MEMORANDUM
Floodplain Management
Regional Flood Control District

DATE: January 21, 2009

TO: Suzanne Shields, P.E.
Director and Chief Engineer

FROM: Eric Shepp, P.E. Manager
Floodplain Management Division

SUBJECT: Special Study #1: Drainage Report for Arivaca Area Plan

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SUMMARY:

Special Study #1: Drainage Report for Arivaca Area Plan (hereafter Report) dated March 1972 covers an area in southeastern Pima County that drains the Arivaca Creek watershed. The purpose of the Report is to estimate peak discharge for the 50 year storm frequency event, utilizing the rational method (Q=CiA). This method pre-dates the method outlined in the Hydrology Manual for Engineering Design and Floodplain Management within Pima County, September 1979, and is considered less accurate.

Watershed delineations were completed using USGS 15 minute quadrangles and Topography Sheets obtained from Cooper Aerial Service dated 12-15-1971. The Topography Sheets are not made part of the Report so it is not possible to determine the quality of those documents.

A search for the source of the rainfall data was unsuccessful, though the data pre-dates the NOAA2 Atlas data, which was published in 1973. The rainfall data apparently comes from a study published in 1956.

The information from this study has not been included in any of our internal GIS data.

RECOMMENDATIONS:

It is recommended that the Drainage Report for Arivaca Area Plan be archived and **discontinued for use** for regulatory purposes for the following reasons.

1) The rainfall data cannot be verified and compared to the NOAA14 Atlas that is the current regulatory standard.
2) The method for determining peak discharge is out of date.
3) The Report does not provide 100 year return frequency peak discharges. Extrapolating 100-year return frequency peak discharges from the existing data, given the limitations of the rainfall and methodology, would lead to highly suspect results.

Further, it is recommended that these watersheds be re-evaluated using the NOAA14 Atlas for the 100-year return frequency. FPM staff is available to provide updated hydrology using PC-Hydro for those watersheds less than 1 sq. mile. The larger watersheds should be completed using HEC-1/HEC HMS

