RWCD REACH 4

SIDE INLET HYDROLOGY

DEC. 1984

H. C MILLSAPS

United States Department of Agriculture

Soil Conservation Service

201 E. Indianola Avenue
Suite 200
Phoenix, Arizona 85012

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Subject: ENG-RWCD Reach-4, Inlet Hydrology
Williams Air Force Base

Date: November 20,1986

To: Ralph Arrington, SCE
Phoenix, Arizona

File Code: 210-18

Attached are revised estimates of peak discharges for the design of the RWCD inlet structures located along the Williams Air Force Base western boundary. The discharges were calculated based on coordination activities with Franzoy and Cory, consulting engineers, who are developing a drainage plan for the Air Force Base. These discharges should be used for the design of the RWCD Inlet stuctures in lieu of those given by memo from myself and you dated December 6, 1984.

Based on Franzoy and Cory's detail analysis of the drainage pattern, about 70 acres which I had placed in sub-area 142F actually drains into sub-area 142B. (See Drainage Area Map included in documentation dated 11/84.) Also, there was some differences in the cover classification used in our separate studies, which have an effect on the curve numbers calculated for the various sub-areas. For instance Sub-area 142F is now classified as commercial (CN-92) instead of housing (CN-80) as used in the 1984 SCS study. During the 1984 study it was assumed that the total Air Force Base sub-area had hydrologic soil group B, when in actuality, based on a detail soil survey map, there is a strip of C soils located along the north side of the Base.

It was discovered during a recent reconnaissance of the runway areas, that a significant portion of the area between the runway strips had been asphalted sometime in the past and served as a storage area for surplus planes. This area is now cracked and has grass growing up through the cracks, but probably still has a higher curve number than was used during the 1984 study.

By making the adjustments in the stated drainage areas and the affected curve numbers, the attached discharges were calculated for the various inlet loctions, and should be used to revise the designs for said inlets, if existing conditions are to be assumed. It should be recognized, however, that one alternative proposed by Franzoy and Cory for the Base is to install detention basins, which will tend to decrease the peak runoff from the Base. Their study has not been completed at this time; therefore, no analysis could be made of the effect of their proposed plan on the runoff from the Base. Coordination should be continued with Franzoy and Cory and with the Base.

Should you have any questions on the revised analysis I will be glad to discuss it with you.

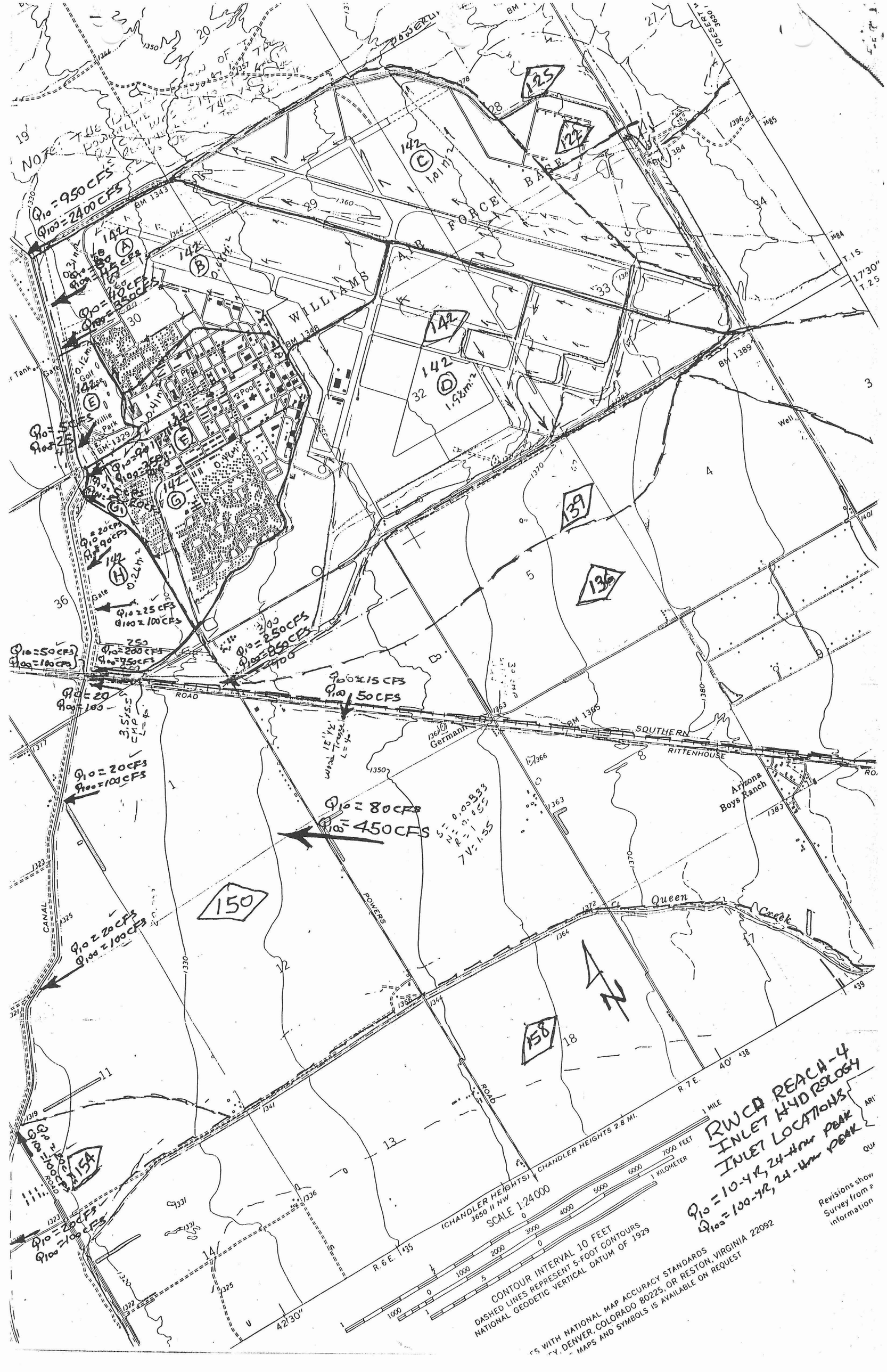
Harry C. Millsaps
Hydraulic Engineer

Attachment

cc: W. Wayne Killgore, ASTC(WR), Phoenix, AZ
Don Paulus, Design Engineer, Phoenix, AZ

SUMMARY TABLE
RWCD Reach-4, Inlet Hydrology

Location	10-year Design Frequency (CFS)	100-year Design Frequency (CFS)
Powerline Floodway at RWCD	950	2400 NOTE Q=3140 CFS WAS USED FOR THE DESIGN OF THE POWERLINE FLOODWAY AND IS RECOMMENDED FOR THE DESIGN OF THE INLET STR. Hem
Williams Field Air Force Base		
142A	~~30~~ 50	~~115~~ 180
142B	~~110~~ 260	~~350~~ 600
142E	5	~~25~~ 40
142F & 142G	~~90~~ 170	~~350~~ 460
$142G_1$	5	20
142H	45	190
Southern Pacific Railroad Channel		
North of R.R.	~~200~~ 250	~~750~~ 800
Between R.R. & Hwy	50	100
Subarea 150	80	450


RWCA REACH-4
INLET HYDROLOGY
INLET LOCATIONS
Q10 = 10-YR, 24-HR PEAK
Q100 = 100-YR, 24-HR PEAK
WILLIAMS AIR FORCE BASE
WILLIAMS
SOUTHERN
RITTENHOUSE
ROAD
POWERS
ROAD
CANAL
Queen Creek
Arizona Boys Ranch
Germann
Golf Course
Willie Park
Pool
Well
Gate
Tank
Q10 = 950 CFS
Q100 = 2400 CFS
Q10 = 80 CFS
Q100 = 450 CFS
Q10 = 50 CFS
Q100 = 100 CFS
Q10 = 20
Q100 = 100
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 25 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 50 CFS
Q100 = 100 CFS
Q10 = 200 CFS
Q100 = 950 CFS
Q10 = 300
Q100 = 850 CFS
Q10 = 15 CFS
Q100 = 50 CFS
S = 0.0333
n = 0.05
R = 1
TV = 1.55
125
122
142
139
136
150
158
154
A
B
C
D
E
G
H
R 6 E.
R 7 E.
T. 1 S.
T. 2 S.
17'30"
42'30"
40'
(CHANDLER HEIGHTS)
3650 II NW
CHANDLER HEIGHTS 2.8 MI.
SCALE 1:24000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
FS WITH NATIONAL MAP ACCURACY STANDARDS
CY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
Revisions show
Survey from a
information

USDA - Soil Conservation Service
201 E. Indianola, Suite 200
Phoenix, Arizona 85012

ENG - RWCD Reach-4, Inlet Hydrology

December 6, 1984

Ralph Arrington, SCE
Phoenix, AZ

210-18

I have completed the hydrologic analysis for Inlet Structures on Reach-4 of the RWCD. This analysis is a modification of Revised Alternate No. 3, TR-20 Program, dated November 1974, used in the Design of the RWCD. The major modifications include: (1) adjusting the areal rainfall for each of the subareas in the reach, (2) redelineation of Williams Field Air Force Base (Subarea 142) into eight separate subareas and computation of peak discharges for selected inlet locations (3) modifying the curve number on irrigated lands in Subarea 150, (4) eliminating Subareas 147 and 148 from Reach-4, since flows from these subareas are diverted into the Queen Creek channel upstream of the small community of Queen Creek and (5) adding Structure Release Rates to uncontrolled drainage discharges on Powerline Floodway. All of these modifications are documented in the back-up data.

