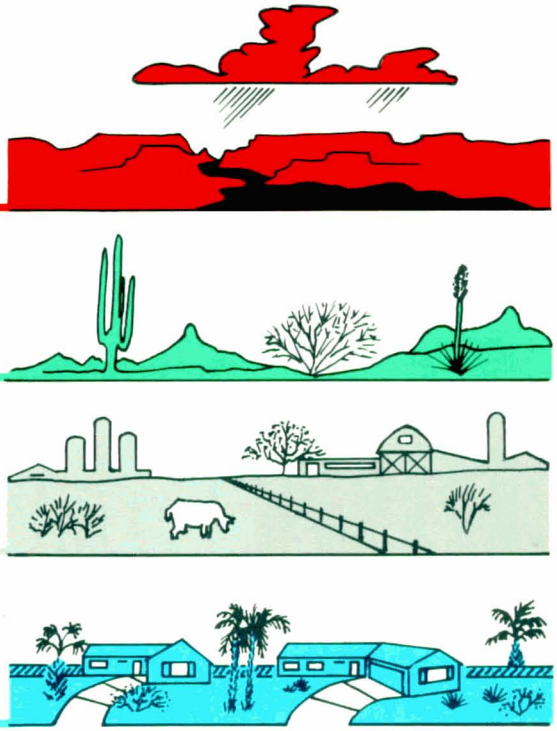


# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

## HYDROLOGIC ANALYSIS FOR WHITE TANKS DISTRIBUTARY FLOW AREA

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

# HYDROLOGIC ANALYSIS FOR
# WHITE TANKS DISTRIBUTARY FLOW AREA
# MAY, 1991

METHODOLOGY: Methodologies used are from the Hydrologic Design Manual for Maricopa County (HDM), September, 1990, and the HEC-1 Flood Hydrograph Package, Version 4.0, September, 1990.

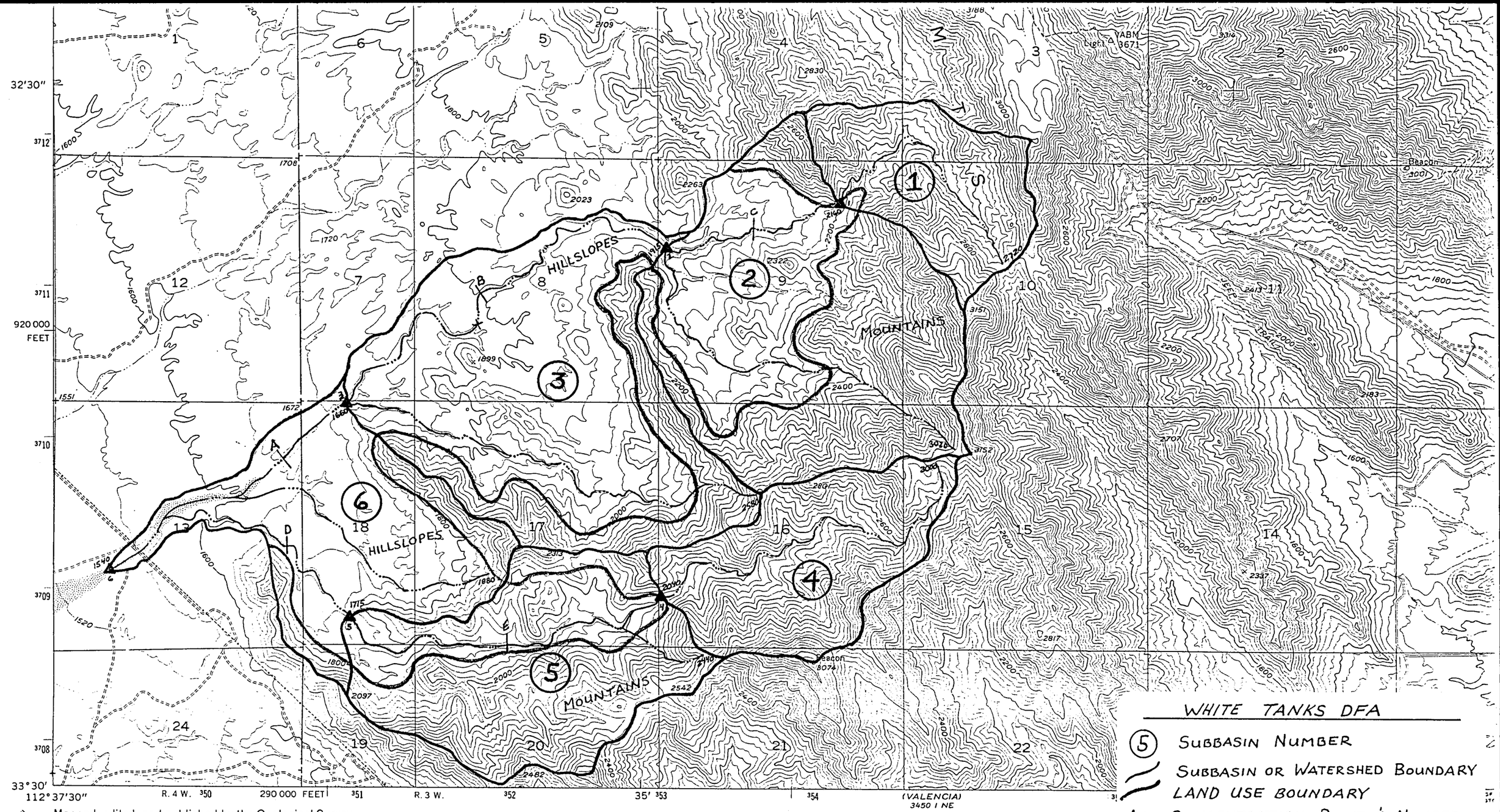
RAINFALL: Three design storms and one historic storm were used in this analysis. These included the SCS Type II 24-hour storm, the 6-hour Queen Creek storm from the HDM, the 2-hour FCD retention design storm, and the recorded August 15, 1990 storm from the telemetered South Mountain raingauge. The 24-hour storm precipitation depths were areally reduced using HYDRO-40, the 6-hour depths were reduced using the Queen Creek curve from the HDM, and the 2-hour depths were reduced using the 2-hour Osborn curves from experimental watershed data at Walnut Gulch near Tombstone, Arizona.

LOSSES: Green and Ampt loss parameters were estimated from soil texture data compiled from the SCS Soil Survey, Aguila - Carefree Area, Parts of Maricopa and Pinal Counties, Arizona. XKSAT values were calculated using arithmetic and logarithmic averaging. Connected imperviousness (RTIMP) was estimated as 75% of the given rock outcrop percentages. Vegetation adjustment values for XKSAT were estimated from Figure 4.3 in the HDM.

HYDROGRAPHS: The Clark Unit Hydrograph Method and the Phoenix Mountain S-Graph were used for rainfall excess routing. For the Clark Method, times of concentration (Tc) and storage coefficients (R) were estimated using the 2/21/91 version of MCUHP1 for the design storms and the Appendix E worksheet in the HDM for the recorded strom. Slopes were adjusted using Figure 5.4 in the HDM. Parameters for the S-Graph Method were estimated using MCUHP2.

ROUTING: Muskingum-Cunge routing was used with an approximate 8-point cross section. Lengths and slopes were estimated from USGS topographic maps, and "n" values were taken from a table in Chow. Transmission losses were estimated at 2 in/hr for the recorded storm run. Routing losses, due to both storage and percolation, were minimal because of very short travel times through the routing reaches.

RESULTS: Since the watershed is dominated by soil map unit #100, which is primarily a loamy sand texture, the soil percolation rates are higher than some other mountainous modeled watersheds. Logarithmic averaging drops the average XKSAT from approximately 0.94 in/hr to 0.56 in/hr. This is still a high average value, which is why there is little or no change in the 2-yr and 5-yr Tc's and Q's. It seems that for these return periods, the runoff component is produced only by impervious area (see Figures 4 & 5). Figure 6 show the peak discharges from the 24-hour strorm as being near the average for Maricopa County, again as a result of the high loss rates. The 6-hour peak discharge values are less because of the lower volume of infiltrated rainfall before the peak rainfall excess intensity occurs. In all cases, logarithmic averaging produced higher discharges and volumes than arithmetic averaging.




Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1954. Field check 1957

Polyconic projection. 1927 North American datum
10,000-foot grid based on Arizona coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Where omitted, land lines have not been established

Revisions shown in purple compiled from aerial photographs

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL RAINFALL COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

## DEPTHS

| RETURN PERIOD (YR) | 24-HOUR | 6-HOUR | 2-HOUR |
|---|---|---|---|
| 2 | 1.60 | 1.35 | 1.17 |
| 5 | 2.22 | 1.82 | 1.53 |
| 10 | 2.70 | 2.18 | 1.82 |
| 25 | 3.35 | 2.65 | 2.21 |
| 50 | 3.80 | 3.00 | 2.50 |
| 100 | 4.29 | 3.37 | 2.79 |

## 2-HOUR CALCS.

$$P_2^1 = .011 + .942\,[(1.35)^2/1.60] = 1.08 \text{ in}$$

$$P_{100}^1 = .494 + .755\,[(3.37)^2/4.29] = 2.49 \text{ in}$$

$$P_2^2 = .341\,(1.35) + .659\,(1.08) = 1.17 \text{ in}$$

$$P_{100}^2 = .341\,(3.37) + .659\,(2.49) = 2.79 \text{ in}$$

## AERIAL REDUCTION & DISTRIBUTIONS

24-HOUR → SCS TYPE II (HYDRO 40) [0.99]

6-HOUR → FCD QUEEN CREEK (QUEEN CREEK) [0.96]

2-HOUR → FCD DETENTION STORM (WALNUT GULCH) [See Next page]

