS) =     27.00
  TOTAL AREA(ACRES) =      5.50   PEAK FLOW RATE(CFS) =     27.00
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.5  TC(MIN.) =      6.54
  EFFECTIVE AREA(ACRES) =      5.50  AREA-AVERAGED Fm(INCH/HR)=  0.54
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.872
  PEAK FLOW RATE(CFS)   =      27.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Pre-Developed

Basin 13

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH13PRE.DAT
   TIME/DATE OF STUDY: 14:18 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   286.00
   ELEVATION DATA: UPSTREAM(FEET) =    467.20  DOWNSTREAM(FEET) =    462.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.509
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.012
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        0.61      0.61     1.000    64   11.24
  COMMERCIAL                 A        0.20      1.33     0.100    17    6.51
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.778
  SUBAREA RUNOFF(CFS) =      4.02
  TOTAL AREA(ACRES) =      0.81   PEAK FLOW RATE(CFS) =      4.02
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =      6.51
  EFFECTIVE AREA(ACRES) =      0.81  AREA-AVERAGED Fm(INCH/HR)=  0.49
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 0.778
  PEAK FLOW RATE(CFS)   =       4.02
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

POST REDEVELOPMENT RUN-OFF DRAINAGE CALCULATIONS
(AES HydroWIN)

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 1

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2012 Advanced Engineering Software (aes)
             Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ---------------------------------------------------------------------------
   FILE NAME: PNH1PST.DAT
   TIME/DATE OF STUDY: 14:37 09/11/2012
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ***************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   416.00
   ELEVATION DATA: UPSTREAM(FEET) =    468.50  DOWNSTREAM(FEET) =    463.70

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.281
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.330
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        2.31      0.61     1.000    64   14.30
  COMMERCIAL                 A        0.20      1.33     0.100    17    8.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.928
  SUBAREA RUNOFF(CFS) =     10.75
  TOTAL AREA(ACRES) =      2.51   PEAK FLOW RATE(CFS) =     10.75
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.5  TC(MIN.) =      8.28
  EFFECTIVE AREA(ACRES) =      2.51  AREA-AVERAGED Fm(INCH/HR)=  0.57
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.928
  PEAK FLOW RATE(CFS)   =      10.75
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 2

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH2PST.DAT
  TIME/DATE OF STUDY: 14:41 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   122.00
  ELEVATION DATA: UPSTREAM(FEET) =    468.40  DOWNSTREAM(FEET) =    462.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.859
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        0.27      0.61     1.000    64    6.67
COMMERCIAL                 A        0.14      1.33     0.100    17    5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.65
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.693
SUBAREA RUNOFF(CFS) =      2.37
TOTAL AREA(ACRES) =      0.41   PEAK FLOW RATE(CFS) =      2.37
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      5.00
EFFECTIVE AREA(ACRES) =      0.41  AREA-AVERAGED Fm(INCH/HR)=  0.45
AREA-AVERAGED Fp(INCH/HR) =  0.65  AREA-AVERAGED Ap = 0.693
PEAK FLOW RATE(CFS)   =       2.37
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 3

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH3PST.DAT
  TIME/DATE OF STUDY: 10:31 09/13/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
  ELEVATION DATA: UPSTREAM(FEET) =    468.50  DOWNSTREAM(FEET) =    466.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.863
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.470
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        0.76      0.61     1.000    64   13.58
COMMERCIAL                 A        0.11      1.33     0.100    17    7.86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
SUBAREA RUNOFF(CFS) =      3.85
TOTAL AREA(ACRES) =      0.87   PEAK FLOW RATE(CFS) =      3.85
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      7.86
EFFECTIVE AREA(ACRES) =      0.87  AREA-AVERAGED Fm(INCH/HR)=  0.55
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.886
PEAK FLOW RATE(CFS)   =       3.85
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 4

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ----------------------------------------------------------------------------
   FILE NAME: PNH4PST.DAT
   TIME/DATE OF STUDY: 14:48 09/11/2012
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ----------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   205.00
   ELEVATION DATA: UPSTREAM(FEET) =    467.90  DOWNSTREAM(FEET) =    463.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.394
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.604
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        4.07      0.61     1.000    64    9.31
COMMERCIAL                 A        0.49      1.33     0.100    17    5.39
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.903
SUBAREA RUNOFF(CFS) =     24.81
TOTAL AREA(ACRES) =      4.56   PEAK FLOW RATE(CFS) =     24.81
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        4.6  TC(MIN.) =      5.39
EFFECTIVE AREA(ACRES) =      4.56  AREA-AVERAGED Fm(INCH/HR)=  0.56
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.903
PEAK FLOW RATE(CFS)   =      24.81
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 5