The results of the analysis are shown in the following Summary Table, with approximate inlet locations shown on the accompanying map. The 100-year and 10-year, 24-hour peak discharges are also shown on the map to indicate approximate distribution of flow. In Subarea 150, the inlet locations and distribution of flow were difficult to determine, and some modification may be needed based on field surveys at the time of construction.

Should you have any questions, please let me know.

Respectfully submitted,

VOID
See Revised Memo
Dated 11/20/86
HCM

Harry C. Millsaps
Hydraulic Engineer

Enclosures

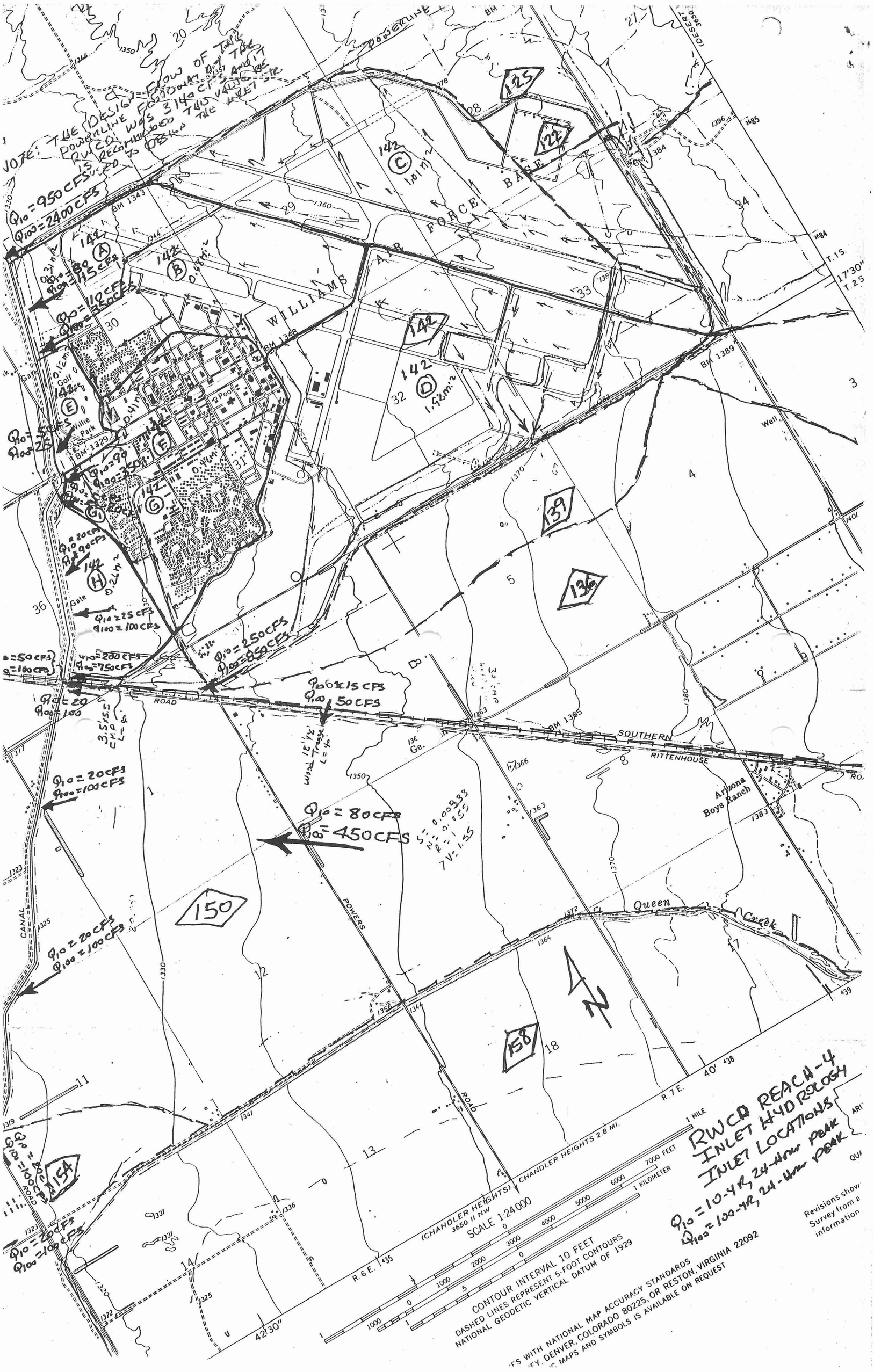
bcc: (w/enc.)
W. Wayne Killgore, ASTC(W), SCS, Phoenix, AZ
Wendell A. Styner, Hyd. Engr., SCS, Portland, OR

HCM:bjp
HCM

SUMMARY TABLE
RWCD Reach-4, Inlet Hydrology

Location	10-year Design Frequency (CFS)	100-year Design Frequency (CFS)
Powerline Floodway at RWCD	950	2400
Williams Field Air Force Base		
142A	30	115
142B	110	350
142E	5	25
142F & 142G	90	350
$142G_1$	5	20
142H	45	190
Southern Pacific Railroad Channel		
North of R.R.	200	750
Between R.R. & Hwy	50	100
Subarea 150	80	450

NOTE, Q=3140 CFS WAS USED FOR THE DESIGN OF THE POWERLINE FLOODWAY AND IS RECOMMENDED FOR THE DESIGN OF THE INLET STR.
Hem


NOTE: THE DESIGN FLOW OF THE POWERLINE FACILITY AND THE RWCD WAS 3140 CFS, AND IT IS RECOMMENDED THIS VALUE BE USED TO DESIGN THE INLET SITE
Q10 = 950 CFS
Q100 = 2400 CFS
Q10 = 110 CFS
Q100 = 850 CFS
Q10 = 250 CFS
Q100 = 850 CFS
Q10 = 80 CFS
Q100 = 450 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 225 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 50 CFS
Q100 = 100 CFS
Q10 = 200 CFS
Q100 = 750 CFS
Q10 = 15 CFS
Q10 = 50 CFS
WILLIAMS AIR FORCE BASE
POWERLINE
SOUTHERN
RITTENHOUSE
ROAD
POWERS
ROAD
CANAL
Queen Creek
Arizona Boys Ranch
Golf
Willie Park
Pool
Gate
Well
BM 1343
BM 1348
BM 1329
BM 1389
BM 1365
BM 1384
T.1.S.
T.2.S.
R 6 E.
R 7 E.
42'30"
40'
(CHANDLER HEIGHTS)
3650 II NW
CHANDLER HEIGHTS 2.8 MI.
1 MILE
7000 FEET
1 KILOMETER
SCALE 1:24000
CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
RWCD REACH-4
INLET HYDROLOGY
INLET LOCATIONS
Q10 = 10-YR, 24-Hour PEAK
Q100 = 100-YR, 24-Hour PEAK

United States Department of Agriculture

Soil Conservation Service

West National Technical Center
511 N. W. Broadway, Room 514
Portland, Oregon 97209-3489

Subject: ENG - RWCD Floodway Reach 4 - Design, Status of Work, Design Data, Williams-Chandler Watershed, Arizona

Date: August 6, 1984

To: Ralph Arrington, State Conservation Engineer, SCS, Phoenix, Arizona

File Code:

We are proceeding with the design of Reach 4 and need some additional information, as discussed with Bill Payne by telephone on July 26, 1984.

1. Hydrology: We have obtained the design flows from the TR-20 results in the work titled 'RWCD FLOODWAY-HYDROLOGY", NOVEMBER 1976, and "RWCD FLOODWAY-UPDATE OF HYDROLOGY STUDIES", MAY 1977. (See attachments nos. 1a and 1b for a summary.)

These include the 100 year design flows in the floodway and from three side drainages: 1) Powerline Floodway (27.07 square miles); 2) The channel joining the floodway at S.P.R.R./Rittenhouse Road alignment (21.92 square miles); 3) and the area between Rittenhouse and Queen Creek Roads (9.69 square miles).

After review of the aerial photos and Quad sheets we have some questions as to the location and design flow in the side inlets. These are summarized in Attachment No. 2.

Send copy to: Harry (Rich?) FCD
1.) Information available?
2.) Arrange time for field ck. & study

It would be best if someone on your staff or from the flood control district familiar with hydrology and the area could confirm the side inlet locations and design flows, as was done during the design of Reach 3.