FIGURE 1

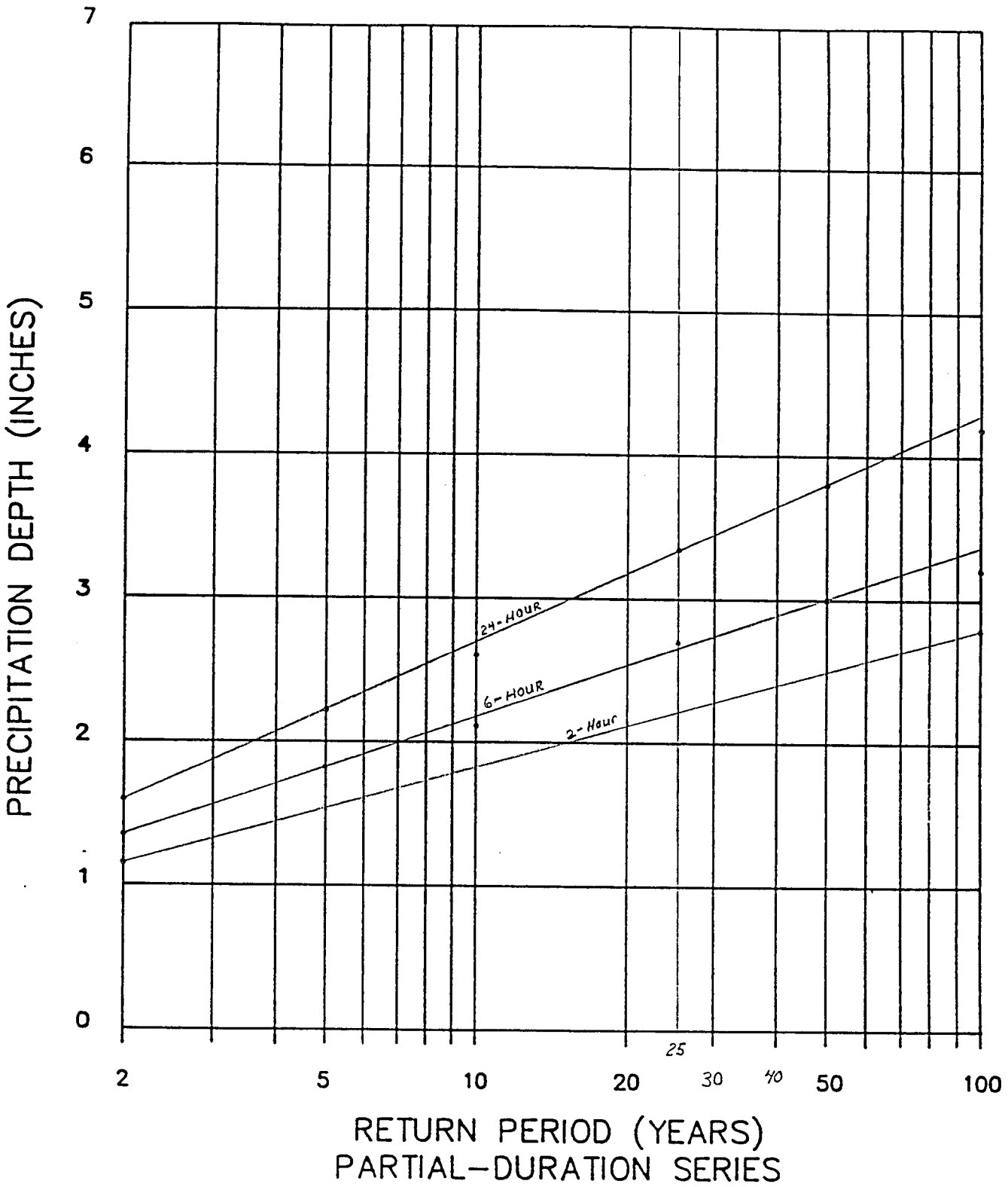



**Figure 2.14**
**Precipitation Depth versus Return Period for Partial-Duration Series**

WHITE TANKS DFA
SECTION 17 - T2N - R3W

FIGURE 2

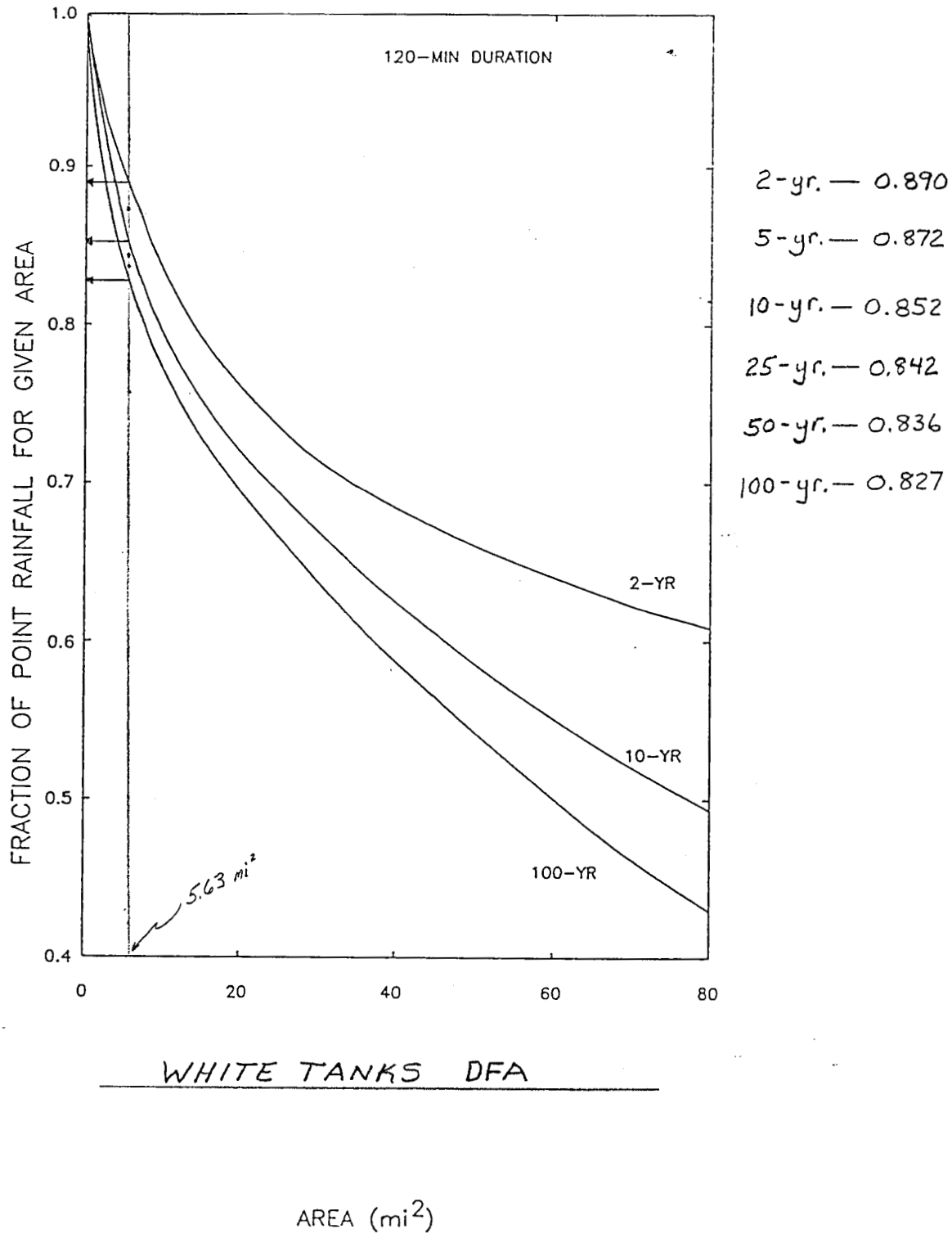


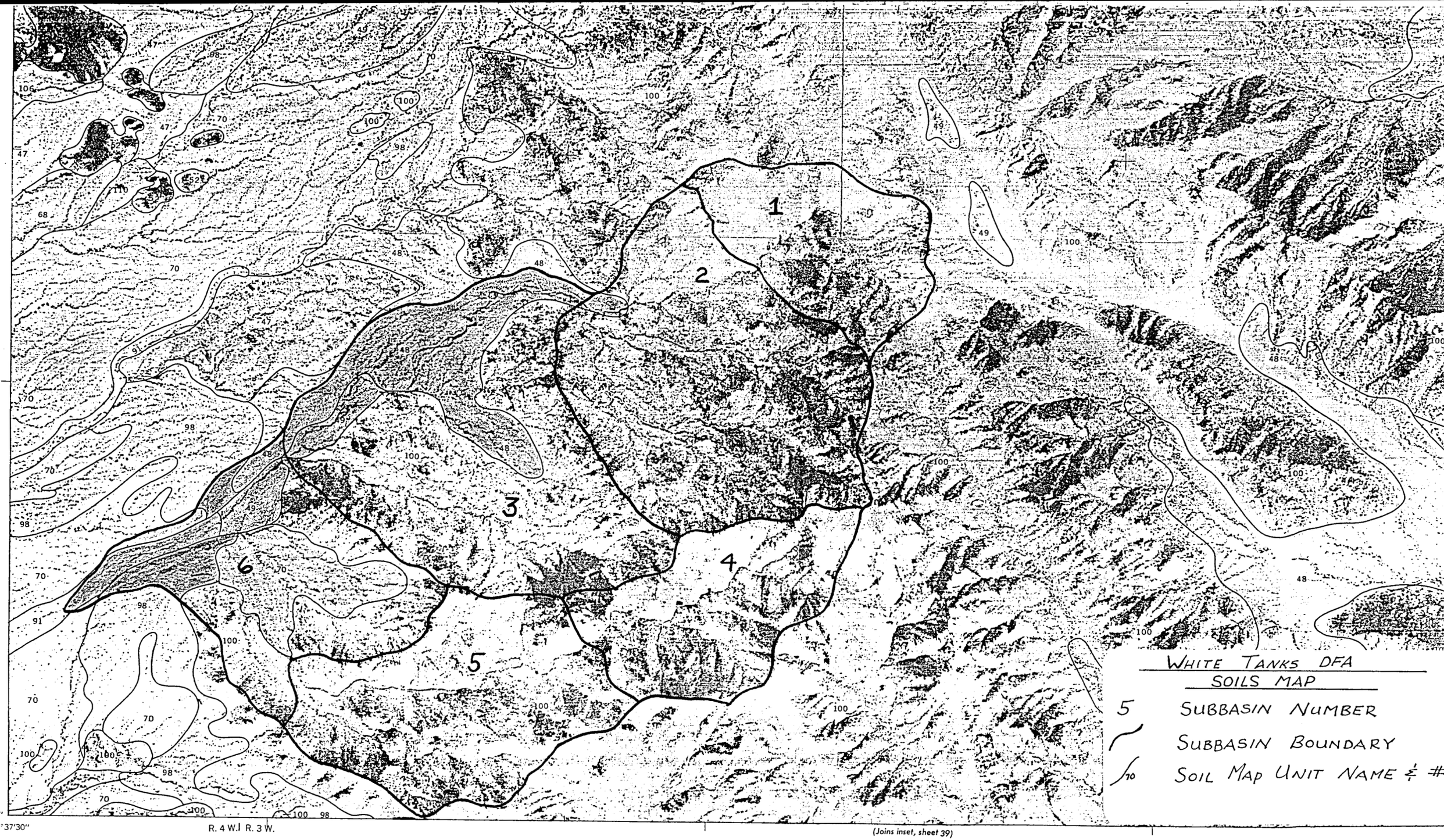

FIGURE 3. Point–to–area conversion ratios for 2–h duration rainfalls for selected frequencies.