APPROVED: _____ 1/23/2009
Suzanne Shields   Date

DRAINAGE REPORT

for

ARIVACA AREA PLAN

prepared for

NATIONWIDE LAND & DEVELOPMENT CO.
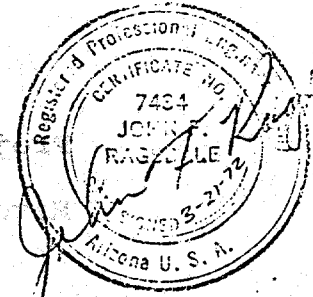

Prepared by

BLANTON & CO.
ARCHITECTS-ENGINEERS
Tucson, Arizona

Project No. 72-009

March 1972

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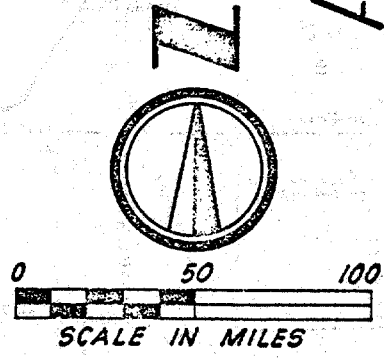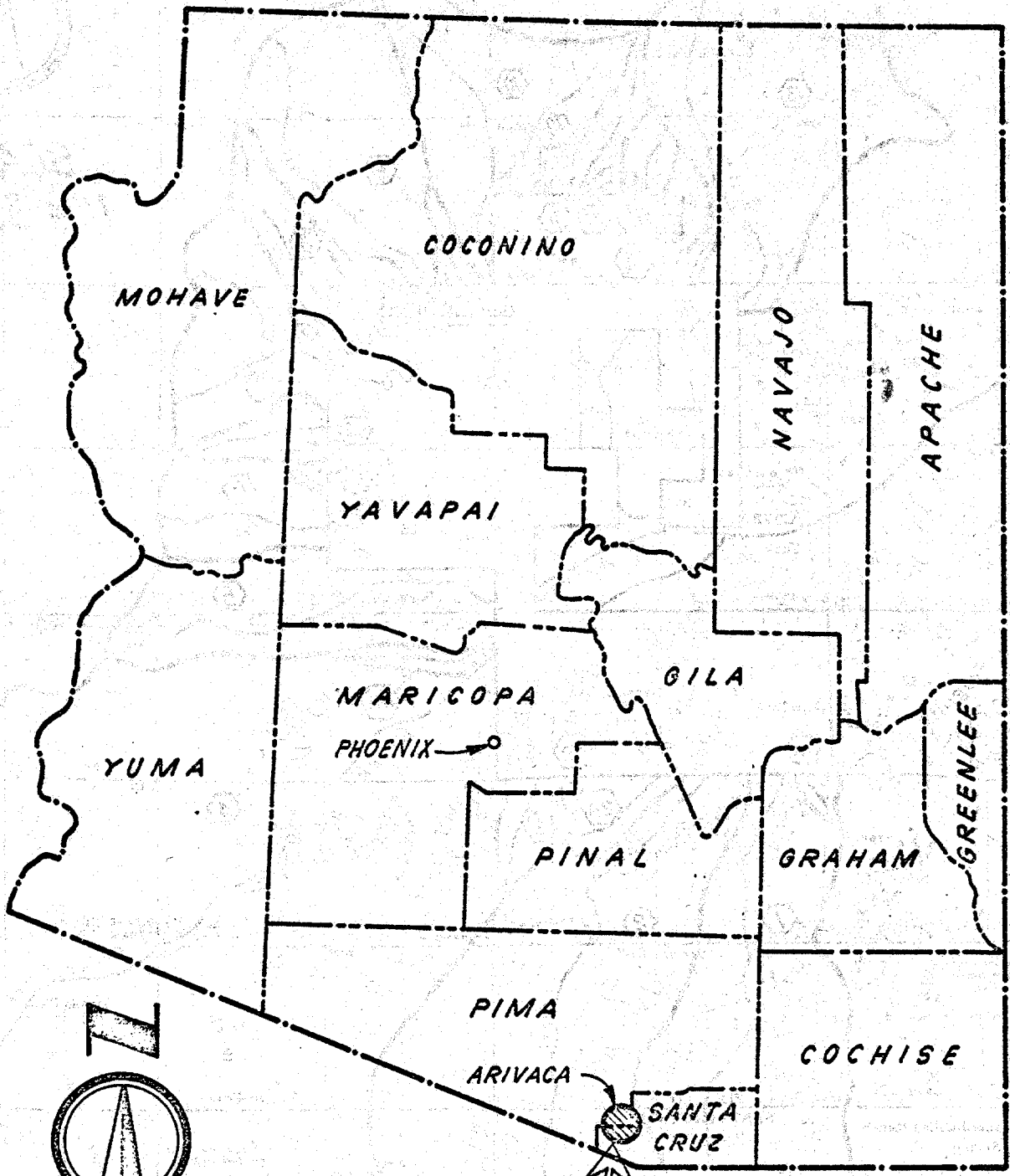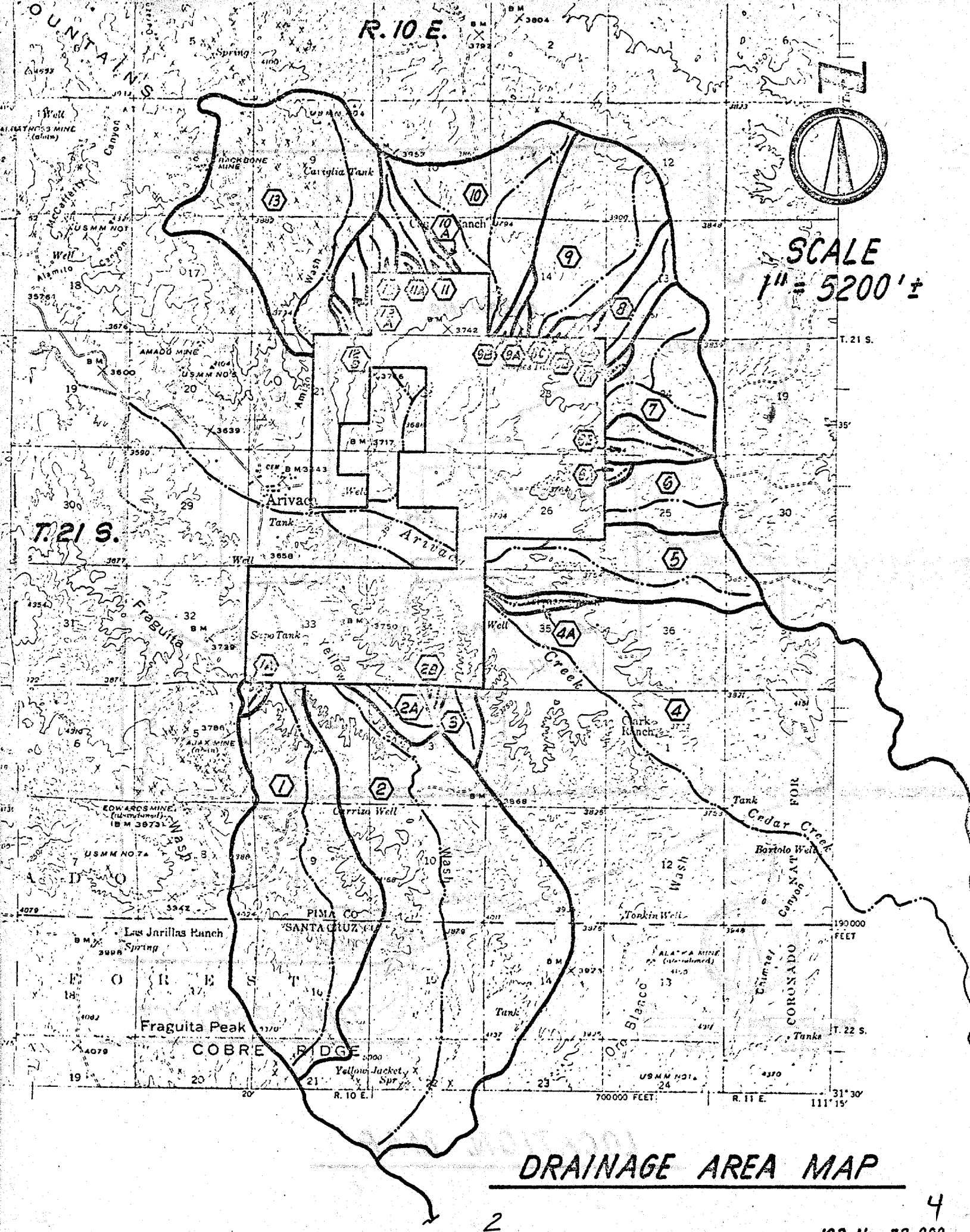
COCONINO