2. POWERLINE FLOODWAY: Any available data on the existing Powerline Floodway including design calculations, as built drawings, geologic investigations, soil mechanics analysis, or correspondence that may be useful in the design of the junction with the RWCD Floodway. ART

Bill

3. SOUTHERN PACIFIC R.R. BRIDGE AT RITTENHOUSE ROAD: Construction drawings, geologic investigations, or other information on the new bridge at this location. We understand that this bridge is now being reconstructed to accommodate the floodway enlargement.

ART

4. AERIAL PHOTOS: Is there an additional contact print in the area of the Powerline Floodway and Ray Road? Our last photo is numbered 2-4. One more would give us stereo coverage of the upper end of Reach 4.

423-2357

1 copy

5. ALTERNATIVES IN R/C LINED SECTION: We are working on developing alternatives to the trapezoidal r/c lining as proposed in the work plan for the portion of the Floodway adjacent to Williams Field. These would be for either a trapezoidal soil-cement lining or a rectangular r/c lining. If either of these appears to be cost effective we will forward the information to you for review and comment.

Red lines back to contractor — waiting

6. PLAN AND PROFILE DRAWINGS: We understand that there are some difficulties in obtaining the plan and profile drawings and survey computations from the AE contractor and that they may become available by the end of August. We will need them at that time in order to continue design work toward the March 1, 1985 date requested for delivery of the drawings and specifications.

We are shooting for a completion of preliminary design work by the end of November 1984. The preliminary design will include the selection of final alignment, grade, lining materials, and the development of plan and profile drawings showing alignment and grade, and cross sections showing typical sections. At that time it would be worthwhile to have a table top and field review in Arizona to identify and reach agreement on work remaining to be done in final design.

JACK C. STEVENSON
Head, Engineering Staff

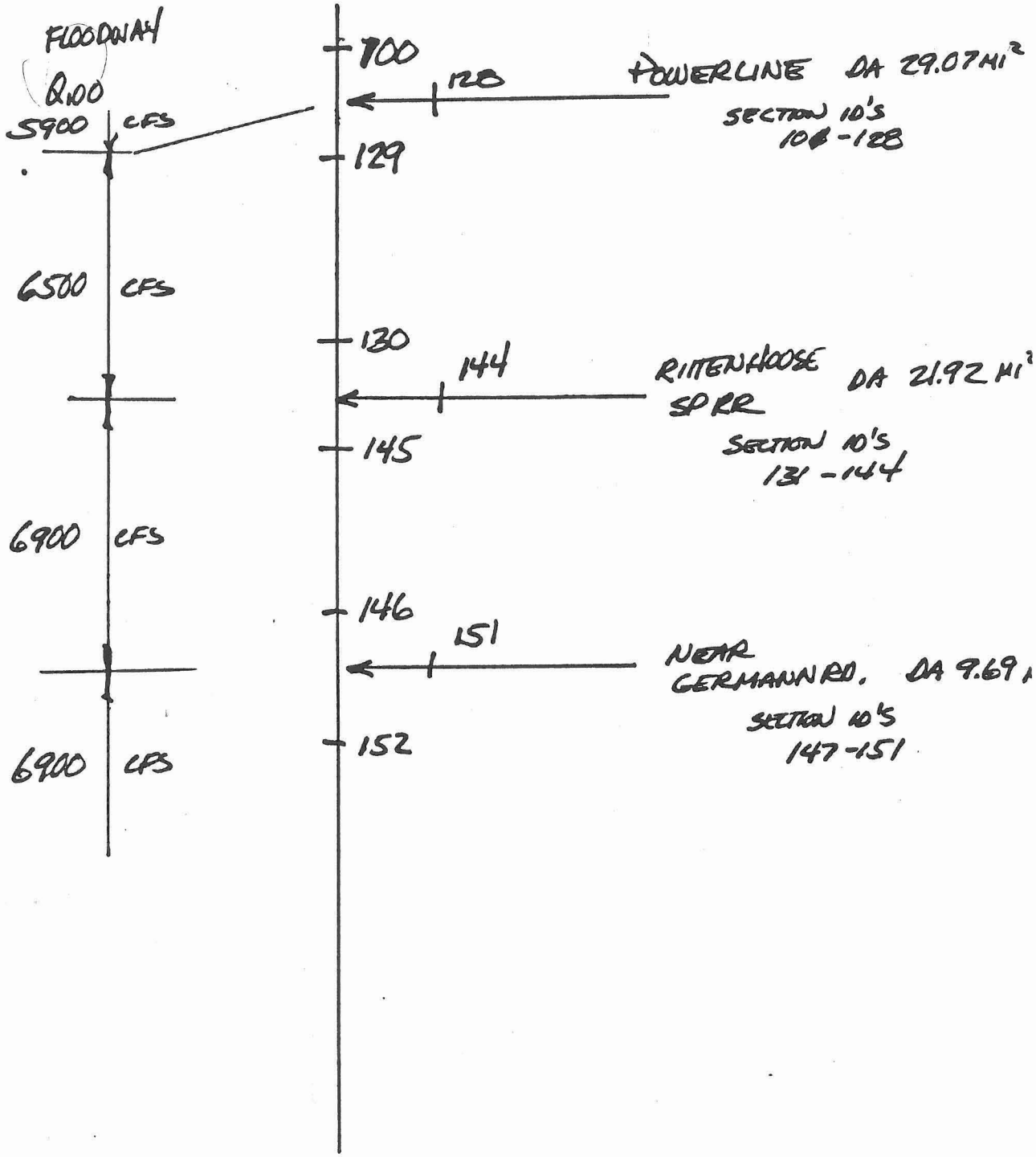
Attachments

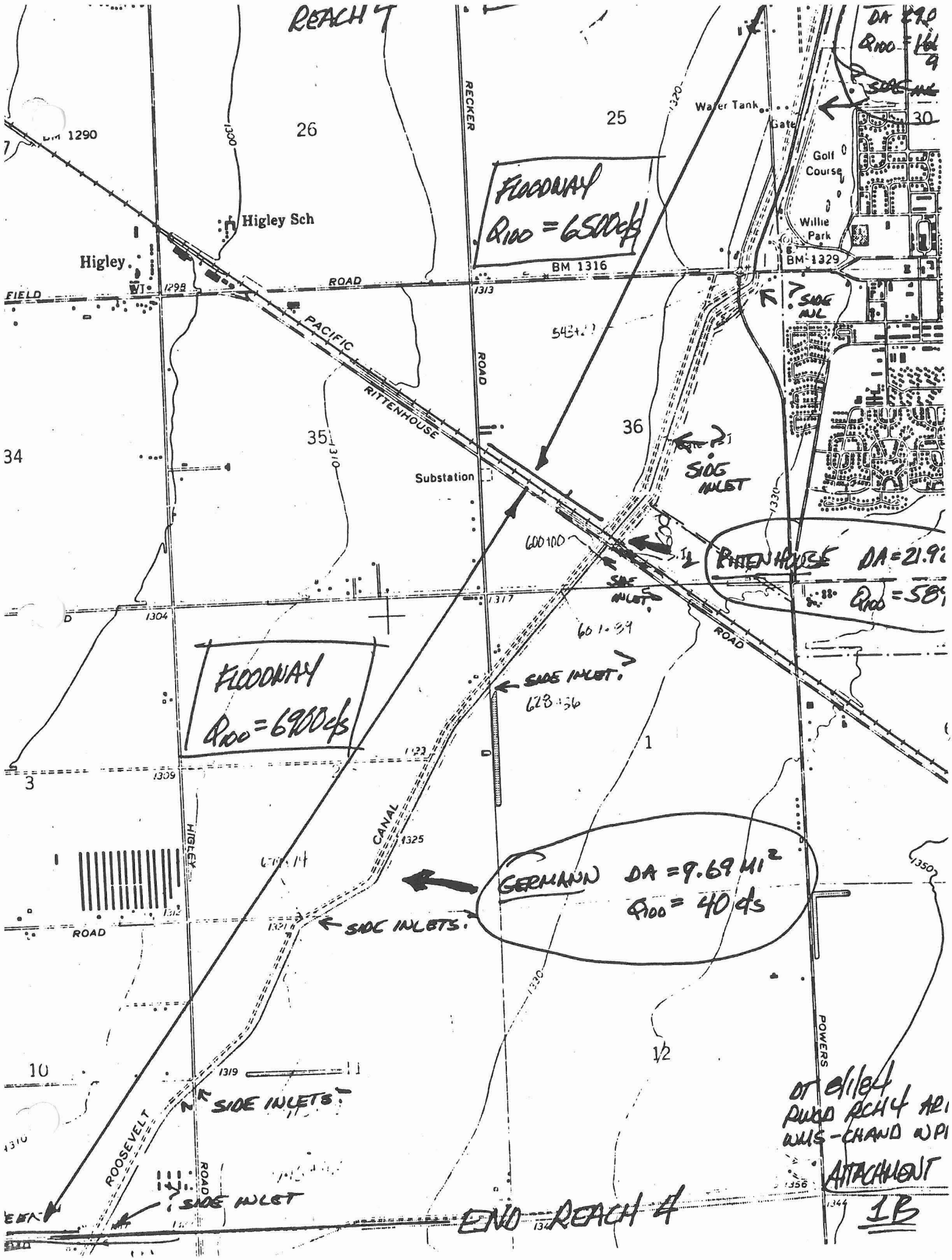
cc:
Verne Bathurst, State Conservationist,
SCS, Phoenix, Arizona
Donald E. Wallin, Head, Design Unit, Engineering, WNTC