TABLE 1

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

| Date | Time |
|---|---|
| 5/24/91 | 1203 |

| | |
|---|---|
| Sensor # | 6510 |
| StatType | dif |
| DataType | precip |
| Units | in |
| 8/15/90 | |
| 0700 | 0.00 |
| 0645 | 0.00 |
| 0630 | 0.00 |
| 0615 | 0.00 |
| 0600 | 0.04 |
| 0545 | 0.04 |
| 0530 | 0.04 |
| 0515 | 0.04 |
| 0500 | 0.04 |
| 0445 | 0.16 |
| 0430 | 0.24 |
| 0415 | 0.24 |
| 0400 | 0.43 |
| 0345 | 0.35 |
| 0330 | 0.39 |
| 0315 | 0.04 |
| 0300 | 0.00 |
| 0245 | 0.00 |
| TOTALS: | 2.05 |




This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

Orthophotobase compiled by the U.S. Department of Planimetric detail obtained 10,000-foot grid based on

AGUILA — CAREFREE AREA, PARTS OF MARICOPA AND PINAL COUNTIES, ARIZONA NO. 44

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL LOSS COMPUTATIONS COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

SOIL DESCRIPTIONS

MAP UNIT #

48, 49 EBON - PINAMT COMPLEX, 3-20% SLOPES & 20-40% SLOPES

45% Ebon Very Gravelly Sandy Clay (1-43) [SANDY CLAY LOAM]
35% PINAMT Extremely gravelly sandy loam (0-3) [LOAMY SAND]
20% CARRIZO, ANTHO } DRAINAGEWAYS [LOAMY SAND] (10%)
CONTINE, LUKE, CIPRIANO, GUNSIGHT, MOMOLI, TREMANT } FAN TERRACES [LOAM] (10%)

XKSAT = .45 (.06) + .35 (1.20) + .10 (1.2) + .10 (.25) = 0.59 in/hr

70 GUNSIGHT - RILLITO COMPLEX, 1-25% SLOPES

40% GUNSIGHT VERY GRAVELLY LOAM (0, 11) [Sandy Loam]
40% RILLITO GRAVELLY LOAM (0-12) [SANDY LOAM]
20% CHUCKAWALLA, Ebon, MoHALL, PINAMT, TREMANT } FAN TERRACES [Loam]
CIPRIANO, ANTHO, CARRIZO, GILMAN } FLOODPLAINS [Sandy Loam]

XKSAT = .90 (.40) + .10 (.25) = 0.39 in/hr

91 MOMOLI - CARRIZO COMPLEX

45% MOMOLI Very Gravelly Sandy Loam (1-60) [SANDY LOAM]
35% CARRIZO Very Gravelly Sandy Loam (0-11) [LOAMY SAND]
20% Mohall, Tremant, Gunsight, CHUCKAWALLA [FAN TERRACES] [SL]
DENURE, GILMAN, MARIPO, CARRIZO [DRAINAGEWAYS] [SL]

XKSAT = .65 (.40) + .35 (1.2) = 0.68 in/hr

98 PINAMT - TREMANT COMPLEX, 1-10% SLOPES

45% PINAMT Extremely gravelly sandy loam [SANDY CLAY LOAM] (1-28)
35% TREMANT gravelly loam [SANDY LOAM] (0-5)
20% CARRIZO [DRAINAGEWAYS] [Loamy Sand] (5%)
CHUCKAWALLA, EBON, GUNSIGHT, RILLITO } [FAN TERRACES] (15%) [Sandy Loam]

XKSAT = .45 (.06) + .35 (.40) + .05 (1.2) + .15 (.40) = 0.29 in/hr

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL LOSS COMPUTATIONS COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

## SOIL DESCRIPTIONS (CONTINUED)

100 QUILOTOSA - VAIVA - ROCK OUTCROP COMPLEX, 20-65% SLOPES
- 50% QUILOTOSA EXTREMELY GRAVELLY LOAM (2-14) [Loamy Sand]
- 20% VAIVA EXTREMELY GRAVELLY SANDY LOAM (0-3) [Sandy Loam]
- 20% ROCK OUTCROP
- 10% SCHENCO [SANDY CLAY LOAM]

### NORMALIZE SOIL PERCENTAGES

| | |
|---|---|
| QUILOTOSA | 50/80 = 62.5% |
| VAIVA | 20/80 = 25% |
| SCHENCO | 10/80 = 12.5% |

XKSAT = .625 (1.20) + .25 (.40) + .125 (.06) = 0.86 in/hr

RTIMP = .75 (20) = 15%

---

## SUBBASIN LOSSES

SUB 1 → #100 - 100% XKSAT = .86 in/hr, PSIF = 2.95 in, DTHETA = .35 in, RTIMP = 15%

SUB 2 → #100 - 100% XKSAT = .86 in/hr, PSIF = 2.95 in, DTHETA = .35 in, RTIMP = 15%

SUB3 → #100 - 69%
#48,49 - 31%
XKSAT = .69(.86) + .31(.59) = 0.78 in/hr
PSIF = 3.1 in, DTHETA = .35 in, RTIMP = .69(15) = 10.4%

SUB4 → #100 - 100% XKSAT = .86 in/hr, PSIF = 2.95 in, DTHETA = .35 in, RTIMP = 15%

SUB5 → #100 - 100% XKSAT = .86 in/hr, PSIF = 2.95 in, DTHETA = .35 in, RTIMP = 15%

SUB6 → #100 - 45.3%
#48,49 - 8.9%
#70 - 27.6%
#91 - 6.8%
#98 - 11.3%
XKSAT = .453(.86) + .089(.59) + .276(.39) + .068(.68) + .113(.29) = 0.63 in/hr
PSIF = 3.5 in, DTHETA = .35 in, RTIMP = .453(15) = 6.8%

---

## VEGETATION ADJUSTMENT

ASSUME: HILLSLOPES → 30% COVER (1.22)
MOUNTAIN → 20% COVER (1.11)

SUB1 → 1.11 (.86) = .95 in/hr (XKSAT)
SUB2 → 1.22 (.41) + 1.11 (.59) = 1.155 (.86) = .99 in/hr
SUB3 → 1.22 (.76) + 1.11 (.24) = 1.194 (.78) = .93 in/hr
SUB4 → 1.11 (.86) = .95 in/hr
SUB5 → 1.22 (.33) + 1.11 (.67) = 1.146 (.86) = .97 in/hr
SUB6 → 1.22 (.83) + 1.11 (.17) = 1.201 (.603) = .72 in/hr

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL ____ COMPUTED ____ DATE ____

____ CHECKED BY ____ DATE ____

## LOSS COMPUTATIONS USING LOG AREAL AVERAGING

**MAP UNIT**

| | |
|---|---|
| 48, 49 | XKSAT = ALOG[(.45 /log .06) + (.35 /log 1.2) + (.10 /log 1.2) + (.10 /log .25)] = .27 in/hr |
| 70 | XKSAT = Alog[(.9 /log .40) + (.1 /log .25)] = .38 in/hr |
| 91 | XKSAT = Alog[(.65 /log .40) + (.35 /log 1.2)] = .59 in/hr |
| 98 | XKSAT = Alog[(.45 /log .06) + (.50 /log .40) + (.05 /log 1.2)] = .18 in/hr |
| 100 | XKSAT = Alog[(.625 /log 1.2) + (.25 /log .40) + (.125 /log .06)] = .63 in/hr |

**SUBBASIN LOSSES**

| | | |
|---|---|---|
| SUB1 → | #100 - 100% | XKSAT = .63 in/hr, PSIF = 3.4 in, DTH = .35 in, RTIMP = 15% |
| SUB2 → | #100 - 100% | XKSAT = .63 in/hr, PSIF = 3.4 in, DTH = .35 in, RTIMP = 15% |
| SUB3 → | #100 - 69% | XKSAT = ALOG[(.69 /log .63) + (.31 /log .27)] = .48 in/hr |
| | #48, 49 - 31% | PSIF = 3.8 in, DTH = .35 in, RTIMP = .69(15) = 10.4% |
| SUB4 → | #100 - 100% | XKSAT = .63 in/hr, PSIF = 3.4 in, DTH = .35 in, RTIMP = 15% |
| SUB5 → | #100 - 100% | XKSAT = .63 in/hr, PSIF = 3.4 in, DTH = .35 in, RTIMP = 15% |
| SUB6 → | #100 - 45.3% | XKSAT = ALOG[(.453 /log .63) + (.089 /log .27) + (.276 /log .38) |
| | #48, 49 - 8.9% | + (.068 /log .59) + (.113 /log .18)] = .44 in/hr |
| | #70 - 27.6% | |
| | #91 - 6.8% | PSIF = 3.9 in, DTH = .35 in, RTIMP = .453(15) = 6.8% |
| | #98 - 11.3% | |