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ----------------------------------------------------------------------------
   FILE NAME: PNH5PST.DAT
   TIME/DATE OF STUDY: 14:51 09/11/2012
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ----------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   345.00
   ELEVATION DATA: UPSTREAM(FEET) =    467.90  DOWNSTREAM(FEET) =    463.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.371
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.649
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        2.24      0.61     1.000    64   12.73
COMMERCIAL                 A        0.27      1.33     0.100    17    7.37
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.903
SUBAREA RUNOFF(CFS) =     11.50
TOTAL AREA(ACRES) =      2.51   PEAK FLOW RATE(CFS) =     11.50
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        2.5  TC(MIN.) =      7.37
EFFECTIVE AREA(ACRES) =      2.51  AREA-AVERAGED Fm(INCH/HR)=  0.56
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.903
PEAK FLOW RATE(CFS)   =      11.50
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 6

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

 ----------------------------------------------------------------------------
   FILE NAME: PNH6PST.DAT
   TIME/DATE OF STUDY: 14:54 09/11/2012
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
 ----------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
   ELEVATION DATA: UPSTREAM(FEET) =    466.20  DOWNSTREAM(FEET) =    460.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.138
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.191
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        1.11      0.61     1.000    64   10.60
COMMERCIAL                 A        0.13      1.33     0.100    17    6.14
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.906
SUBAREA RUNOFF(CFS) =      6.28
TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      6.28
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      6.14
EFFECTIVE AREA(ACRES) =      1.24  AREA-AVERAGED Fm(INCH/HR)=  0.56
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.906
PEAK FLOW RATE(CFS)   =       6.28
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 7

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH7PST.DAT
  TIME/DATE OF STUDY: 14:57 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   483.00
  ELEVATION DATA: UPSTREAM(FEET) =    468.00  DOWNSTREAM(FEET) =    464.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.394
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.004
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        2.69      0.61     1.000    64   16.22
COMMERCIAL                 A        0.39      1.33     0.100    17    9.39
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
SUBAREA RUNOFF(CFS) =     12.35
TOTAL AREA(ACRES) =      3.08   PEAK FLOW RATE(CFS) =     12.35
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        3.1  TC(MIN.) =      9.39
EFFECTIVE AREA(ACRES) =      3.08  AREA-AVERAGED Fm(INCH/HR)=  0.55
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.886
PEAK FLOW RATE(CFS)   =      12.35
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 8

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH8PST.DAT
  TIME/DATE OF STUDY: 14:59 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   358.00
  ELEVATION DATA: UPSTREAM(FEET) =    467.00  DOWNSTREAM(FEET) =    462.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.666
```

```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.539
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        3.47      0.61     1.000    64   13.24
  COMMERCIAL                 A        0.39      1.33     0.100    17    7.67
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.909
  SUBAREA RUNOFF(CFS) =     17.29
  TOTAL AREA(ACRES) =      3.86   PEAK FLOW RATE(CFS) =     17.29
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.9  TC(MIN.) =      7.67
  EFFECTIVE AREA(ACRES) =      3.86  AREA-AVERAGED Fm(INCH/HR)=  0.56
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.909
  PEAK FLOW RATE(CFS)   =      17.29
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 9

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH9PST.DAT
  TIME/DATE OF STUDY: 15:10 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   286.00
  ELEVATION DATA: UPSTREAM(FEET) =    467.00  DOWNSTREAM(FEET) =    462.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.700
```

```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.925
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        1.41      0.61     1.000    64   11.57
  COMMERCIAL                 A        0.14      1.33     0.100    17    6.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.919
  SUBAREA RUNOFF(CFS) =      7.48
  TOTAL AREA(ACRES) =      1.55   PEAK FLOW RATE(CFS) =      7.48
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.5  TC(MIN.) =      6.70
  EFFECTIVE AREA(ACRES) =      1.55  AREA-AVERAGED Fm(INCH/HR)=  0.57
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.919
  PEAK FLOW RATE(CFS)   =       7.48
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 10