RWCD RCH 4 FILE
WMS - CHANP WPP

ATTACHMENT 1A

TR 20 SCHEMATIC
(FROM "HYDROLOGY STUDIES")




REACH 4
FLOODWAY
Q100 = 6500cfs
FLOODWAY
Q100 = 6900cfs
RITTENHOUSE DA = 21.9
Q100 = 58
GERMANN DA = 9.69 MI²
Q100 = 40 cfs
SIDE INLET
SIDE INLETS
SIDE INLETS
SIDE INLET
END REACH 4
ATTACHMENT 1B
Higley
Higley Sch
BM 1290
BM 1316
BM 1329
Water Tank
Gate
Golf Course
Willie Park
Substation
PACIFIC
RITTENHOUSE
ROAD
FIELD
RECKER
HIGLEY
CANAL
ROOSEVELT
POWERS
26
25
30
35
36
34
3
1
10
12

ATTACHMENT 2

HYDROLOGY RWCD FLOODWAY REACH 4 ARIZONA
Work needed to cofirm location of
and design flow in the side inlets
8/1/84

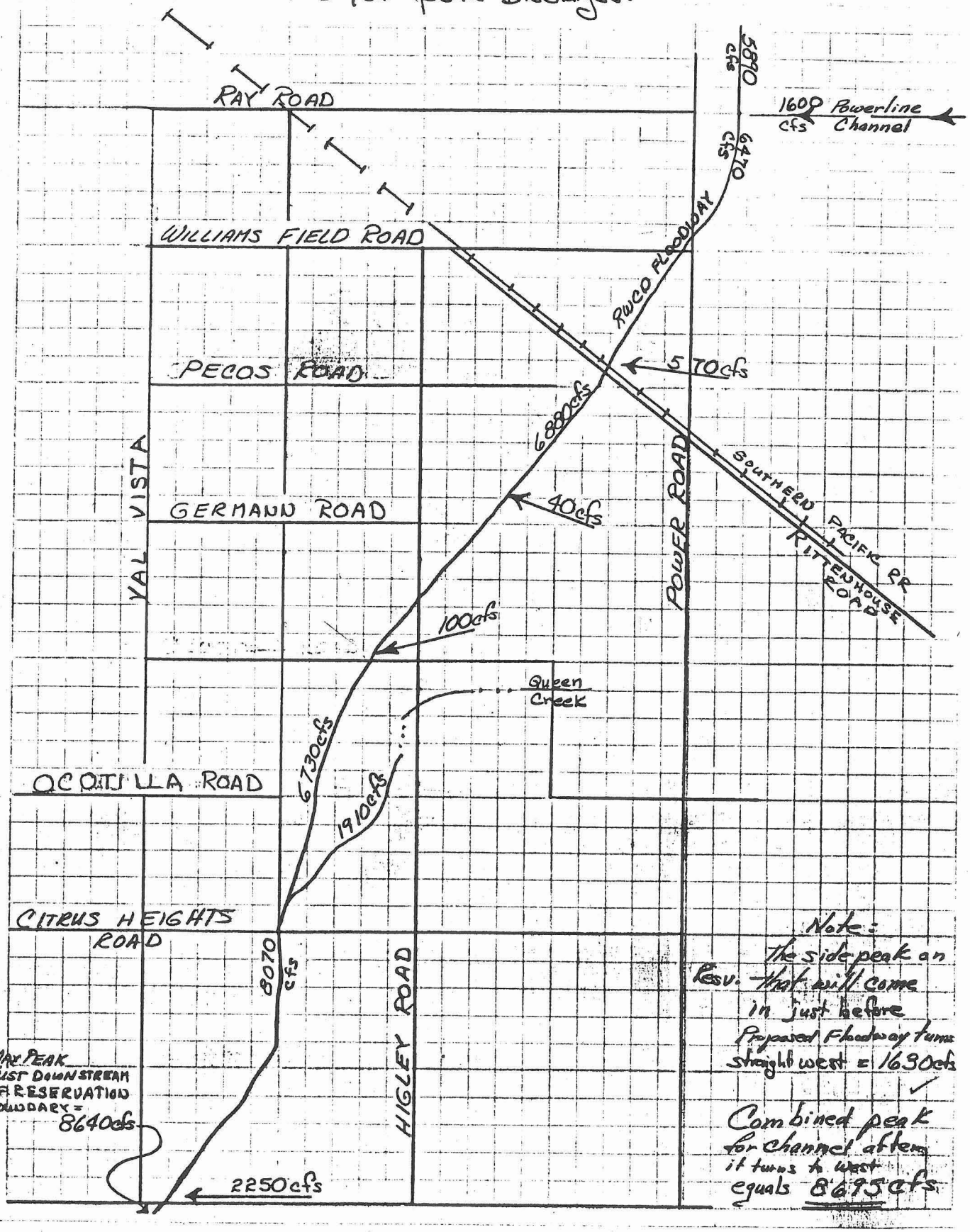
LOCATION	NEED
1. Powerline Floodway	OK (Q_{100}=1600 cfs)
2. Williams Field Golf Course drain near STA 547+00	Q_{100},Q_{10}
3. Between Wms. Field Rd. and Powers Rd.	Q_{100},Q_{10}
4. Near the middle of Sec. 36, between Powers Rd. and Rittenhouse Rd.	Q_{100},Q_{10}
5. At the Rittenhouse and SPRR bridges.	Q_{100} from TR20 run = 600 cfs. How is this distributed between the channel upstream of the RR bridge, the channel between the RR bridge and Rittenhouse Rd., and downstream of Rittenhouse Rd.
6. Between Rittenhouse Rd. and Queen Creek Rd.	Q_{100} =40 cfs from the TR20 run for this entire side drainage area. We are proposing that side inlets of nominal size be located at: approx. STA 629+00, STA 680+00, STA 716+00 (Higley Rd.) and at Queen Creek Rd. A check in the field is needed to confirm that these locations are sufficient.
7. General.	Location, Q_{100}, and Q_{10} of any additional side inlets that appear to be necessary and are not mentioned above.

ARIZONA RWCD

RM BARTELS Sept 11, 74

SUBJECT: Summary of Alternate 3 100 year peak Discharges.

SHEET 2 OF 2



COMPUTATION SHEET
SCS ENG 522A
Rev 8 69

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE		PROJECT		
BY	DATE 11/29/84	CHECKED BY	DATE	JOB NO
SUBJECT				SHEET OF

GENERAL MOTORS - PROVING GROUNDS
Gene Flatt
SCOTT Klinger - 827-5105
Jack Sellar - 827-5108

Metro Consultants - Engs for Design of Drainage Facilities
RAY Stadler - 245-0505
Called 12/25/84 for Development plans of Proving Gr Extension
Called 12/12/84 Mr Stadler said he would try to get plan in next 2 to 3 days

DRAINAGE AREAS

RWCD, REACH 4,

There were 21 sub-drainage basins used in the Design Hydrology for Reach 4, of the RWCD Floodway. These were labeled as follows in Rev, Alt #3, TR-20 program used for Design (See D.A. Map which follows

Subarea (No.)	Drainage Area (Sq miles)
101	1.00
103	2.97
104	9.48
106	0.99
109	3.70
111	2.90
113	1.25
114	2.05
116	3.20
120	0.58
122	0.41
125	0.54
131	1.56
133	6.11
136	3.60
137	4.68
139	0.72
142	5.25
147	3.07
148	0.69
~~149~~ (150)	5.93
154	1.03

Note, these two areas actually contribute to Green Creek channel and thus Reach 3 of the RWCD although they are shown to be contributing to Reach 4 in the Rev. Alt 3 TR-20 program

(Most of this subarea actually is located in Reach 3 of the RWCD.)

Most of the subareas were used as originally delineated, although some minor changes in some of the boundaries might be warranted if the study was being made today. The only changes made were in subarea 142, 147 and 148.

Subarea 142 was subdivided into 8 separate subareas, numbered with estimated sq. miles as follows (See Subarea map)

Subarea # (No.)	Drainage Area (Mi²)
142A	0.31
142B	~~0.68~~ 0.79
142C	1.01
142D	1.98
142E	0.80
142F	~~0.41~~ 0.30
142G	0.48
142H	0.26
	5.85

NOTE: Adj. D.A.'s for subareas 142B & 142F are based on D.A. 1 D.A. on map by Frances Williams plan

This subdivision was necessary to estimate inflow peaks for side inlet structures required for the reach. It will be noted that this reach consist basically of flows from the Williams Field Air Force Base. In the TR-20 program (Rev Alt #3), the total 5.25 sq miles was assumed to contribute flow to the RWCD at a point just upstream of the Southern Pacific R.R. However, based on a drainage plan furnished by the Air Force Base, only the runoff from about 1.98 sq miles of the total drainage area actually enters the RWCD at the railroad. The remaining drainage area contribute runoff either to the Powerline Floodway or to the RWCD upstream of the RR. The various entry points are shown on the Subarea drainage map for Subarea 142.