**VEGETATION ADJUSTMENT (XKSAT)**

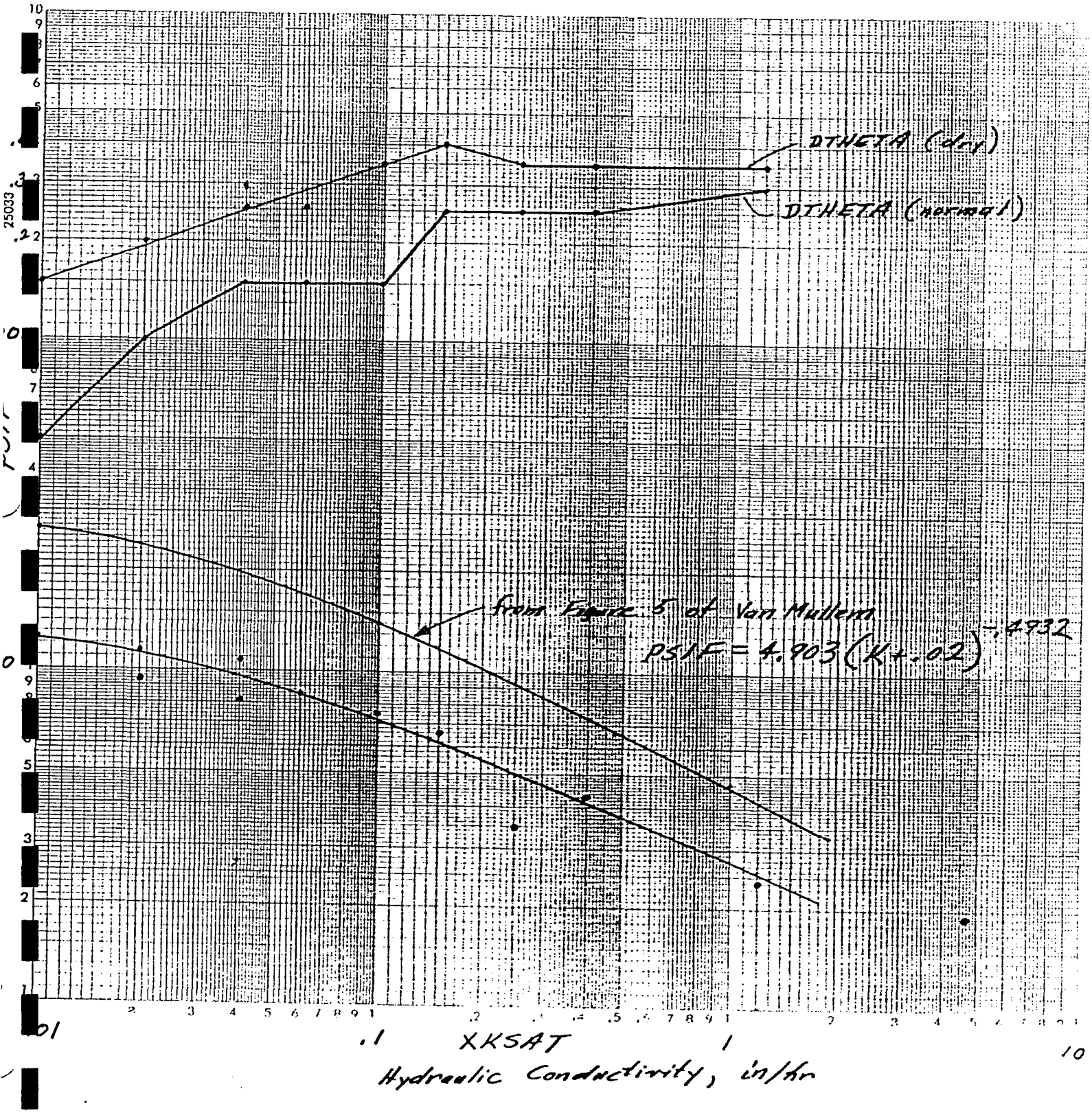
ASSUME: HILLSLOPES → 30% Cover (1.22)
MOUNTAINS → 20% Cover (1.11)

SUB1 → 1.11 (.63) = .70 in/hr
SUB2 → 1.22(.41) + 1.11(.59) = 1.155(.63) = .73 in/hr
SUB3 → 1.22(.76) + 1.11(.24) = 1.194(.48) = .57 in/hr
SUB4 → 1.11 (.63) = .70 in/hr
SUB5 → 1.22(.33) + 1.11(.67) = 1.146 (.63) = .72 in/hr
SUB6 → 1.22 (.83) + 1.11 (.17) = 1.201 (.44) = .53 in/hr

am 29
25 April 91

# FIGURE III

Comparison of XKSAT vs PSIF from Table 4.2 and the relation by Van Mullem (1989)




Logarithmic 3 X 3 Cycles

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL PHYSICAL PARAMETERS COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

## SUBBASIN AREAS

SUB1 → 3.286 $in^2$ × $(2000)^2$ $ft^2/in^2$ × $(1/5280)^2$ $mi^2/ft^2$ = 0.471 $mi^2$
SUB2 → 9.502 $in^2$ = 1.363 $mi^2$
SUB3 → 9.996 $in^2$ = 1.434 $mi^2$
SUB4 → 4.402 $in^2$ = 0.632 $mi^2$
SUB5 → 6.324 $in^2$ = 0.907 $mi^2$
SUB6 → 5.735 $in^2$ = 0.823 $mi^2$
5.630 $mi^2$

## LAND USE

| | HILLSLOPE | MOUNTAIN |
|---|---|---|
| SUB1 | 0% | 100% |
| SUB2 | 41% | 59% |
| SUB3 | 76% | 24% |
| SUB4 | 0% | 100% |
| SUB5 | 33% | 67% |
| SUB6 | 83% | 17% |

## LENGTHS

SUB1 2.813 in × 2000 ft/in × 1/5280 mi/ft = 1.065 mi
SUB2 4.313 in = 1.634 mi
SUB3 4.875 in = 1.847 mi
SUB4 4.063 in = 1.539 mi
SUB5 4.250 in = 1.610 mi
SUB6 4.906 in = 1.858 mi

## SLOPES

SUB1 2720 - 2160/1.065 = 526 ft/mi ADJ. SLOPE = 305 ft/mi
SUB2 3020 - 1915/1.634 = 676 ft/mi ADJ. SLOPE = 315 ft/mi
SUB3 2580 - 1660/1.847 = 498 ft/mi ADJ. SLOPE = 302 ft/mi
SUB4 3000 - 2040/1.539 = 624 ft/mi ADJ. SLOPE = 315 ft/mi
SUB5 2440 - 1715/1.610 = 450 ft/mi ADJ. SLOPE = 295 ft/mi
SUB6 1880 - 1540/1.858 = 183 ft/mi

## BASIN ROUGHNESS

SUB1 → -.03 (log 301) + .20 = 0.126
SUB2 → .41[-.025 (log 872) + .15] + .59 [-.03 (log 872) + .20] = .097
SUB3 → .76 [-.025 (log 918) + .15] + .24 [-.03 (log 918) + .20] = .084
SUB4 → -.03 (log 404) + .20 = .122
SUB5 → .33 [-.025 (log 580) + .15] + .67 [-.03 (log 580) + .20] = .105
SUB6 → .83 [-.025 (log 527) + .15] + .17 [-.03 (log 527) + .20] = .088

## INITIAL ABSTRACTION

SUB1 → 1.00 (.25) = .25 in
SUB2 → .41 (.15) + .59 (.25) = .21 in
SUB3 → .76 (.15) + .24 (.25) = .17 in
SUB4 → 1.00 (.25) = .25 in
SUB5 → .33 (.15) + .67 (.25) = .22 in
SUB6 → .83 (.15) + .17 (.25) = .18 in

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL Tc & R COMPUTED ____ DATE ____

ADJUSTED SLOPES CHECKED BY ____ DATE ____

TABLE 2

LOSS PARAMETERS BY ARITHMETIC AVERAGE

Tc / R (HOURS)

24 - HOUR

| | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| SUB 1 | 1.167 / .709 | 1.167 / .709 | 1.117 / .676 | .883 / .521 | .717 / .413 | .617 / .349 |
| SUB 2 | 1.250 / .588 | 1.250 / .588 | 1.217 / .571 | .967 / .442 | .800 / .359 | .683 / .301 |
| SUB 3 | 1.250 / .631 | 1.250 / .631 | 1.200 / .603 | .933 / .456 | .783 / .375 | .667 / .314 |
| SUB 4 | 1.367 / .960 | 1.367 / .960 | 1.317 / .921 | 1.067 / .729 | .900 / .604 | .767 / .505 |
| SUB 5 | 1.317 / .777 | 1.317 / .777 | 1.283 / .755 | 1.033 / .594 | .867 / .488 | .733 / .406 |
| SUB 6 | 1.483 / 1.051 | 1.483 / 1.051 | 1.333 / .934 | 1.050 / .716 | .917 / .618 | .800 / .530 |

6 - HOUR

| | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| SUB 1 | 1.167 / .709 | 1.167 / .709 | 1.167 / .709 | 1.050 / .631 | .950 / .565 | .817 / .477 |
| SUB 2 | 1.250 / .588 | 1.250 / .588 | 1.250 / .588 | 1.150 / .536 | 1.033 / .476 | .917 / .417 |
| SUB 3 | 1.250 / .631 | 1.250 / .631 | 1.250 / .631 | 1.117 / .556 | 1.017 / .501 | .883 / .429 |
| SUB 4 | 1.367 / .960 | 1.367 / .960 | 1.367 / .960 | 1.250 / .869 | 1.133 / .780 | 1.000 / .679 |
| SUB 5 | 1.317 / .777 | 1.317 / .777 | 1.317 / .777 | 1.200 / .701 | 1.100 / .636 | .967 / .551 |
| SUB 6 | 1.483 / 1.051 | 1.483 / 1.051 | 1.400 / .986 | 1.283 / .895 | 1.150 / .793 | .967 / .654 |

2 - HOUR

| | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| SUB 1 | 1.167 / .709 | 1.017 / .609 | .783 / .456 | .600 / .339 | .517 / .287 | .467 / .256 |
| SUB 2 | 1.250 / .588 | 1.083 / .502 | .850 / .384 | .650 / .285 | .567 / .245 | .517 / .221 |
| SUB 3 | 1.250 / .631 | 1.017 / .501 | .800 / .384 | .633 / .296 | .550 / .253 | .500 / .228 |
| SUB 4 | 1.367 / .960 | 1.217 / .844 | .967 / .653 | .750 / .493 | .650 / .421 | .583 / .373 |
| SUB 5 | 1.317 / .777 | 1.150 / .669 | .900 / .509 | .700 / .385 | .617 / .335 | .550 / .295 |
| SUB 6 | 1.483 / 1.051 | 1.150 / .793 | .950 / .641 | .783 / .518 | .700 / .457 | .633 / .409 |

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL Tc & R COMPUTED ____ DATE ____

ADJUSTED SLOPES CHECKED BY ____ DATE ____

TABLE 3

Tc & R (HOURS)

LOSS PARAMETERS BY LOGARITHMIC AVERAGE

24-HOUR

| | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| SUB1 | 1.167 / .709 | 1.167 / .709 | 1.000 / .598 | .750 / .434 | .633 / .360 | .550 / .308 |
| SUB2 | 1.250 / .588 | 1.250 / .588 | 1.100 / .511 | .833 / .375 | .717 / .317 | .617 / .267 |
| SUB3 | 1.250 / .631 | 1.183 / .593 | .983 / .483 | .750 / .358 | .650 / .305 | .583 / .271 |
| SUB4 | 1.367 / .960 | 1.367 / .960 | 1.200 / .831 | .933 / .629 | .800 / .530 | .700 / .457 |
| SUB5 | 1.317 / .777 | 1.317 / .777 | 1.167 / .679 | .883 / .499 | .767 / .426 | .667 / .365 |
| SUB6 | 1.483 / 1.051 | 1.400 / .986 | 1.200 / .831 | .950 / .641 | .833 / .554 | .750 / .493 |