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH10PST.DAT
  TIME/DATE OF STUDY: 15:13 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   325.00
  ELEVATION DATA: UPSTREAM(FEET) =    467.00  DOWNSTREAM(FEET) =    463.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.406
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.636
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        2.41      0.61     1.000    64   12.79
COMMERCIAL                 A        0.27      1.33     0.100    17    7.41
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.909
SUBAREA RUNOFF(CFS) =     12.24
TOTAL AREA(ACRES) =      2.68   PEAK FLOW RATE(CFS) =     12.24
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =      7.41
EFFECTIVE AREA(ACRES) =      2.68  AREA-AVERAGED Fm(INCH/HR)=  0.56
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.909
PEAK FLOW RATE(CFS)   =      12.24
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 11

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH11PST.DAT
  TIME/DATE OF STUDY: 15:15 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   435.00
  ELEVATION DATA: UPSTREAM(FEET) =    464.50  DOWNSTREAM(FEET) =    463.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.640
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.495
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        3.71      0.61     1.000    64   20.10
COMMERCIAL                 A        0.43      1.33     0.100    17   11.64
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.907
SUBAREA RUNOFF(CFS) =     14.66
TOTAL AREA(ACRES) =      4.14   PEAK FLOW RATE(CFS) =     14.66
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        4.1  TC(MIN.) =     11.64
EFFECTIVE AREA(ACRES) =      4.14  AREA-AVERAGED Fm(INCH/HR)=  0.56
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.907
PEAK FLOW RATE(CFS)   =      14.66
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 12

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH12PST.DAT
  TIME/DATE OF STUDY: 15:18 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   428.00
  ELEVATION DATA: UPSTREAM(FEET) =    479.00  DOWNSTREAM(FEET) =    462.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.541
```