The other two major Subareas (i.e. Subareas 147 and 148) actually do not contribute flow to Reach 4 of the KWCD, but runoff from these areas is diverted by two sets of culverts thru the RR and Kitterhouse Road into a low ~~flow~~ swale ~~channel~~ which carries any discharge from these areas into Queen Creek. The culverts and designated channel are located just west of Ellsworth Road upstream of the small community of Queen Creek.

COMPUTATION SHEET

SCS-ELD-5234 Rev. 9-69

STATE: Arizona | PROJECT: RWCD, REACH - 4, INLET Hydrology

BY: Hem | DATE: 11/28/84 | CHECKED BY:

SUBJECT: Subdrainage Areas for WILLIAMS FIELD Air Force Base i.e. Sub area 142 IN REV. Att. #3 XEQ NOV. 1974 as used for Design of RWCD. Subareas were planimetered from 7½-MIN Quad Sheet, after delineation & transfer from 1" = 500 topo map at Base.

Subarea 142A

8.89	11.01	3.18	
6.75	8.89	11.01	
2.14	2.12	2.17	

$2.14^{\square''} \times .1435\ Mi^2/\square'' = 0.31\ Mi^2$

Subarea 142B

8.04	12.84	7.53	12.27
3.18	8.04	2.84	7.53
4.86	4.80	4.69	4.74

$4.77^{\square''} \times .1435 = 0.68\ Mi^2$

Subarea 142D

48.44	62.29	76.37	90.10
34.64	48.44	62.29	76.37
13.60	13.85	14.08	13.73

$13.82^{\square''} \times .1435 = 1.98\ Mi^2$

Subarea 142E

1.75	2.54	3.32
0.92	1.75	2.54
0.83	0.79	0.78

$0.80^{\square''} \times .1435 = 0.12\ Mi^2$

Subarea 142F

92.94	95.75	98.63
90.10	92.94	95.75
2.84	2.81	2.88

$2.84^{\square''} \times .1435 = 0.41\ Mi^2$

Subarea 142G

6.72	10.02	3.40
3.32	6.72	0.02
3.40	3.30	3.38

$3.36^{\square''} \times .1435 = 0.48\ Mi^2$

Subarea 142H

10.77	2.58	4.44
8.95	0.77	2.58
1.82	1.81	1.86

$1.83^{\square''} \times .1435 = 0.26\ Mi^2$

ARIZONA RWCD DRAINAGE BELOW FRS's

Hom 11/27/84

X-SECTION NUMBERS CROSS REFERENCE, Drainage Areas, Curve Numbers & T_c's for Subareas Below FRS's

(1) Subarea No.'s used by JIM Malm shown on 7½ Min Quad Shed Mylar overlay	(2) Subarea No.'s used by Bob Bartels shown on 1"=1-Mile Mylar overlay, used in Alt.'s 5 & 6 & Rev Alt. #3 XEQ Nov. 1974	(3) Subarea No.'s used by Bob Bartels for original Alt.'s 1, 2 3 & 4 XEQ Sept 1974	(4)	(5) Drainage Area (Mi²)	(6) RUNOFF CURVE (No.)	(7) Time of Concentration (Hrs)
3	1			3.00	72	0.80
8	3			2.58	74	1.00
12	6			1.58	75	1.00
17	8			1.42	75	0.75
20	10			1.32	73	0.90
26	13			1.33	74	0.70
33	15			0.85	73	1.25
? Subarea Not used	—			—	—	—
39	18			0.63	73	0.60
42	20			0.63	73	1.55
48	21			1.13	73	0.45
51	23			0.81	73	1.90
57	26			1.20	75	0.75
64	27			1.27	75	0.65
68	29			1.56	73	1.60
75	30			1.48	75	0.60
80	33			3.12	73	2.10 ?
84	36			0.96	72	1.10 ?
89	38			0.67	75	0.70
92	39			1.57	74	0.90
95	41			1.28	74	2.85
99	42			1.06	75	0.90
104 (107)	44			1.63	74	2.60
113	47			1.63	71	2.40
116	49			1.04	52	2.00
130 (120)	53			2.69	67	3.20
122	55			0.97	51	1.80
128	58			1.05	75	0.70
123 (133)	60			1.71	76	0.60
138	63			3.60	76	2.30
143	67			6.47	72	6.10
147	70			0.95	75	2.30
150	71			2.55	75	3.25
152	73			1.32	75	3.80
? (156)	76			0.50	75	2.00

NOTE: These numbers were used in Alt. #3 Design Run labeled Rev

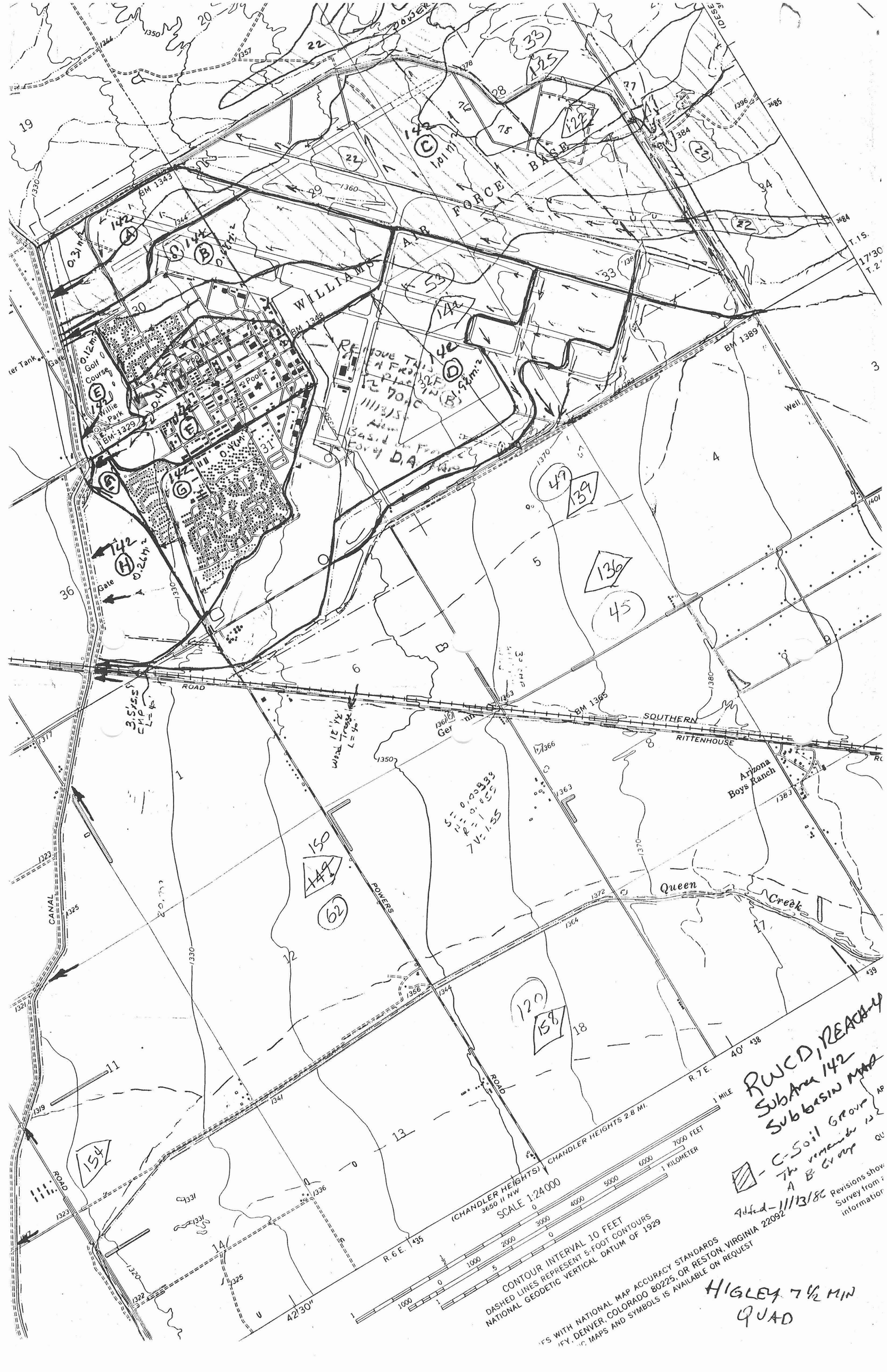
Note, No.'s same as first Column down to Subarea No. 99