MOHAVE

NAVAJO

APACHE

YAVAPAI

GILA

MARICOPA

PHOENIX

YUMA

GREENLEE

PINAL

GRAHAM

PIMA

COCHISE

ARIVACA

SANTA CRUZ

THIS PROJECT

0   50   100

SCALE IN MILES

LOCATION MAP

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DRAINAGE AREA MAP

SCALE
1" = 5200'±

I. GENERAL DISCUSSION

The Area included in this study is located within Section 23, 33, and 34 and portions of Sections 15, 21, 22, 26, 27 and 28, T-21-S, R-10-E, Gila & Salt River, Base & Meridian, Pima County, Arizona.

The drainages in this area cross the above referenced land in various directions toward Arivaca Creek. Arivaca Creek generally runs Northwest and just south of the Los Guijas Mountains. There are many small tributaries contributing to Arivaca Creek.

The moisture-laden air masses which cause precipitation are of various types and come from several sources.

Winter storms are usually caused by moisture-laden polar-Pacific air entering from the west or the northwest during the period of October through May. Accumulation of snow in the higher altitudes is usually from this source. There is no significant snow melt runoff for this area.

Tropical air from the Gulf of Mexico, enters from the south and southeast during the summer months of July through September. This air mass is the source of the high intensity convective storms for this area.

Tropical Pacific air masses from the south and southwest during the summer months of July through September are rare but have caused some flooding.

The Arivaca drainage basin is located in the low mountainous area between the Altar and Santa Cruz Valleys in southern Arizona. This area is composed of primarily volcanic materials and clays.

In general, for this watershed, it may be stated that high intensity storms over small areas are the principal cause of flood water. Peak flows in this desert area most generally occur in the summer months from July through September.

II. PURPOSE

The purpose of this report is to estimate by generally accepted methods, the quantity of storm runoff that could be reasonably expected in this area of study. The rational method was used in the computations of this runoff.

III. CRITERIA FOR STUDY

     A.   50 year storm frequency for quantities of water exceeding 1000 cubic feet per second.

     B.   25 year storm frequency for quantities of water less than 1000 cubic feet per second.

     C.   Rational formula for runoff water; $Q = AiC$

        1. Q = quantity of runoff water in cubic feet per second.

        2. A = Area in Acres.

        3. i = intensity of rainfall in inches per hour.