6-HOUR

| | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| SUB1 | 1.167 / .709 | 1.167 / .709 | 1.117 / .676 | .950 / .565 | .817 / .477 | .683 / .392 |
| SUB2 | 1.250 / .588 | 1.250 / .588 | 1.200 / .562 | 1.050 / .485 | .917 / .417 | .767 / .342 |
| SUB3 | 1.250 / .631 | 1.250 / .631 | 1.117 / .556 | .950 / .465 | .800 / .384 | .667 / .314 |
| SUB4 | 1.367 / .960 | 1.367 / .960 | 1.317 / .921 | 1.150 / .792 | 1.017 / .691 | .850 / .567 |
| SUB5 | 1.317 / .777 | 1.317 / .777 | 1.267 / .744 | 1.100 / .636 | .967 / .551 | .817 / .457 |
| SUB6 | 1.483 / 1.051 | 1.483 / 1.051 | 1.350 / .947 | 1.167 / .805 | .983 / .665 | .850 / .567 |

2-HOUR

| | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| SUB1 | 1.167 / .709 | .900 / .532 | .700 / .402 | .550 / .308 | .483 / .267 | .450 / .246 |
| SUB2 | 1.250 / .588 | .950 / .434 | .767 / .342 | .600 / .261 | .533 / .229 | .483 / .205 |
| SUB3 | 1.183 / .593 | .833 / .402 | .683 / .323 | .567 / .262 | .517 / .236 | .467 / .211 |
| SUB4 | 1.367 / .960 | 1.083 / .742 | .867 / .579 | .700 / .457 | .617 / .397 | .550 / .349 |
| SUB5 | 1.317 / .777 | 1.017 / .583 | .817 / .457 | .650 / .355 | .583 / .315 | .533 / .285 |
| SUB6 | 1.400 / .986 | 1.050 / .716 | .833 / .591 | .733 / .481 | .667 / .433 | .617 / .397 |

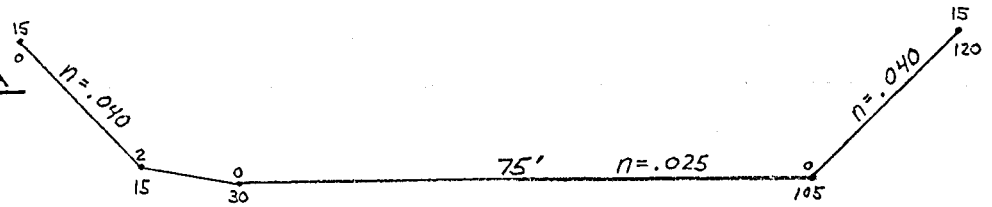
# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL CHANNEL ROUTING COMPUTED ____ DATE ____

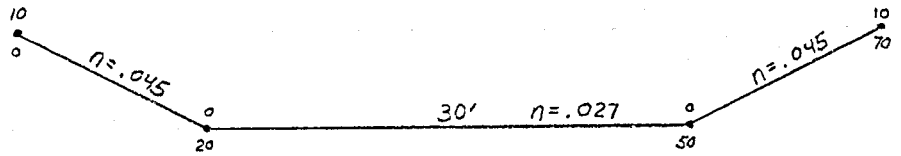
CHECKED BY ____ DATE ____

SECTION A




L = 6400'
S = .0186 ft/ft

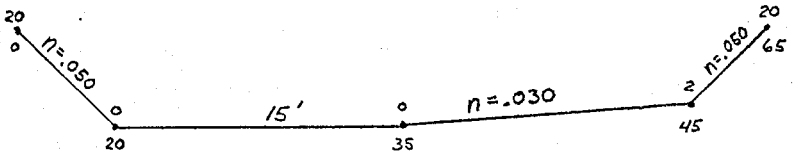
SECTION B



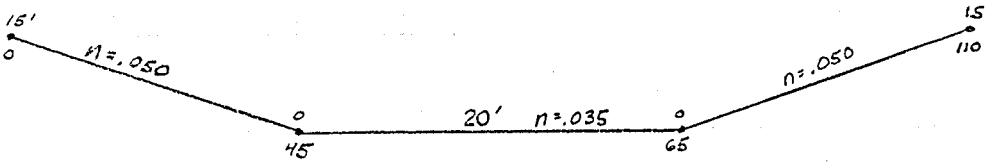

L = 9375'
S = .0272 ft/ft

SECTION C

L = 4000'
S = .0613 ft/ft




SECTION D




L = 6500'
S = .0269 ft/ft

SECTION E

ASSUME SAME DIMENSIONS AS SECTION B

L = 7500'
S = .0433 %

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT *WHITE TANKS DFA* PAGE ____ OF ____

DETAIL *S-GRAPH PARAMETERS* COMPUTED ____ DATE ____

*PHX. MOUNTAIN S-GRAPH* CHECKED BY ____ DATE ____

AREA : 5.63 $mi^2$

LENGTH (L): 12.75 in × 2000 ft/in × 1/5280 mi/ft = 4.83 mi

Lca: 5.25 in = 1.989 mi

SLOPE : (2720 - 1540) / 4.83 mi = 244 ft/mi

BASIN FACTOR (Kn): From comparison with similar watersheds, Kn=.050

LAG TIME : $24Kn\,(L \cdot Lca / S^{1/2})^{.38}$ = .998 hrs = 59.86 min

LOSSES : (ARITHMETIC AVERAGE)

1. WEIGHT XKSAT, THEN INTERPOLATE PSIF & DTHETA

XKSAT=[(.86 × .471) + (.86 × 1.363) + (.78 × 1.434) + (.86 × .632) + (.86 × .907) + (.63 × .823)] / 5.63
= 0.806 in/hr

2. LAND USE : HILLSLOPES → [.41 (1.363) + .76 (1.434) + .33 (.907) + .83 (.823)] / 5.63 = 46.7%
MOUNTAIN = 100 - 46.7% = 53.3%

3. VEGETATION ADJUSTMENT : .467 (1.22) + .533 (1.11) = 1.161
XKSAT = 1.161 (.806) = .936 in/hr
PSIF = 3.1 in
DTHETA = 0.35 in

4. RTIMP : [15 (.471 + 1.363 + .632 + .907) + 10.4 (1.434) + 6.8 (.823)] / 5.63 = 12.63 %

5. IA = .467 (.15) + .533 (.25) = 0.203 in

DISCHARGES (cfs)

| RETURN PERIOD (yr) | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| 24-HOUR → | 249 | 347 | 622 | 1386 | 1948 | 2548 |
| 6-HOUR → | 279 | 378 | 464 | 889 | 1293 | 1865 |
| 2-HOUR → | 347 | 645 | 1082 | 1800 | 2318 | 2809 |

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL S-GRAPH CALCS. COMPUTED ____ DATE ____

USING LOG AERIAL AVERAGING CHECKED BY ____ DATE ____

LOSSES : WEIGHT XKSAT, THEN INTERPOLATE PSIF & DTHETA

$$XKSAT = ALOG\left[\frac{.471}{5.63}(\log .63) + \frac{1.363}{5.63}(\log .63) + \frac{1.434}{5.63}(\log .48) + \frac{.632}{5.63}(\log .63) + \frac{.907}{5.63}(\log .63) + \frac{.823}{5.63}(\log .44)\right] = 0.56 \text{ in/hr}$$

PSIF = 3.6 in DTHETA (DRY) = 0.35 in RTIMP = 12.63 %

IA = .203 in XKSAT (ADJUSTED) = 1.161(.56) = 0.65 in/hr

DISCHARGES (cfs)

| RETURN PERIOD (YR) | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| 24-HOUR | 249 | 487 | 1033 | 1865 | 2423 | 3017 |
| 6-HOUR | 279 | 386 | 710 | 1323 | 1884 | 2479 |
| 2-HOUR | 358 | 901 | 1433 | 2162 | 2682 | 3182 |

SOUTH MOUNTAIN STORM OF AUGUST 15, 1990

3-HOUR DURATION, 2.05 inches
LOSSES BY LOGARITHMIC AVERAGING
CHANNEL TRANSMISSION LOSS RATE OF 2 in/hr INCLUDED

| SUBBASIN | Q (cfs) |
|---|---|
| SUB1 | 44 |
| SUB2 | 139 |
| SUB3 | 130 |
| SUB4 | 52 |
| SUB5 | 81 |
| SUB6 | 47 |
| APEX | 465 |

CALCULATION OF Tc & R

Calculated by: SDW  Date: 5-22-91
Checked by:  Project: 90-22

Watershed: SUB1 → SAMPLE Tc Sheet for S. Mtn. Storm
Rainfall Frequency: _____ - yr  Duration: _____ - hr.  Pattern #: _____

Rainfall Loss Method:
[X] Green & Ampt Method
[ ] IL + ULR by soil texture
[ ] IL + ULR by hydrologic soil group

Tabulate Period of Peak Rainfall Excess

| Clock Time @ end of Increm. | Increm. Excess in. |
|---|---|
| 0330 | .04 |
| 0340 | .03 |
| 0350 | .04 |
| 0400 | .05 |
| 0410 | .02 |
| 0420 | .02 |
| 0430 | .02 |
| 0440 | .02 |

Rearrange Incremental Excesses in Order of Decreasing Average Intensity

| Accum. Time hr./min. | Increm. Excess in. | Accum. Excess in. | Avg. Excess Intensity in./hr. |
|---|---|---|---|
| 10 | .05 | .05 | .30 |
| 20 | .04 | .09 | .27 |
| 30 | .03 | .12 | .24 |
| 40 | .04 | .16 | .24 |
| 50 | .02 | .18 | .216 |
| 60 | .02 | .20 | .20 |
| 70 | .02 | .22 | .189 |
| 80 | .02 | .24 | .180 |

A = .471 sq.mi.
L = 1.065 mi.
S = 305 ft/mi.