```
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.997
SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
NATURAL DESERT COVER
"DESERT BRUSH"   (40.0%)   B        4.89      0.61     1.000    64   11.30
COMMERCIAL                 A        0.61      1.33     0.100    17    6.54
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
SUBAREA RUNOFF(CFS) =     26.93
TOTAL AREA(ACRES) =      5.50   PEAK FLOW RATE(CFS) =     26.93
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        5.5  TC(MIN.) =      6.54
EFFECTIVE AREA(ACRES) =      5.50  AREA-AVERAGED Fm(INCH/HR)=  0.56
AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.900
PEAK FLOW RATE(CFS)   =      26.93
==============================================================================
==============================================================================
END OF RATIONAL METHOD ANALYSIS
```

♀

Pirate Cove Peninsula Improvements North

Post-Developed

Basin 13

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
          (c) Copyright 1983-2012 Advanced Engineering Software (aes)
              Ver. 19.0  Release Date: 06/01/2012  License ID 1644

                              Analysis prepared by:

                               ARQ Engineering, LLC
                              4440 S. Hwy 95, Ste. A
                              Fort Mohave, AZ 86426
                                  (928)758-3333

----------------------------------------------------------------------------
  FILE NAME: PNH13PST.DAT
  TIME/DATE OF STUDY: 15:20 09/11/2012
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  24.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.01
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.5000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.9800

  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE      1.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   286.00
  ELEVATION DATA: UPSTREAM(FEET) =    467.20  DOWNSTREAM(FEET) =    462.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.509
```

```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.012
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL DESERT COVER
  "DESERT BRUSH"   (40.0%)   B        0.66      0.61     1.000    64   11.24
  COMMERCIAL                 A        0.15      1.33     0.100    17    6.51
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.63
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.833
  SUBAREA RUNOFF(CFS) =      4.00
  TOTAL AREA(ACRES) =      0.81   PEAK FLOW RATE(CFS) =      4.00
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =      6.51
  EFFECTIVE AREA(ACRES) =      0.81  AREA-AVERAGED Fm(INCH/HR)=  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.63  AREA-AVERAGED Ap = 0.833
  PEAK FLOW RATE(CFS)   =       4.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

PRE/POST REDEVELOPMENT RUNOFF VOLUMES CALCULATIONS
(SBC DRAINAGE MANUAL)

Runoff volume Estimation

The catchment yield fraction will be used to approximate the total runoff produced from a 24-hour duration precipitation event. The basis of this determination is the curve number approach which provides a rainfall-runoff relationship. This method is used per the San Bernardino County Drainage Manual.

$P_{2,24}$= 1.19

$P_{10,24}$= 2.03 Using 5yr rainfall = 1.64

$P_{25,24}$= 2.60 Using 10yr rainfall = 2.03

$P_{100,24}$= 3.58 Using 25yr rainfall = 2.60

SCS CN for Pervious Areas - Natural Desert Cover "Desert Brush" 40% = 64

SCS CN for Impervious Areas - Commercial Development = 17

S (Soil Capacity) = (1000/CN) – 10

Ia = (0.2)S

$Y_1 = (P_{24}\text{-Ia})^2 / (P_{24}\text{-Ia+S})P_{24}$

$Y_2 = (Y_1\text{*area pervious\%})+(Y_1\text{*area impervious\%})$

Volume = $Y_2P_{24}A(0.0833)$

Example:

BASIN A A = 1.12ac.

Y_2 = (0.117*0.85)+(0.474*0.15)= 0.171

CN PERV = 64

V = (0.171)(2.6)(1.12)(0.0833) = 0.0415 Ac/ft

CN IMPERV = 17

AREA % PERVIOUS = 0.85

AREA % IMPERVIOUS 0.15

S_{perv} = (1000/64)-10 = 5.625

S_{imperv} = (1000/17)-10 = 48.823

Ia_{perv} = (0.2)5.625 = 1.125

Ia_{imperv} = (0.2)48.823 = 9.765