        4. C = runoff coefficient

IV. CALCULATIONS

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage Study_   Project No. _72-009_
Location _DA #1_   Co. No.   Co-
County _Pima_   Station
Name of Stream

DESIGN DATA

Design Frequency		_50_	years
Drainage Area	A_1	_1719_	acres
	A_2		acres
	A_3		acres
Drainage Length		_18538_	feet
Elevation			
Top of Drainage Area		_4850_	feet
At Structure		_3750_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_43_	minutes
Rainfall Intensity	i	_3.3_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA =	_1719×0.5×3.3 = 2836_		cfs

Computed by _R_   date _3-72_
Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_ Project No. _72-009_

Location _DA # 1-A_ Co. No. Co- _____

County _Pima_ Station _____

Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_28_	acres
	A_2		acres
	A_3		acres
Drainage Length		_1600_	feet
Elevation			
Top of Drainage Area		_3800_	feet
At Structure		_3750_	feet
Drainage Area Slope			%
Precipitation			
P = 6 hour			inches
P = 24 hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	T_c	_10_	minutes
Rainfall Intensity	i	_6.9_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge Q_p = CiA = $28 \times 6.9 \times 0.5$ = _94_ cfs

Computed by _W_   date _3-72_

Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Avvvara drainage study_ Project No. _77-000_
Location _DA # 2_ Co. No. Co-
County _Pima_ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		_50_	years
Drainage Area	A_1	_3393_	acres
	A_2	_____	acres
	A_3	_____	acres
Drainage Length		_3427_	feet
Elevation			
Top of Drainage Area		_2200_	feet
At Structure		_2000_	feet
Drainage Area Slope		_____	%
Precipitation			
P = 6 hour		_____	inches
P = 24 hour		_____	inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour		_____	inches
Time of Concentration	Tc	_63_	minutes
Rainfall Intensity	i	_2.78_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2	_____	
	C_3	_____	
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge Q_p = CiA = $3393 \times 2.78 \times 0.5$ = _4959_ cfs

Computed by ___J.C.___ date _3-72_
Checked by ___SJT___ date _3-72_

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project *Arizona drainage study*   Project No. 72-009
Location *Q# 2-9*   Co. No. Co-
County *Pima*   Station
Name of Stream

DESIGN DATA

Design Frequency   25   years
Drainage Area A_1 99   acres
                           A_2 acres
                           A_3 acres

Drainage Length   4500   feet
Elevation
   Top of Drainage Area   3800   feet
   At Structure   3920   feet
Drainage Area Slope   %
Precipitation
   P = 6-hour   inches
   P = 24-hour   inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour   inches
Time of Concentration Tc 23   minutes
Rainfall Intensity i 4.2   inches/hour
Runoff Coefficient C_1 0.5
                           C_2
                           C_3
Weighted Runoff Coefficient C 0.5
Peak Discharge $Qp = CiA = 99 \times 4.2 \times 0.5 = 208$ cfs

Computed by ____JR____   date __3-72__
Checked by ____SJT____   date __3-72__

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arizona drainage study_   Project No. _72-009_

Location _DA # 2B_   Co. No. Co- _____

County _PIMA_   Station _____

Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_27_	acres
	A_2		acres
	A_3		acres
Drainage Length		_1700_	feet
Elevation			
Top of Drainage Area		_3800_	feet
At Structure		_3750_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_10_	minutes
Rainfall Intensity	i	_6.9_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA = $27 \times 6.9 \times 0.5$ =		_93_	cfs

Computed by _JP_   date _3-72_

Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_ Project No. _22-000_
Location _LA. # 3_ Co. No. Co- _____
County _Pima_ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency _____25_____ years
Drainage Area A_1 _____137_____ acres
       A_2 _____ acres
       A_3 _____ acres
Drainage Length _____3645_____ feet
Elevation
   Top of Drainage Area _____3800_____ feet
   At Structure _____3740_____ feet
Drainage Area Slope _____ %
Precipitation
   P = 6 hour _____ inches
   P = 24 hour _____ inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour _____ inches
Time of Concentration   Tc _____21_____ minutes
Rainfall Intensity   i _____4.7_____ inches/hour
Runoff Coefficient C_1 _____0.5_____
       C_2 _____
       C_3 _____
Weighted Runoff Coefficient   C _____0.5_____
Peak Discharge $Qp = CiA = 137 \times 4.7 \times 0.5 = 322$ cfs

Computed by _____JR_____ date _3-72_
Checked by _____SJT_____ date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

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LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_
Location _QA # 4_   Co. No. Co- _____
County _Pima_   Station _____
Name of Stream _Arivaca Creek_