Kb = m [log(A * 640)]+ b
Kb = (  ) log (  *640) + (  )
Kb = .126

$Tc = 11.4\ L^{.50}\ Kb^{.52}\ S^{-.31}\ i^{-.38}$

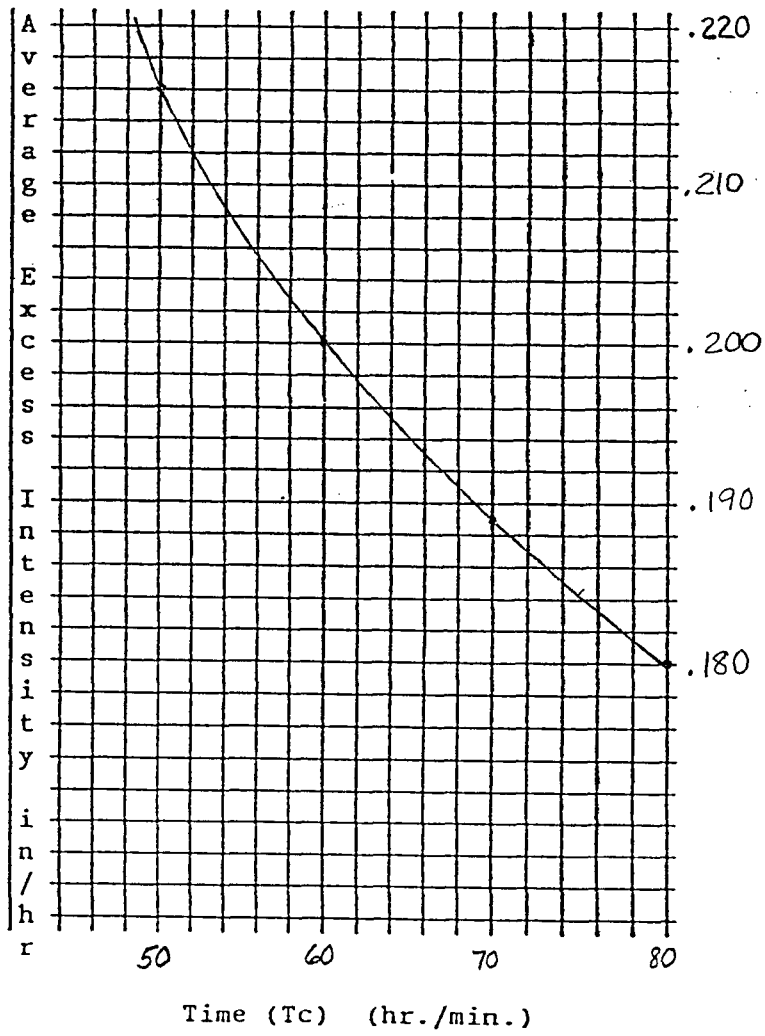
Tc = ( .680 ) i

| Trial Tc | i | Calc. Tc |
|---|---|---|
| 50 | .216 | 73 |
| 75 | .184 | 78 |
| 80 | .180 | 78 |

Tc = 1.300 hr.