REACH - 4, RWCD

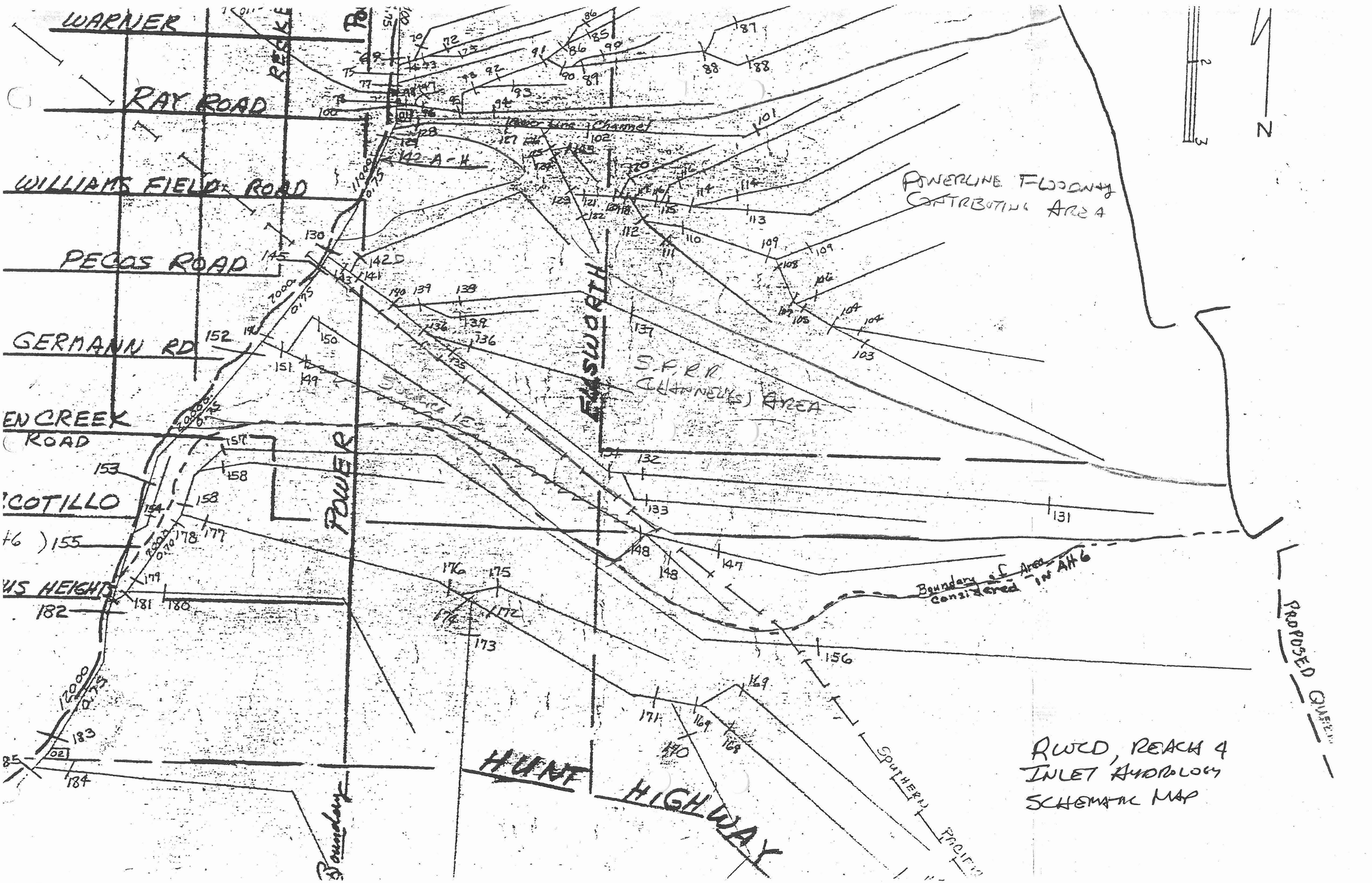
①	②	③	④	⑤ (D.A)	⑥ (CN)	⑦ (Tc)
160 (159)?	79			2.30	75	3.95
? (160)?	80			1.11	75	2.20
163	82			1.06	75	2.00
165	83			2.54	75	3.50
168	86			0.57	75	2.00
170	87			1.28	75	2.00
171	88			2.12	75	3.60
174	90			1.66	75	1.80
178	93			0.64	75	1.50
180	94			1.71	75	3.30
183	97			0.52	75	0.90
		No.'s are same as in Column 1				
		Orsico Pt				
3	✓ 101	303		1.00	75	2.20
6	✓ 103	306		2.97	68	3.80
7	✓ 104	307		9.48	74	5.40
10	✓ 106	310		0.99	75	2.50
13	✓ 109	313		3.70	75	4.40
16	✓ 111	316		2.90	68	3.00
18	✓ 113	318		1.25	75	3.20
19	✓ 114	319		2.05	75	5.00
22	✓ 116	322		3.20	75	5.40
27	✓ 120	327		0.58	75	1.30
33	122	330		0.41	75	0.90
	125	333		0.54	75	0.47
40	131	340		1.56	68	2.80
42	133	342		6.11	50	5.60
45	136	345		3.60	53	3.20
47	✓ 137	347		4.68	53	5.60
49	139	349		0.72	55	2.40
53	142	353		5.25	75	3.30
58	147	358		3.07	50	5.00
59	148	359		0.69	50	1.80
62	149 (150)	362		5.93	51	5.60
66	154	366		1.03	68	1.70
117	156	417		15.90	54	3.80
120	158	420		4.70	53	3.20
139	159	439		7.90	58	4.30
141	160	441		9.00	73	2.70
146	163	446		16.60	65	3.80
150	166	450		6.00	67	2.50
153	169	453		3.90	50	4.00
155	170	455		13.90	73	2.00

REV ALT #3 - USED

①	②	③	④	⑤ (D.A.)	⑥ (CN)	⑦ (Tc)
158	173	458		8.30	79	1.40
160	175	460		2.60	53	3.20
?	?	?	Subarea	Not used, See	7½ Min	Mylar Nailing
165	180	465		16.50	54	2.60
169	184	469		13.80	82	3.10
172	187	472		5.00	81	1.10


RWCD, REACH 4
SubArea 142
Subbasin MAP
C-Soil Group
The remainder is A B Group
Added 11/13/86
Revisions show
Survey from
information
HIGLEY 7½ MIN
QUAD
WILLIAMS
AIR FORCE BASE
Golf Course
Willie Park
Pool
Gate
Well
BM 1343
BM 1348
BM 1329
BM 1389
BM 1365
SOUTHERN
RITTENHOUSE
ROAD
POWERS
ROAD
CANAL
ROAD
Queen Creek
Arizona Boys Ranch
R. 6 E.
R. 7 E.
T. 1 S.
(CHANDLER HEIGHTS)
3650 II NW
CHANDLER HEIGHTS 2.8 MI.
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
FS WITH NATIONAL MAP ACCURACY STANDARDS
FEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
IC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

RWCD – REACH
SUBAREA MAP
Elliot Road
Vista
Road
Val
Road
Rector
Road
Roy
Greenfield
Road
Williams
Field
Higley
Pop (Est)
295
INGLEY
Queen
Creek
Road
Germann
Road
Queen Creek Road
Curtis
Road
Creek
Pacific
Railroad
WILLIAMS AIR FORCE BASE
FOR ENLARGEMENT SEE PAGE
PIPELINES
FLOOD ZONE
PATTERSON AIRPORT
U.S.A.F.
FIELD
DA=5.25
CN=75
DA=0.54
CN=75
DA=2.90
CN=66
DA=0.41
CN=75
DA=3.60
CN=53
DA=0.72
CN=55
DA=4.66
CN=53
DA=5.95
CN=51
DA=1.03
CN=62
DA=6.11
CN=53
DA=0.69
CN=50
DA=3.07
CN=53
DA=7.46
CN=74
DA=2.97
CN=62
DA=1.00
CN=75
DA=3.22
CN=75
DA=3.22
CN=75


WARNER
RAY ROAD
WILLIAMS FIELD ROAD
PECOS ROAD
GERMANN RD
EN CREEK ROAD
COTILLO
US HEIGHTS
HUNT HIGHWAY
ELLSWORTH
POWER
Power Line Channel
142 A-H
142D
POWERLINE FLOODWAY CONTRIBUTING AREA
S.F.R.R. CHANNEL(S) AREA
Boundary of Area Considered in AH6
PROPOSED QUEEN
SOUTHERN PACIFIC
Boundary
N
RWCD, REACH 4
INLET HYDROLOGY
SCHEMATIC MAP

12/3/84
HM

TIME OF Concentration
Reach 4, RWCD
Inlet Hydrology

The times of Concentration used in this analysis are the same as those used for Design of the RWCD, i.e. Tc's are those used in Rev Alt # 3, XEQ NOV 1974, except for Subarea 142 which has been subdivided and Tc's calc as follows:

Subarea (NO.)	Time of Conc. (Hrs)
142A	0.74
142B	0.96
142C	Not Calculated
142D	1.48
142E	0.69
142F	0.51
142G	0.95
142H	0.33

Other Subareas and Tc's developed by Bob Burdeis are as follows:

Subarea (NO)	Tc (Hrs)	Subarea (NO)	Tc (Hrs)	Subarea NO	Tc (Hrs)
101	2.20	116	5.40	139	2.40
103	3.80	120	1.30	142	See Above
104	5.40	122	0.90	147	5.00
106	2.50	125	0.47	148	1.80
109	4.40	131	2.80	~~149~~(150)	5.60
111	3.00	133	5.60	154	1.70
113	3.20	136	3.20		
114	5.00	137	5.60		

COMPUTATION SHEET

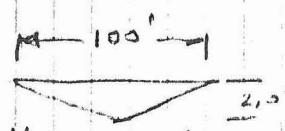
SCS-ENG-523A Rev. 9-69

STATE: AR12 | PROJECT: RWCD, REACH-4, Inlet Hydrology

BY: Hem | DATE: 11/29/89 | CHECKED:

SUBJECT: TIMES of Concentration on Williams AIF Base Subarea 142 in Rev. Alt #3, TR-20, used in Design of RWCD.