DESIGN DATA

Design Frequency		_50_	years
Drainage Area	A_1	_21,214_	acres
	A_2		acres
	A_3		acres
Drainage Length		_58,329_	feet
Elevation			
Top of Drainage Area		_4750_	feet
At Structure		_3700_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_168_	minutes
Rainfall Intensity	i	_1.2_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge Qp = CiA = $21,214 \times 1.2 \times 0.5 = $ _12,728_ cfs

Computed by _IR_   date _3-72_
Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_ Project No. _72-009_
Location _DA # 4 A_ Co. No. Co-_____
County _Pima_ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_63_	acres
	A_2		acres
	A_3		acres
Drainage Length		_4500_	feet
Elevation			
Top of Drainage Area		_3750_	feet
At Structure		_3700_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_28_	minutes
Rainfall Intensity	i	_3.7_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge Qp = CiA = $63 \times 3.7 \times 0.5$ = _117_ cfs

Computed by _JR_ date _3-72_
Checked by _SJT_ date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_
Location _DA # 5 + 6_   Co. No. Co-_____
County _Pima_   Station _____
Name of Stream _____

DESIGN DATA

Design Frequency _____ _50_ years
Drainage Area A_1 _1071_ acres
A_2 _____ acres
A_3 _____ acres

Drainage Length _12499_ feet
Elevation
   Top of Drainage Area _3850_ feet
   At Structure _3685_ feet
Drainage Area Slope _____ %
Precipitation
   ~~P = 6 hour~~ _____ inches
   ~~P = 24 hour~~ _____ inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour _____ inches
Time of Concentration T_c _60_ minutes
Rainfall Intensity i _2.85_ inches/hour
Runoff Coefficient C_1 _0.5_
C_2 _____
C_3 _____
Weighted Runoff Coefficient C _0.5_
Peak Discharge $Q_p = CiA = 1071 \times 2.85 \times 0.5 =$ _1526_ cfs

Computed by _JR_   date _3-72_
Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_
Location _DA # 6_   Co. No. Co-_____
County _Pima_   Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_342_	acres
	A_2		acres
	A_3		acres
Drainage Length		_5208_	feet
Elevation			
Top of Drainage Area		_3900_	feet
At Structure		_3750_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_22_	minutes
Rainfall Intensity	i	_4.55_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge $Qp = CiA = 342 \times 4.55 \times 0.5 =$ _778_ cfs

Computed by _J R_   date _3-72_
Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_ Project No. _72-009_
Location _DA # 6A_ Co. No. Co-
County _Pima_ Station
Name of Stream

DESIGN DATA

Design Frequency			_25_	years
Drainage Area	A_1		_12_	acres
	A_2			acres
	A_3			acres
Drainage Length			_1225_	feet
Elevation				
Top of Drainage Area			_3850_	feet
At Structure			_3800_	feet
Drainage Area Slope				%
Precipitation				
P = 6 hour				inches
P = 24 hour				inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_10_	minutes
Rainfall Intensity	i	_6.9_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA =		$12 \times 6.9 \times 0.5 =$ _41_	cfs

Computed by _JR_ date _3-72_
Checked by _SJT_ date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _73-009_

Location _DA # 6 E_   Co. No. Co- _____

County _Pima_   Station _____

Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_137_	acres
	A_2	_____	acres
	A_3	_____	acres
Drainage Length		_4437_	feet
Elevation			
Top of Drainage Area		_3980_	feet
At Structure		_3040_	feet
Drainage Area Slope		_____	%
Precipitation			
P = 6 hour		_____	inches
P = 24 hour		_____	inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour		_____	inches
Time of Concentration	Tc	_12_	minutes
Rainfall Intensity	i	_5.0_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2	_____	
	C_3	_____	
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA =		$137 \times 5.0 \times 0.5$ _343_	cfs

Computed by _JB_   date _3-72_

Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_

Location _DA #7_   Co. No. Co- _____

County _Pima_   Station _____

Name of Stream _____

DESIGN DATA

Design Frequency		_50_	years
Drainage Area	A_1	_517_	acres
	A_2		acres
	A_3		acres
Drainage Length		_5728_	feet
Elevation			
Top of Drainage Area		_3900_	feet
At Structure		_3775_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_27_	minutes
Rainfall Intensity	i	_4.4_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge Qp = CiA = _517 × 4.4 × 0.5 = 1137_ cfs

Computed by _JE_   date _3-72_

Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_
Location _DA # 7A_   Co. No. Co-
County _Pima_   Station
Name of Stream