$R = .37\ Tc^{1.11}\ A^{-.57}\ L^{.80}$

R = .800 hr.



```
****************************************
                                       *
  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
                                       *
 RUN DATE  05/23/1991  TIME  10:48:31  *
                                       *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL  LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT  PAGE 1

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID   ALLUVIAL FAN DATA COLLECTION AND MONITORING PROJECT
  2           ID   HYDROLOGY FOR WHITE TANKS DISTRIBUTARY FLOW AREA
  3           ID   LOSSES BY LOGARITHMIC AVERAGING
  4           ID   6-HOUR STORM,  PATTERN NUMBER 2.40,  ARF = 0.96
              * ****************************************************************************
              *DIAGRAM
  5           IT       5                    200
  6           IO       5
              * ************************************

  7           KK    SUB1
  8           KM   RUNOFF FROM SUBBASIN 1
  9           BA    .471
 10           IN      15
 11           PB   3.235
 12           PC    0.00    .011    .018    .027    .040    .050    .061    .071    .082    .093
 13           PC    .106    .121    .142    .187    .273    .459    .684    .821    .887    .928
 14           PC    .948    .962    .974    .988   1.000
 15           LG    .250   3.400    .350    .700  15.000
 16           UC    .683    .392
 17           UA       0       3       5       8      12      20      43      75      90      96
 18           UA     100
              * ************************************
```

```
          ***************************************
19        KK     CP2
20        KM   ROUTE SUB1 FROM CP1 TO CP2
21        RD
22        RC    .050    .030    .050    4000   .0613     20.
23        RX       0      10      20      30      35      45      55      65
24        RY      20      10       0       0       0       2      10      20
          * ***************************************

25        KK    SUB2
26        KM   RUNOFF FROM SUBBASIN 2
27        BA   1.363
28        LG    .210   3.400    .350    .730  15.000
29        UC    .767    .342
30        UA       0       3       5       8      12      20      43      75      90      96
31        UA     100
          * ***************************************

32        KK     CP2
33        KM   COMBINE SUB1 AND SUB2 AT CP2
34        HC       2
          * ***************************************

35        KK     CP3
36        KM   ROUTE (SUB1 & SUB2) FROM CP2 TO CP3
37        RD
38        RC    .045    .027    .045    9375   .0272
39        RX       0      10      20      30      40      50      60      70
40        RY      10       5       0       0       0       0       5      10
          * ***************************************

41        KK    SUB3
42        KM   RUNOFF FROM SUBBASIN 3
43        BA   1.434
44        LG    .170   3.800    .350    .570  10.400
45        UC    .667    .314
46        UA       0       3       5       8      12      20      43      75      90      96
47        UA     100
          * ***************************************

48        KK     CP3
49        KM   COMBINE (SUB1 & SUB2) + SUB3 AT CP3
50        HC       2
          * ***************************************

51        KK     CP6
52        KM   ROUTE (SUB1 & SUB2 & SUB3) FROM CP3 TO CP6
53        RD
54        RC    .040    .025    .040    6400   .0186
55        RX       0      15      30      50      75     105     112     120
56        RY      15       2       0       0       0       0     7.5      15
          * ***************************************

57        KK    SUB4
58        KM   RUNOFF FROM SUBBASIN 4
59        BA    .632
60        LG    .250   3.400    .350    .700  15.000
61        UC    .850    .567
62        UA       0       3       5       8      12      20      43      75      90      96
63        UA     100
```

```
* ************************************

KK     CP5
KM   ROUTE SUB4 FROM CP4 TO CP5
RD
RC    .045    .027    .045    7500   .0422
RX       0      10      20      30      40      50      60      70
RY      10       5       0       0       0       0       5      10
* ************************************

KK    SUB5
KM   RUNOFF FROM SUBBASIN 5
BA    .907
LG    .220   3.400    .350    .720  15.000
UC    .817    .457
UA       0       3       5       8      12      20      43      75      90      96
UA     100
* ************************************

KK     CP5
KM   COMBINE SUB4 + SUB5 AT CP5
HC       2
* ************************************

KK     CP6
KM   ROUTE (SUB4 & SUB5) FROM CP5 TO CP6
RD
RC    .050    .035    .050    6500   .0269
RX       0    22.5      45      50      55      65    87.5     110
RY      15     7.5       0       0       0       0     7.5      15
* ************************************

KK    SUB6
KM   RUNOFF FROM SUBBASIN 6
BA    .823
LG    .180   3.900    .350    .530   6.800
UC    .850    .567
UA       0       3       5       8      12      20      43      75      90      96
UA     100
* ************************************

KK     CP6
KM   COMBINE (SUB1 & SUB2 & SUB3) + (SUB4 & SUB5) + SUB6 AT CP6
HC       3
ZZ
```

```
                SCHEMATIC DIAGRAM OF STREAM NETWORK
PUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 7          SUB1
              V
              V
19           CP2
              .
              .
25            .        SUB2
              .           .
              .           .
32           CP2............
              V
              V
35           CP3
              .
              .
41            .        SUB3
              .           .
              .           .
48           CP3............
              V
              V
51           CP6
              .
              .
57            .        SUB4
              .           V
              .           V
64            .         CP5
              .           .
              .           .
70            .           .        SUB5
              .           .           .
              .           .           .
77            .         CP5............
              .           V
              .           V