Subarea 142A



$Y = \frac{100}{100} = 1.0$

$S = 10/2900 = .0037$

$L = 6000'$

$V = \frac{1.486}{0.040}(1.0)^{2/3}(.0037)^{1/2} = 2.26$ '/sec

$T_c = \frac{6000}{(3600)(2.26)} = 0.74$ Hrs

Subarea 142B

$L_T = 9600'$

$L_1 = 4700'$

$S = 0.0039$

$Y = 1.0$

$V = \frac{1.486}{.040}(1.0)^{2/3}(.0039)^{1/2} = 2.32$

$T_t = \frac{4700}{(3600)(2.32)} = 0.66$

$L_2 = 1900$

60" RCP

$N = 0.012$

$S = 0.0034$

$Y = 1.25$

$V = \frac{1.486}{.012}(1.25)^{2/3}(.0034)^{1/2} = 8.38$

$T_t = \frac{1900}{(3600)(8.38)} = .06$

$L_3 = 3000'$

$S = .0034$

$BW = 3'$, $S:S = 2:1$

$D = 3$, $Y = 1.64$

$N = 0.035$

$V = \frac{1.486}{.035}(1.64)^{2/3}(.0034)^{1/2}$

$V = 3.44$

$T_t = \frac{3000}{(3600)(3.44)} = 0.24$

$T_c = 0.66 + 0.06 + 0.24 = 0.96$ hrs

Subarea 142D

$L_T = 29,100'$

$L_1 = 1300'$

$V = 1.5$

$T_t = \frac{1300}{(3600)(1.5)} = 0.24$

$L_2 = 5000'$

$V \cong 4.5$

$T_t = \frac{(5000)}{(3600)(4.5)} = 0.31$

$L_3 = 10,300$

$BW = 20'$, $D = 3$, $N = 0.030$

$S:S = 4:1$, $Y = 2.15$, $S = .0035$

$V = \frac{1.486}{.030}(2.15)^{2/3}(.0035)^{1/2} = 4.90$

$T_t = \frac{10,500}{(3600)(4.9)} = 0.60$

$L_4 = 3500$

Same Channel as L_3 except $N = 0.050$

$V = \frac{.030}{.050}(4.9) = 2.94$

$T_t = \frac{3500}{(3600)(2.94)} = 0.33$

$T_c = 0.24 + 0.31 + 0.60 + 0.33 = 1.48$ hrs

COMPUTATION SHEET
SCS-ENG-522A
Rev. 8-69

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE: ARIZ
BY: Hem
DATE: 11/30/84
PROJECT: RWCD, REACH-4, Inlet Hydrology
CHECKED BY:
DATE:
JOB NO.:
SUBJECT: Times of Conc on Williams Field A/F Base for Subarea 142 in Rev. Alt #3 TR-20 program used for Design of RWCD
SHEET OF

Subarea 142E

L = 1250'
V = 0.5 '/sec (overland flow on Golf course) (Fig 3-1, Draft TR-55, 8/84)
Tc = 0.69 hrs

Subarea 142F

L_1 = 3900 (Gutter flow)
S = 0.0037 N = 0.020
$Y = 0.5^{.63}$
$V = \frac{1.486}{.020}(.5)^{2/3}(.0037)^{1/2} = 2.84$
$T_t = \frac{3900}{(3600)(2.84)} = 0.38$

L_2 = 900' (2-30" RCP)
S = ? V ≈ 9'/sec
$T_t = \frac{900}{(3600)(9)} = .03$ hrs

L_3 = 1450 (open chan
Bw = 4' 5:S = 3:1
D = 4.0' Y = 2.18
S = .0025, N = 0.030
$V = \frac{1.486}{.030}(2.18)^{1.48/3}(.0025)^{.5/2}$
V = 4.16
$T_t = \frac{1450}{(3600)(4.16)} = 0.10$

Tc = 0.38 + .03 + .10 = 0.51 hrs

Subarea 142G

L_1 = 2900' (Gutter flow)
S = 0.0027 Y = 0.5, n = 0.020
$V = \frac{1.486}{.020}(0.5)^{.63\ 2/3}(.0027)^{.0522\ 1/2} = 2.44$
$T_t = \frac{2900}{(3600)(2.44)} = 0.33$ hrs

L_2 = 4450'
S = 0.00065
Bw = 2' 5:S = 3:1 N = 0.030
D = 2.5 Y = 1.57
$V = \frac{1.486}{.030}(1.57)^{1.35\ 2/3}(.00065)^{.0255\ 1/2} = 1.71$
$T_t = \frac{4450}{(3600)(1.71)} = 0.72$

Tc = 0.33 + 0.72 = 0.95 hrs

Subarea 142H

L = 2000'
$S = \frac{10}{3000} = .0033$
V = 1.7 (Fig 3, TR-55)
$T_c = \frac{2000}{(3600)(1.7)} = 0.33$ hrs

12/4/84
Hem

RWCD REACH - 4
Inlet Hydrology
CURVE NUMBERS

Curve Numbers used in this analysis were the same as those developed by Bob Bartels for Rev. Alt #3 for the TR-20 program as used in the Design of the RWCD, except for Subareas 142 and 150. Subarea 142, which is basically the Williams Field Air Force Base, was further subdivided and individual curve numbers were developed for each subarea as follows:

Subarea No.	Runoff[1] CN
142A	70 76
142B	77 86
142C	79 81
142D	77 80
142E	64 65
142F	74 84
142G	77 78
142H	72

Note! This individual Subarea CN was further based on field data and developed in 1984 and 1985 by Brown, Cox & Lane Consulting Engs. who are developing a primary plan for the AFB Base. See the data 11/20/85 attached

[1] See Attached work sheet

76 weighted for total subarea. This compares with CN=75 used by Bartels

For Subarea 150 Bartels used a CN=50 for all irrigated lands. This was based on the assumption that most irrigated land had a field border around them which would tend to retain a certain amount of rainfall before runoff would occur from the field. Although this may be true for most irrigated areas in the RWCD drainage, it is not true for Subarea 150. Only on about 20% to 30%

of the total irrigated area in this subbasin would [illegible] any significant amount of water be retained. This is based on a field reconnaissance of the subarea. Thus, using a CN = 69 for fields w/o borders and CN = 50 for fields with borders a weighted CN = 65 was developed for the irrigated lands in Subarea 150. A final weighted CN = 66 was finally used for this subarea since about 5% of the subarea is in Desert Brush. This compares with a CN = 51 used by Dodds in his analysis.

Similar reasoning might be used for other agricultural areas contributing to the RWCD Reach-4, but these were not analyzed during this study, since the basic assumptions concerning CN's were agreed to during the RWCD Design Analysis and other irrigated subbasins are not as critical in the sizing of inlet control structures for the RWCD as Subarea 150. For instance Subareas 101 thru 125 contribute to the prevailing floodway and generally the inlet structure for this channel will be sized according to the design flows in the floodway. As noted above, Subarea 142 has been further subdivided and CN's developed for each subarea. For Subareas 131 thru 139, which contribute flows to the RWCD immediately upstream of the Southern Pacific RR and to the channel between the RR & Rancho Road, design discharges were generally controlled by runoff from Subarea 142 which had a q_p = 2557 CFS as compared to q_p = 584 CFS based on running off all of the contributing subareas. The same holds true in the present analysis, although it is now recognized that only about 40% of Subarea 142 contributes flow to the channel(s) located at the RR. (See Drainage Area Map located in Drainage Area Section of this documentation) Subareas 147 and 148, although shown in Alt #3 as contributing to Reach 4, actually are diverted into Queen Creek and thus contribute to Reach 2. [illegible]

Map Symbol	Series Name	Hyd Soil Group	
Gm,	Gilman	B	RWCD REACH-4 INLET Hydrology
Mw	– Mohall	B	
Co	– Contine	C	EASTERN MARICOPA & NORTHERN PINAL COUNTIES AREA, ARIZ
Es	– Estrella	B	