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_13_	acres
	A_2		acres
	A_3		acres
Drainage Length		_1250_	feet
Elevation			
Top of Drainage Area		_3850_	feet
At Structure		_3810_	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_10_	minutes
Rainfall Intensity	i	_6.9_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA =	$13 \times 6.9 \times .5 =$	_45_	cfs

Computed by ____JP____   date _3-72_
Checked by ____SJT____   date _3-72_

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_
Location _DA # 8_   Co. No. Co-_____
County _Pima_   Station _____
Name of Stream _____

DESIGN DATA

Design Frequency   _25_ years
Drainage Area A_1 _230_ acres
                       A_2 _____ acres
                       A_3 _____ acres
Drainage Length   _6249_ feet
Elevation
   Top of Drainage Area   _3900_ feet
   At Structure   _3775_ feet
Drainage Area Slope   _____ %
Precipitation
   ~~P = 6 hour~~   _____ inches
   ~~P = 24 hour~~   _____ inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour   _____ inches
Time of Concentration T_c _29_ minutes
Rainfall Intensity i _3.7_ inches/hour
Runoff Coefficient C_1 _0.5_
                          C_2 _____
                          C_3 _____
Weighted Runoff Coefficient C _0.5_
Peak Discharge $Q_p = CiA = 230 \times 3.7 \times 0.5 =$ _426_ cfs

Computed by _JR_   date _3-72_
Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_
Location _OA # 8A_   Co. No. Co-_____
County _Pima_   Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A$_1$	_22_	acres
	A$_2$		acres
	A$_3$		acres
Drainage Length		_3800_	feet
Elevation			
Top of Drainage Area		_3850_	feet
At Structure		_3800_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_15_	minutes
Rainfall Intensity	i	_5.6_	inches/hour
Runoff Coefficient	C$_1$	_0.5_	
	C$_2$		
	C$_3$		
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge Qp = CiA = $22 \times 5.6 \times 0.5$ = _62_ cfs

Computed by _JR_   date _3-72_
Checked by _SJT_   date _3-72_

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Amado drainage study_ Project No. _72-009_
Location _QH # 5.2_ Co. No. Co-___
County _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_10_	acres
	A_2		acres
	A_3		acres
Drainage Length		_1350_	feet
Elevation			
Top of Drainage Area		_3780_	feet
At Structure		_3750_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_10_	minutes
Rainfall Intensity	i	_6.9_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA = $10 \times 6.9 \times .5$ =		_35_	cfs

Computed by ___JR___ date _3-72_
Checked by ___SJT___ date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage Study_ Project No. _72-004_
Location _DA# 8-C_ Co. No. Co-
County _Pima_ Station
Name of Stream

DESIGN DATA

Design Frequency		25	years
Drainage Area	A_1	19	acres
	A_2		acres
	A_3		acres
Drainage Length		1250	feet
Elevation			
Top of Drainage Area		3800	feet
At Structure		3750	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	10	minutes
Rainfall Intensity	i	6.9	inches/hour
Runoff Coefficient	C_1	0.5	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.5	
Peak Discharge Qp = CiA = $19 \times 6.9 \times 0.5$ =		66	cfs

Computed by _JR_ date _3-72_
Checked by _SJE_ date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

    Project _Arivaca drainage study_   Project No. _72-009_
    Location _OA # 9_   Co. No. Co-
    County _Pima_   Station _____
    Name of Stream _____

DESIGN DATA

    Design Frequency   _50_   years
    Drainage Area A_1 _915_   acres
                                    A_2 _____   acres
                                    A_3 _____   acres

    Drainage Length   _9895_   feet
    Elevation
        Top of Drainage Area   _4050_   feet
        At Structure   _3740_   feet
    Drainage Area Slope   _____   %
    Precipitation
        P = 6 hour   _____   inches
        P = 24 hour   _____   inches

DESIGN COMPUTATIONS

    Precipitation P_1 = 1 hour   _____   inches
    Time of Concentration   Tc   _36_   minutes
    Rainfall Intensity   i   _3.74_   inches/hour
    Runoff Coefficient C_1 _0.5_
                                    C_2 _____
                                    C_3 _____
    Weighted Runoff Coefficient   C   _0.5_
    Peak Discharge Qp = CiA = $915 \times 3.74 \times 0.5 =$ _1711_   cfs

Computed by _____JR_____   date _3-72_
Checked by _____EJT_____   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-009_
Location _DA # 9A_   Co. No. Co-
County _Pima_   Station
Name of Stream