80            .         CP6
              .           .
              .           .
86            .           .        SUB6
              .           .           .
              .           .           .
93           CP6........................
(*) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
* RUN DATE  05/23/1991  TIME  10:48:31 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
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```
                    ALLUVIAL FAN DATA COLLECTION AND MONITORING PROJECT
                    HYDROLOGY FOR WHITE TANKS DISTRIBUTARY FLOW AREA
                    LOSSES BY LOGARITHMIC AVERAGING
                    6-HOUR STORM,  PATTERN NUMBER 2.40,  ARF = 0.96

6 IO          OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

  IT          HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        200  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      1   0  ENDING DATE
                   NDTIME       1635  ENDING TIME
                    ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .08 HOURS
                   TOTAL TIME BASE   16.58 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR | 24-HOUR | 72-HOUR | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---|---|---|---|---|---|---|---|---|---|
| HYDROGRAPH AT | SUB1 | 297. | 4.50 | 54. | 20. | 20. | .47 | | |
| ROUTED TO | CP2 | 298. | 4.58 | 54. | 20. | 20. | .47 | | |
| HYDROGRAPH AT | SUB2 | 874. | 4.50 | 153. | 56. | 56. | 1.36 | | |
| 2 COMBINED AT | CP2 | 1165. | 4.50 | 207. | 75. | 75. | 1.83 | | |
| ROUTED TO | CP3 | 1177. | 4.67 | 208. | 76. | 76. | 1.83 | | |
| HYDROGRAPH AT | SUB3 | 1066. | 4.42 | 168. | 61. | 61. | 1.43 | | |
| 2 COMBINED AT | CP3 | 2112. | 4.58 | 375. | 137. | 137. | 3.27 | | |
| ROUTED TO | CP6 | 2102. | 4.75 | 375. | 137. | 137. | 3.27 | | |
| HYDROGRAPH AT | SUB4 | 327. | 4.67 | 72. | 26. | 26. | .63 | | |
| ROUTED TO | CP5 | 328. | 4.75 | 72. | 26. | 26. | .63 | | |
| HYDROGRAPH AT | SUB5 | 518. | 4.58 | 103. | 37. | 37. | .91 | | |
| 2 COMBINED AT | CP5 | 812. | 4.67 | 174. | 64. | 64. | 1.54 | | |
| ROUTED TO | CP6 | 816. | 4.83 | 174. | 64. | 64. | 1.54 | | |
| HYDROGRAPH AT | SUB6 | 456. | 4.67 | 92. | 33. | 33. | .82 | | |
| 3 COMBINED AT | CP6 | 3348. | 4.75 | 641. | 234. | 234. | 5.63 | | |

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

| ISTAQ | ELEMENT | DT (MIN) | PEAK (CFS) | TIME TO PEAK (MIN) | VOLUME (IN) | INTERPOLATED TO COMPUTATION INTERVAL DT (MIN) | PEAK (CFS) | TIME TO PEAK (MIN) | VOLUME (IN) |
|---|---|---|---|---|---|---|---|---|---|
| CP2 | MANE | 5.00 | 297.93 | 275.00 | 1.07 | 5.00 | 297.93 | 275.00 | 1.07 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2692E+02 EXCESS= .0000E+00 OUTFLOW= .2692E+02 BASIN STORAGE= .1244E-03 PERCENT ERROR= .0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CP3 | MANE | 5.00 | 1176.86 | 280.00 | 1.06 | 5.00 | 1176.86 | 280.00 | 1.06 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1035E+03 EXCESS= .0000E+00 OUTFLOW= .1036E+03 BASIN STORAGE= .5349E-03 PERCENT ERROR= -.2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CP6 | MANE | 5.00 | 2101.96 | 285.00 | 1.07 | 5.00 | 2101.96 | 285.00 | 1.07 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1872E+03 EXCESS= .0000E+00 OUTFLOW= .1873E+03 BASIN STORAGE= .2463E-03 PERCENT ERROR= -.1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CP5 | MANE | 5.00 | 328.06 | 285.00 | 1.07 | 5.00 | 328.06 | 285.00 | 1.07 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3611E+02 EXCESS= .0000E+00 OUTFLOW= .3612E+02 BASIN STORAGE= .3039E-03 PERCENT ERROR= .0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CP6 | MANE | 5.00 | 815.73 | 290.00 | 1.07 | 5.00 | 815.73 | 290.00 | 1.07 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8741E+02 EXCESS= .0000E+00 OUTFLOW= .8745E+02 BASIN STORAGE= .3840E-03 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT WHITE TANKS DFA PAGE ____ OF ____

DETAIL DISCHARGE & RUNOFF VOLUMES COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

## TABLE 4

| TR | ARITHMETIC LOSSES APEX PEAK Q (cfs) | ARITHMETIC LOSSES VOLUME (ac-ft) | LOGARITHMIC LOSSES APEX PEAK Q (cfs) | LOGARITHMIC LOSSES VOLUME (ac-ft) |
|---|---|---|---|---|
| **24-HOUR** | | | | |
| 2 | 232 | 59 | 232 | 59 |
| 5 | 336 | 83 | 454 | 98 |
| 10 | 624 | 124 | 1082 | 165 |
| 25 | 1686 | 221 | 2402 | 270 |
| 50 | 2643 | 292 | 3518 | 341 |
| 100 | 3936 | 369 | 4892 | 416 |
| **6-HOUR** | | | | |
| 2 | 266 | 49 | 266 | 49 |
| 5 | 363 | 66 | 385 | 69 |
| 10 | 462 | 83 | 669 | 104 |
| 25 | 912 | 132 | 1408 | 177 |
| 50 | 1432 | 181 | 2230 | 246 |
| 100 | 2293 | 252 | 3348 | 321 |
| **2-HOUR** | | | | |
| 2 | 305 | 39 | 323 | 43 |
| 5 | 613 | 68 | 916 | 89 |
| 10 | 1288 | 109 | 1783 | 138 |
| 25 | 2642 | 177 | 3292 | 206 |
| 50 | 3839 | 225 | 4608 | 255 |
| 100 | 5097 | 271 | 5870 | 302 |

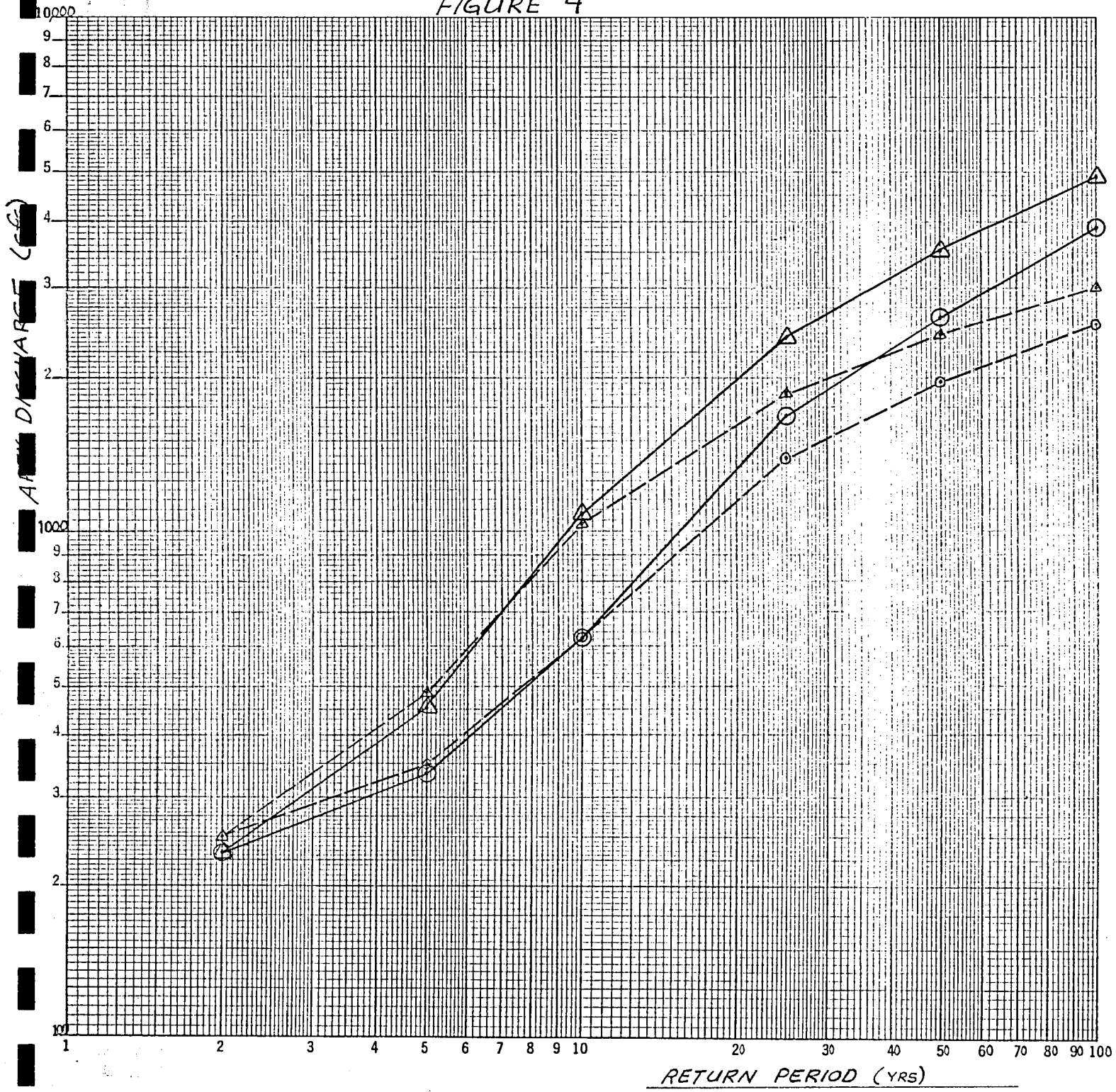
# WHITE TANKS DFA

## GRAPHS OF DISCHARGE vs. FREQUENCY

## RESULTS OF HEC-1 MODELING

## 24-HOUR DURATION

FIGURE 4




CLARK UNIT HYDROGRAPH

PHX. MTN. S-GRAPH

○ ARITHMETICALLY AVERAGED LOSSES

△ LOGARITHMICALLY AVERAGED LOSSES

ogarithmic, 2 x 2 Cycles

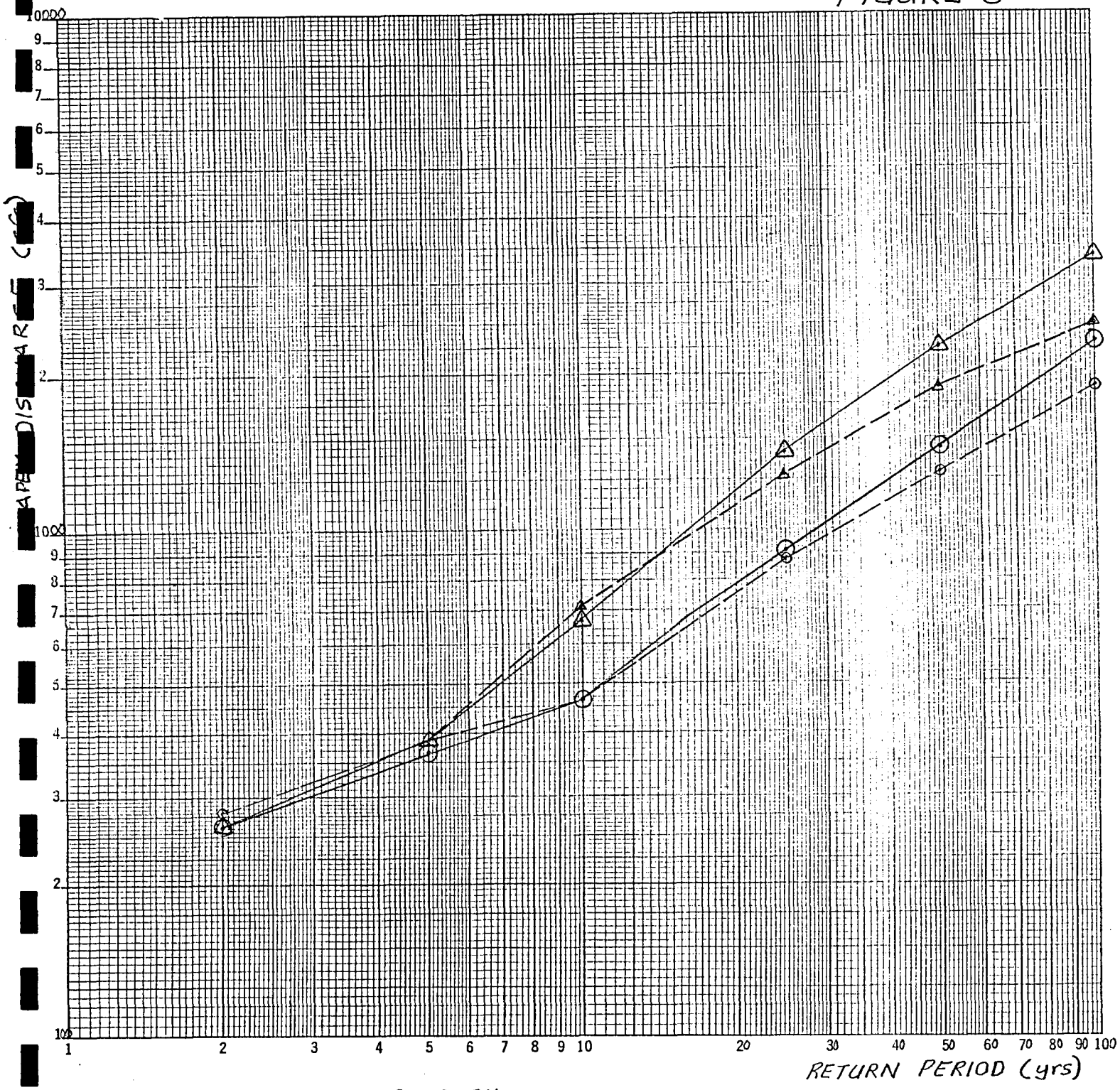
# WHITE TANKS DFA

## GRAPHS OF DISCHARGE VS. FREQUENCY

## RESULTS OF HEC-1 MODELING

## 6-HOUR DURATION

FIGURE 5




——— CLARK UNIT HYDROGRAPH

– – – – PHX. MTN. S-GRAPH

○ ARITHMETICALLY AVERAGED LOSSES

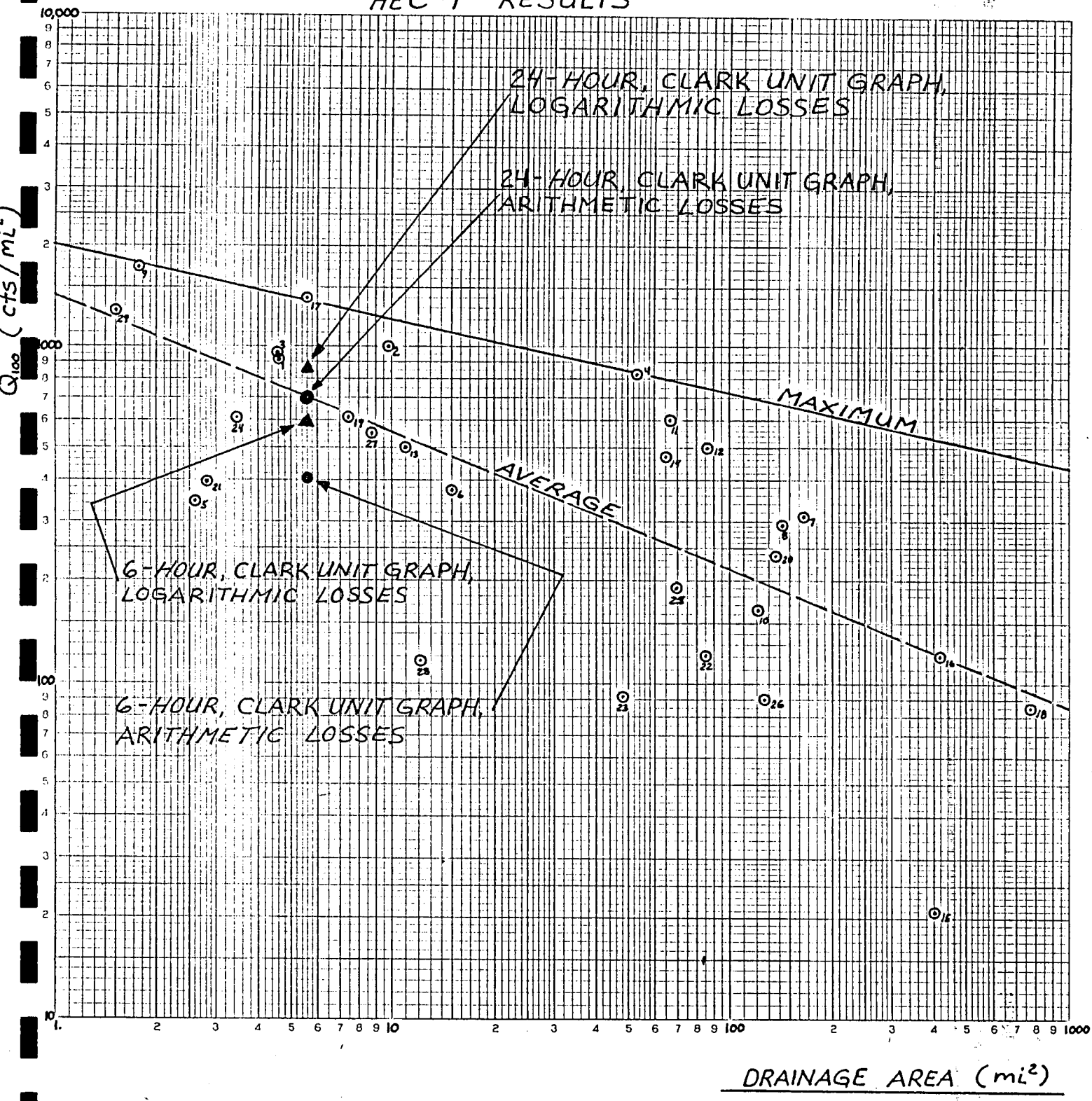
△ LOGARITHMICALLY AVERAGED LOSSES

Logarithmic, 2 x 2 Cycles

PLOT OF 100-YEAR DISCHARGE, FROM LOG PEARSON III ANALYSIS, FOR STREAMFLOW STATIONS IN MARICOPA COUNTY *

FIGURE 6

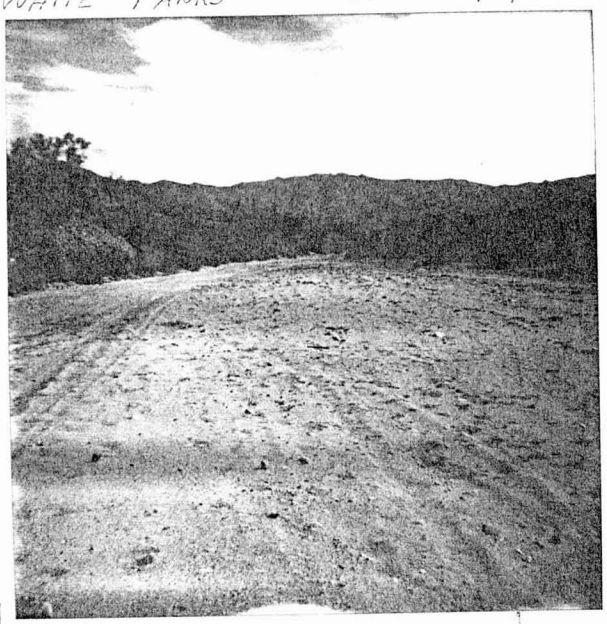
HEC-1 RESULTS



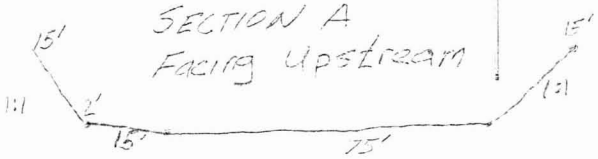

Full Logarithmic, 3 × 3 Cycles

* ORIGINAL FIGURE BY R. CRUFF, FCDMC, 1990.

WHITE TANKS — SDW 5/9/91

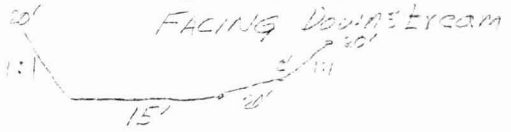


SECTION A
FACING Upstream

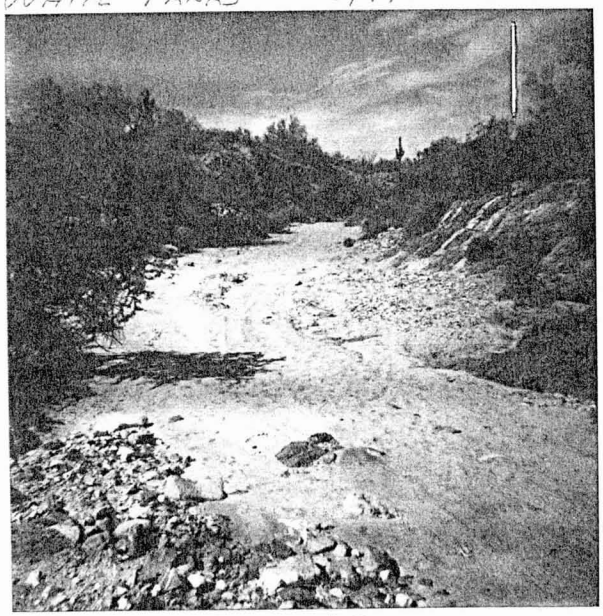



WHITE TANKS 5/9/91 SDW

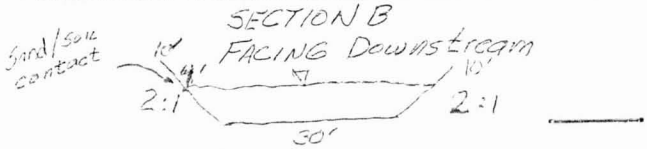
SECTION C
FACING Downstream



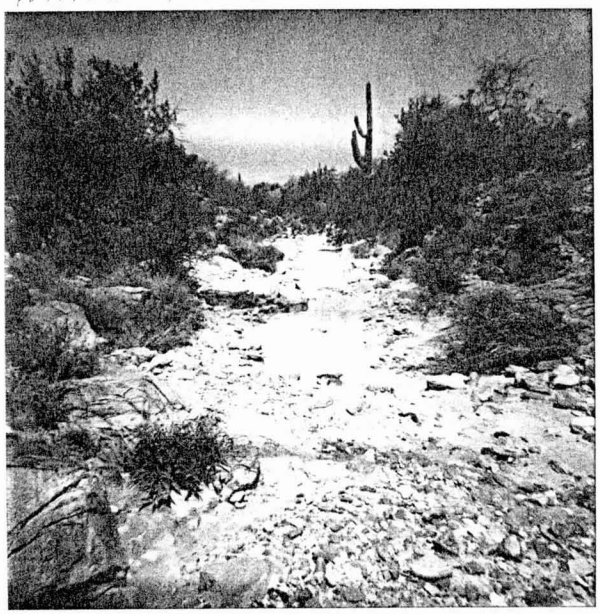
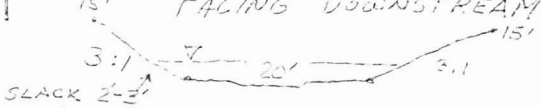

WHITE TANKS 5/9/91 SDW



SECTION B
FACING Downstream




WHITE TANKS 5/9/91 SDW



SECTION D
FACING DOWNSTREAM