$Y_{1,perv} = (2.6\text{-}1.125)^2/((2.6\text{-}1.125+5.625)2.6)= 0.117$

$Y_{1,imperv} = (2.6\text{-}9.765)^2/((2.6\text{-}9.765+48.823)2.6)= 0.474$

PRE REDEVELOPMENT RUN-OFF VOLUME CALCULATIONS
(SBC Drainage Manual)

PARK MOABI NORTH PENINSULA

PIRATE COVE REDEVELOPMENT PROJECT

PARK MOABI - SAN BERNARDINO PARKS DEPARTMENT

PRE-DEVELOPED CALULATIONS FOR VOLUME

P = 2 YR, 24 HR

USING 2 YEAR RAINFALL

SAN BERNARDINO VOLUME CALCULATIONS

BASIN ID	RAINFALL	SCS CN PRE	SCS CN PRE	AREA	AREA	SOIL CAPACITY	SOIL CAPACITY	Ia	Ia	YIELD	YIELD	SUB-AREA YIELD-PRE	VOLUME PRE	VOLUME PRE
	P2,24	CN PERV	CN IMP	% PERV	% IMPERV	S - PERV	S - IMPERV	PERV	IMPERV	Y - PERV	Y - IMPERV	Y - TOTAL	AC/FT	CU/FT
1	1.19	64	17	0.95	0.05	5.63	48.82	1.13	9.76	0.001	1.535	0.08	0.020	883.05
2	1.19	64	17	0.98	0.02	5.63	48.82	1.13	9.76	0.001	1.535	0.04	0.002	69.40
3	1.19	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.001	1.535	0.00	0.000	2.35
4	1.19	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.001	1.535	0.18	0.081	3545.94
5	1.19	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.001	1.535	0.00	0.000	6.78
6	1.19	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.001	1.535	0.00	0.000	3.33
7	1.19	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.001	1.535	0.00	0.000	8.28
8	1.19	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.001	1.535	0.19	0.071	3096.63
9	1.19	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.001	1.535	0.17	0.025	1109.15
10	1.19	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.001	1.535	0.00	0.000	7.21
11	1.19	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.001	1.535	0.00	0.000	11.14
12	1.19	64	17	0.86	0.14	5.63	48.82	1.13	9.76	0.001	1.535	0.22	0.119	5171.77
13	1.19	64	17	0.75	0.25	5.63	48.82	1.13	9.76	0.001	1.535	0.39	0.032	1374.29
												TOTAL PRE100	0.351	15289.32

PARK MOABI NORTH PENINSULA

PIRATE COVE REDEVELOPMENT PROJECT

PARK MOABI - SAN BERNARDINO PARKS DEPARTMENT

PRE-DEVELOPED CALULATIONS FOR VOLUME

P = 10 YR, 24 HR

USING 5 YEAR RAINFALL

SAN BERNARDINO VOLUME CALCULATIONS

BASIN ID	RAINFALL	SCS CN PRE	SCS CN PRE	AREA	AREA	SOIL CAPACITY	SOIL CAPACITY	Ia	Ia	YIELD	YIELD	SUB-AREA YIELD-PRE	VOLUME PRE	VOLUME PRE
	P5,24	CN PERV	CN IMP	% PERV	% IMPERV	S - PERV	S - IMPERV	PERV	IMPERV	Y - PERV	Y - IMPERV	Y - TOTAL	AC/FT	CU/FT
1	1.64	64	17	0.95	0.05	5.63	48.82	1.13	9.76	0.026	0.989	0.08	0.026	1151.18
2	1.64	64	17	0.98	0.02	5.63	48.82	1.13	9.76	0.026	0.989	0.05	0.003	124.41
3	1.64	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.026	0.989	0.03	0.003	136.76
4	1.64	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.026	0.989	0.14	0.087	3770.39
5	1.64	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.026	0.989	0.03	0.009	394.47
6	1.64	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.026	0.989	0.03	0.004	193.87
7	1.64	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.026	0.989	0.03	0.011	481.95
8	1.64	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.026	0.989	0.14	0.075	3273.77
9	1.64	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.026	0.989	0.13	0.028	1198.95
10	1.64	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.026	0.989	0.03	0.010	419.71
11	1.64	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.026	0.989	0.03	0.015	648.16
12	1.64	64	17	0.86	0.14	5.63	48.82	1.13	9.76	0.026	0.989	0.16	0.122	5320.49
13	1.64	64	17	0.75	0.25	5.63	48.82	1.13	9.76	0.026	0.989	0.27	0.030	1313.76
												TOTAL PRE100	0.423	18427.85

PARK MOABI NORTH PENINSULA

PIRATE COVE REDEVELOPMENT PROJECT

PARK MOABI - SAN BERNARDINO PARKS DEPARTMENT

PRE-DEVELOPED CALULATIONS FOR VOLUME

P = 25 YR, 24 HR

USING 10 YEAR RAINFALL

SAN BERNARDINO VOLUME CALCULATIONS

BASIN ID	RAINFALL	SCS CN PRE	SCS CN PRE	AREA	AREA	SOIL CAPACITY	SOIL CAPACITY	Ia	Ia	YIELD	YIELD	SUB-AREA YIELD-PRE	VOLUME PRE	VOLUME PRE
	P10,24	CN PERV	CN IMP	% PERV	% IMPERV	S - PERV	S - IMPERV	PERV	IMPERV	Y - PERV	Y - IMPERV	Y - TOTAL	AC/FT	CU/FT
1	2.03	64	17	0.95	0.05	5.63	48.82	1.13	9.76	0.062	0.717	0.10	0.041	1781.31
2	2.03	64	17	0.98	0.02	5.63	48.82	1.13	9.76	0.062	0.717	0.08	0.006	239.61