DESIGN DATA

Design Frequency _____25_____ years
Drainage Area A_1 _____17_____ acres
                A_2 _____ acres
                A_3 _____ acres
Drainage Length _____1700_____ feet
Elevation
    Top of Drainage Area _____3770_____ feet
    At Structure _____3730_____ feet
Drainage Area Slope _____ %
Precipitation
    ~~P = 6-hour~~ _____ inches
    ~~P = 24-hour~~ _____ inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour _____ inches
Time of Concentration   Tc _____10_____ minutes
Rainfall Intensity   i _____6.9_____ inches/hour
Runoff Coefficient C_1 _____0.5_____
                        C_2 _____
                        C_3 _____
Weighted Runoff Coefficient C _____0.5_____
Peak Discharge Qp = CiA = $17 \times 6.9 \times 0.5 =$ _____59_____ cfs

Computed by _____JR_____   date _3-72_
Checked by _____SJT_____   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

<u>LOCATION DATA</u>

Project *Arivaca drainage study* Project No. *72-009*
Location *DA # 9-B* Co. No. Co-
County *Pima* Station
Name of Stream

<u>DESIGN DATA</u>

Design Frequency		*25*	years
Drainage Area	A_1	*73*	acres
	A_2		acres
	A_3		acres
Drainage Length		*4140*	feet
Elevation			
Top of Drainage Area		*3800*	feet
At Structure		*3730*	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

<u>DESIGN COMPUTATIONS</u>

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	*23*	minutes
Rainfall Intensity	i	*4.2*	inches/hour
Runoff Coefficient	C_1	*0.5*	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	*0.5*	
Peak Discharge Qp = CiA = *73 × 4.2 × 0.5* =		*153*	cfs

Computed by *JB* date *3-72*
Checked by *SJT* date *3-72*

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca Drainage study_   Project No. _73-009_

Location _DA #10_   Co. No. Co-_____

County _Pima_   Station _____

Name of Stream _____

DESIGN DATA

Design Frequency		_50_	years
Drainage Area	A_1	_778_	acres
	A_2	_____	acres
	A_3	_____	acres
Drainage Length		_12,400_	feet
Elevation			
Top of Drainage Area		_3,000_	feet
At Structure		_2,730_	feet
Drainage Area Slope		_____	%
Precipitation			
P = 6 hour		_____	inches
P = 24 hour		_____	inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour		_____	inches
Time of Concentration	Tc	_42_	minutes
Rainfall Intensity	i	_3.4_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2	_____	
	C_3	_____	
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA = $778 \times 3.4 \times 0.5$		_1300_	cfs

Computed by _JP_   date _3-72_

Checked by _SJT_   date _3-72_

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca Drainage study_   Project No. _72-009_
Location _DA # 10 A_   Co. No.   Co-
County _Pima_   Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_43_	acres
	A_2		acres
	A_3		acres
Drainage Length		_3270_	feet
Elevation			
Top of Drainage Area		_3850_	feet
At Structure		_3800_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_20_	minutes
Rainfall Intensity	i	_4.7_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA =		$43 \times 4.7 \times 0.5 =$ _101_	cfs

Computed by _____JR_____   date _3-72_
Checked by _____SJT_____   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arizona drainage study_ Project No. _72-009_
Location _DA # 11_ Co. No. Co-_____
County _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_181_	acres
	A_2		acres
	A_3		acres
Drainage Length		_5930_	feet
Elevation			
Top of Drainage Area		_3060_	feet
At Structure		_3990_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	T_c	_25_	minutes
Rainfall Intensity	i	_4.1_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge $Q_p = CiA =$ _181 × 4.1 × 0.5_ = _371_			cfs

Computed by _JE_ date _3-72_
Checked by _SJT_ date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_	Project No. _72-009_
Location _OH = 11A_	Co. No. Co-_____
County _Pima_	Station _____
Name of Stream _____	

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_10_	acres
	A_2	_____	acres
	A_3	_____	acres
Drainage Length		_1150_	feet
Elevation			
Top of Drainage Area		_3870_	feet
At Structure		_3840_	feet
Drainage Area Slope		_____	%
Precipitation			
P = 6 hour		_____	inches
P = 24 hour		_____	inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour		_____	inches
Time of Concentration	Tc	_10_	minutes
Rainfall Intensity	i	_6.9_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2	_____	
	C_3	_____	
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge Qp = CiA = $10 \times 6.9 \times 0.5$		_35_	cfs

Computed by _JR_	date _3-72_
Checked by _SJ_	date _3-72_

$$\frac{30}{300}$$

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project ___Arivaca drainage study___ Project No. ___72-209___

Location ___DA # 12___ Co. No. Co-___

County ___Pima___ Station ___

Name of Stream ___

DESIGN DATA

Design Frequency		25	years
Drainage Area	A$_1$	116	acres
	A$_2$		acres
	A$_3$		acres
Drainage Length		3620	feet
Elevation			
Top of Drainage Area		3900	feet
At Structure		3810	feet
Drainage Area Slope			%
Precipitation			
P = 6 hour			inches
P = 24 hour			inches

DESIGN COMPUTATIONS

Precipitation P$_1$ = 1 hour			inches
Time of Concentration	Tc	10	minutes
Rainfall Intensity	i	4.9	inches/hour
Runoff Coefficient	C$_1$	0.5	
	C$_2$		
	C$_3$		
Weighted Runoff Coefficient	C	0.5	
Peak Discharge Qp = CiA = $116 \times 4.9 \times 0.5 =$		284	cfs

Computed by ___J2___ date ___3-72___

Checked by ___SJT___ date ___3-72___

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-309_

Location _DA # 12A_   Co. No. Co- ___

County ___   Station ___

Name of Stream ___

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_79_	acres
	A_2		acres
	A_3		acres
Drainage Length		_3,080_	feet
Elevation			
Top of Drainage Area		_3,160_	feet
At Structure		_3,040_	feet
Drainage Area Slope			%
Precipitation			
~~P = 6 hour~~			inches
~~P = 24 hour~~			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	T_c	_20_	minutes
Rainfall Intensity	i	_4.7_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge $Q_p = CiA = 79 \times 4.7 \times .5 =$		_186_	cfs

Computed by ___   date ___

Checked by _SJT_   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arizona drainage study_   Project No. _70-009_

Location _DA #13-B_   Co. No. Co- _____

County _____   Station _____

Name of Stream _____

DESIGN DATA

Design Frequency		_25_	years
Drainage Area	A_1	_30_	acres
	A_2	_____	acres
	A_3	_____	acres
Drainage Length		_450_	feet
Elevation			
Top of Drainage Area		_3900_	feet
At Structure		_3780_	feet
Drainage Area Slope		_____	%
Precipitation			
P = 6 hour		_____	inches
P = 24 hour		_____	inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour		_____	inches
Time of Concentration	T_c	_10_	minutes
Rainfall Intensity	i	_6.3_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2	_____	
	C_3	_____	
Weighted Runoff Coefficient	C	_0.5_	
Peak Discharge $Q_p = CiA$ = _30 x 6.3 x 0.5_ = _63_			cfs

Computed by _____JR_____   date _3-72_

Checked by _____SJT_____   date _3-72_

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HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Project _Arivaca drainage study_   Project No. _72-003_
Location _DA #13_   Co. No. Co-
County _Pima_   Station
Name of Stream

DESIGN DATA

Design Frequency		_50_	years
Drainage Area	A_1	_1376_	acres
	A_2		acres
	A_3		acres
Drainage Length		_13000_	feet
Elevation			
Top of Drainage Area		_39.70_	feet
At Structure		_37.0_	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1 hour			inches
Time of Concentration	Tc	_57_	minutes
Rainfall Intensity	i	_3.0_	inches/hour
Runoff Coefficient	C_1	_0.5_	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	_0.5_	

Peak Discharge $Qp = CiA = 1376 \times 3.0 \times 0.5 = 2064$ cfs

Computed by _JE_   date _5-72_
Checked by _SJT_   date _3-72_

RESULTS: (refer to drainage area map for locations)

Drainage Area No.	Q in cubic feet per second	Contributing Area in Acres
1	2836*	1719
1A	97	28
2	4959*	3393
2A	208	99
2B	93	27
3	322	137
4	12728*	21214
4A	117	63
5 & 6	1526*	1071
6	778	342
6A	41	12
6E	343	137
7	1137*	517
7A	45	13
8	426	230
8A	62	22
8B	35	10
8C	66	19
9	1711*	915
9A	59	17
9B	153	73
10	1322*	778
10A	101	43
11	371	181
11A	35	10
12	284	116
12A	186	79
12B	69	20
13	2064*	1376

* 50 year storm

   This area is typical of desert areas having high peak flows of
   short duration.

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5. Geophysical & Hydrological Reconnaissance of the Arivaca Area by Manera & Associates, Inc., Consulting Hydrologists, Phoenix, Arizona

6. Magnitude & Frequency of Floods in the U.S. Geological Survey Water Supply No. 1683 (Part 9, Colorado River Basin)

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