3	2.03	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.062	0.717	0.06	0.009	397.10
4	2.03	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.062	0.717	0.14	0.107	4651.82
5	2.03	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.062	0.717	0.06	0.026	1145.38
6	2.03	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.062	0.717	0.06	0.013	562.92
7	2.03	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.062	0.717	0.06	0.032	1399.38
8	2.03	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.062	0.717	0.14	0.092	4007.00
9	2.03	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.062	0.717	0.13	0.035	1512.55
10	2.03	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.062	0.717	0.06	0.028	1218.68
11	2.03	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.062	0.717	0.06	0.043	1881.99
12	2.03	64	17	0.86	0.14	5.63	48.82	1.13	9.76	0.062	0.717	0.15	0.144	6260.43
13	2.03	64	17	0.75	0.25	5.63	48.82	1.13	9.76	0.062	0.717	0.23	0.031	1369.96
												TOTAL PRE100	0.607	26428.11

PARK MOABI NORTH PENINSULA

PIRATE COVE REDEVELOPMENT PROJECT

PARK MOABI - SAN BERNARDINO PARKS DEPARTMENT

PRE-DEVELOPED CALULATIONS FOR VOLUME

P = 100 YR, 24 HR

USING 25 YEAR RAINFALL

SAN BERNARDINO VOLUME CALCULATIONS

BASIN ID	RAINFALL	SCS CN PRE	SCS CN PRE	AREA	AREA	SOIL CAPACITY	SOIL CAPACITY	Ia	Ia	YIELD	YIELD	SUB-AREA YIELD-PRE	VOLUME PRE	VOLUME PRE
	P25,24	CN PERV	CN IMP	% PERV	% IMPERV	S - PERV	S - IMPERV	PERV	IMPERV	Y - PERV	Y - IMPERV	Y - TOTAL	AC/FT	CU/FT
1	2.6	64	17	0.95	0.05	5.63	48.82	1.13	9.76	0.118	0.474	0.14	0.074	3236.20
2	2.6	64	17	0.98	0.02	5.63	48.82	1.13	9.76	0.118	0.474	0.13	0.011	498.45
3	2.6	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.118	0.474	0.12	0.022	970.17
4	2.6	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.118	0.474	0.16	0.158	6865.74
5	2.6	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.118	0.474	0.12	0.064	2798.27
6	2.6	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.118	0.474	0.12	0.032	1375.28
7	2.6	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.118	0.474	0.12	0.078	3418.83
8	2.6	64	17	0.88	0.12	5.63	48.82	1.13	9.76	0.118	0.474	0.16	0.135	5860.05
9	2.6	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.118	0.474	0.16	0.053	2288.43
10	2.6	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.118	0.474	0.12	0.068	2977.35
11	2.6	64	17	1.00	0.00	5.63	48.82	1.13	9.76	0.118	0.474	0.12	0.106	4597.89
12	2.6	64	17	0.86	0.14	5.63	48.82	1.13	9.76	0.118	0.474	0.17	0.200	8728.90
13	2.6	64	17	0.75	0.25	5.63	48.82	1.13	9.76	0.118	0.474	0.21	0.037	1599.97
												TOTAL PRE100	1.038	45215.55

POST REDEVELOPMENT RUN-OFF VOLUME CALCULATIONS
(SBC Drainage Manual)

PARK MOABI NORTH PENINSULA

PIRATE COVE REDEVELOPMENT PROJECT

PARK MOABI - SAN BERNARDINO PARKS DEPARTMENT

POST-DEVELOPED CALCULATIONS FOR VOLUME

P = 25 YR, 24 HR

SAN BERNARDINO VOLUME CALCULATIONS

BASIN ID	RAINFALL	CS CN POS	CS CN POS	AREA	AREA	SOIL CAPACITY	SOIL CAPACITY	Ia	Ia	YIELD	YIELD	SUB-AREA YIELD	VOLUME POST	VOLUME POST
	P100,24	CN PERV	CN IMP	% PERV	% IMPERV	S - PERV	S - IMPERV	PERV	IMPERV	Y - PERV	Y - PERV	Y - TOTAL	AC/FT	CU/FT
1	2.6	64	17	0.92	0.08	5.63	48.82	1.13	9.76	0.12	0.47	0.15	0.079	3462.38
2	2.6	64	17	0.66	0.34	5.63	48.82	1.13	9.76	0.12	0.47	0.24	0.022	942.06
3	2.6	64	17	0.87	0.13	5.63	48.82	1.13	9.76	0.12	0.47	0.16	0.031	1349.92
4	2.6	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.12	0.47	0.16	0.154	6727.29
5	2.6	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.12	0.47	0.16	0.085	3709.00
6	2.6	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.12	0.47	0.16	0.042	1814.85
7	2.6	64	17	0.87	0.13	5.63	48.82	1.13	9.76	0.12	0.47	0.16	0.108	4720.74
8	2.6	64	17	0.90	0.10	5.63	48.82	1.13	9.76	0.12	0.47	0.15	0.129	5597.59
9	2.6	64	17	0.91	0.09	5.63	48.82	1.13	9.76	0.12	0.47	0.15	0.050	2196.02
10	2.6	64	17	0.90	0.10	5.63	48.82	1.13	9.76	0.12	0.47	0.15	0.089	3880.35
11	2.6	64	17	0.90	0.10	5.63	48.82	1.13	9.76	0.12	0.47	0.15	0.139	6034.23
12	2.6	64	17	0.89	0.11	5.63	48.82	1.13	9.76	0.12	0.47	0.16	0.187	8155.57
13	2.6	64	17	0.81	0.19	5.63	48.82	1.13	9.76	0.12	0.47	0.18	0.032	1413.79
												TOTAL POST100	1.148	50003.78