77	Mohall	B	AGUILA – CAREFREE AREA PARTS of MARICOPA & PINAL COUNTIES, ARIZ
22	Contine	C	
76	Mohall	B	
75	Mohall	B	
55	Gilman	B	
78	Mohall	B	
112	Tremant	B	

See D.A. Map for Location of "C" Soil Group

COMPUTATION SHEET
SCS ENG 522A
Rev. 8-69

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE Arizona
BY Tom
DATE 11/30/84
SUBJECT Curve Number Calculations for Williams Field A/F #3 Use in RWCD Design Hyd.
PROJECT RWCD, REACH-4, Inter Hydrology
CHECKED BY
DATE
SHEET OF

Drainage Area (No.)	(Mi²)	Hydrologic Soil Group	COVER CONDITIONS Runway CN=89	Housing (CN=80)[1]	Desert Brush Irr Agric (CN=76)	(CN=69)	Open Lawn Golf Course (CN=61)	Weighted 24-Hour CN.
142A	0.31	B C			60%		40%	70
142B	0.68	B C	5%	15%	80%			77
142C	1.01	B	20%		80%			79
142D	1.98	B	5%		95%			77
142E	0.12	B					100%	61
142F	0.41	B		70%			30%	74
142G	0.48	B		80%	5%		15%	77
142H	0.26	B			40%	60%		72
	5.25							76 ← Note Bob W. Used a Composite CN=75 for total Subarea No 142.
~~149~~ (150)	5.93	B			5%	95% (USE CN=65[2] for this Irr Agric)		66

See Joel D Cole's Calc dated 11/20/86 for

1) This CN is based on 12000 Houses/Acre on 1/2 Acre Lots as used in RWCD Design Analysis, Note TR-55, dated 8/84 gives a CN=70 for this cond.
2) Curve Number for Subarea 150 base on 20% of field with Border with CN=50 And 80% w/o field borders CN=69. The first CN was developed by Bob Bowles in RWCD Design Hyd & the latter CN is taken from Draft TR 55, dated Aug 1984 Table 2-1 for Rangeland's Continuous Forage & Cover Type (Good Cond)

STATE Arizona PROJECT RWCD, REACH-4, Indian Bend Wash
Area 4 Curve Number Calculations for Williams Field
AIF Bas Subarea (142) Subarea 150 on
All #3 use in RWCD Design Hyd.
11/20/86
113 of 184

Drainage Area (No.)	(Mi²)	Hydrologic Soil Group	Cover Conditions: Pavement & Cracked Grass CN=89 95	Residential Housing (CN=80)[1] CN=85	Desert Brush Inv Agric (CN=77) B (CN=69) CN=85-C	Open Lawn Golf Course (CN=65) B CN=74-C	Weighted 24-Hour CN
142A	0.31	50% B 50% C			~~60~~% 30% 30%	20% ~~40~~% 20%	~~70~~ 76
142B	0.79 ~~0.68~~	45% B 55% C	~~5%~~ 30%	15%	25% ~~80~~% 30%		~~77~~ 86
142C	1.01	B	20%		80%		~~79~~ 81
142D	1.98	B	16 ~~5~~%		84 ~~95~~%		~~77~~ 80
142E	0.12	B				100%	~~61~~ 65
142F	0.30 ~~0.41~~	B		Commercial use CN=92 70%		30%	~~74~~ 84
142G	0.48	B		80%	5%	15%	~~77~~ 78
142H	0.26	B			40%	60%	72
	5.25						~~76~~ 80
149 (150)	5.93	B			5%	95% (Use CN=65[2] for this subarea)	66

← Note Bartell Used as Composite CN=75 for whole Subarea No 142

1) This CN is based on 12 Houses/Ac on 1/2 ac lots as used in RWCD Design Analysis. Note TR-55, detail sheet gives a CN=70 for this land
2) Curve Number for Subarea 150 base on 20% of field with Boulder

12/4/84
Stern

RWCD, REACH-4
INLET HYDROLOGY
PRECIPITATION

The precipitation values used in this analysis are the same as those used in Rev Alt #3, TR-20 program for the Design of the RWCD, except the Areal Reduction factors have been changed to account for the smaller contributing drainage areas for the individual inlet structures. In the RWCD Design Hydrology, point rainfall was used on the northern most drainage areas and reduced areally in a southern direction. Using this procedure, rainfalls for 100-year storm frequency for Reach-4 varied from 3.05" down to 2.90" as compared to point rainfall of 3.60". Similar reductions were made for other storm frequencies. (See Work Outline, which follows, RWCD Design Hydrology, by Bob Bartels, dated Aug 27, 1974.)

In the present analysis, the following rainfalls were used for the 100-yr and 10-yr storm frequencies

DESCRIPTION	SUBAREA (NO.)	CONTRIBUTING AREA (MI²)	AREAL REDUCTION FACTOR	FREQUENCY (YRS)	RAINFALL (IN)
Powerline Floodway Subareas	101-128	29.07	0.92	100 YR	3.31
				10 YR	1.98
Subdrainages contributing to channel(s) upstream of S.P. RR.	129-143	21.92 (Note: Actually part of Subarea 142 should not be included in this total)	0.92	100 yr	3.31
				10 yr	1.98
[illegible] in Field vs Basin	142A-142H	5.25 (Total Area of Although individual subareas are < 2.00 mi²)	1.00	100 yr	3.60
				10 yr	2.15
Subarea South of S.P. RR.	150	5.93	1.00	100 yr	3.60

UGH DRAFT
b Bartels:mn
gust 27, 1974

WORK OUTLINE

RWCD DESIGN HYDROLOGY

1. Use Jim Malone's method of placing storm on watershed; i.e., start at north end and reduce rainfall as we go south. Same general procedure as May 23, 1973 run.

2. Use data developed by Jim on 24-hour area reduction factor, and as calculated by Wendall Styner in his memo of July 19, 1974 to determine design precipitation. (See Attachment No. 1)

Drainage Area Total Sq. mi.	Intervening Sq. mi.	Intervening Rainfall (Percent of Point)	Average Rainfall For Total Watershed (Percent of Point)
1	1	100	100
5	4	96.2	97
25	20	91.9	93
55	30	87.6	90
95	40	82.8	87
150	55	78.8	84
220	70	77.6	82
300	80	74.5	80
385	85	71.0	78
500	115	69.3	76

3. Use the following precipitation values for design of RWCD. From WB Rev TP 40 maps, use point rainfall halfway between Mesa and Apache Junction as representative of uncontrolled area.

Map Rainfall	Factor	Plotted Value	*Design Point
1% = 3.6 inches	1.00	3.6	3.70
4% = 2.8 inches	1.00	2.8	2.80
10% = 2.25 inches	.99	2.23	2.20
20% = 1.85 inches	.96	1.78	1.80
50% = 1.35 inches	.88	1.19	1.20

* (See Attachment No. 2)

4. For Runoff Curve Number Determination use the following procedures:

A. From original data used in 1973 TR-20 Run and General Soil Maps, it has been determined that the soils for the uncontrolled area between the dams and the RWCD, except the San Tan Mountains, are B soils.

B. Use the procedures shown in Hydrology Design Manual to determine RCN for present natural conditions; i.e., use the curves in the handbook for the natural vegetation existing today to determine the short duration RCN.

C. Reduce the short duration RCN for duration; i.e., if short duration RCN is 80 then the 24-hour RCN will be 71. (Actual value used is a 24-hour RCN of 75 for desert conditions.)

D. The 24-hour RCN will be used on all desert lands in both present and future conditions.

E. The Runoff Curve Number for irrigated agricultural land is estimated to be 50 to show effect of built-in storage of leveled fields.

F. For urban lands, use the RCN shown in the Mohave County manual for urban areas. These RCN will not be reduced for duration. The percent of impervious surfaces will be estimated based on housing density from the MAG data. Use the following to determine the RCN of urban areas: (Attachment No. 3)

Density of Housing Units Number/Square Mile	RCN
0 to 100	Same as natural conditions
100 to 300	75
300 to 600	77
600 to 1200	79
1200 to 2000	80
2000 +	81

5. To estimate the effect of urbanization on T_c, use Figure 15-3 NEH-4, along with Figure ~~3-3~~ 3-5 of Urban Hydrology (~~Hydrology Tech.~~ TR-55 dated 1/75 ~~Note~~ 1) to determine the amount to reduce the T_c under natural conditions:

Increase in RCN From its Natural (Rangeland) Condition	Ratio of After Urbanization to Natural Conditions (T_c)
1	0.90
2	0.85
4	0.75
6	0.60

Example: If velocity is 1.5 fps in natural condition and then the area is completely urbanized, the velocity in the future condition is $\frac{1.5}{0.6} = 2.5$ fps

or if original T_c was 1.0 hour, the future T_c is 1.0 (0.6) = 0.6 hour.

6. When Don Woodward was down, it was agreed that the Chap. 15 method did not reduce the T_c enough. The procedures used in Urban Hydrology CTU Hydrol Tech. Note No. 1 were used to farther reduce the T_c. It was decided during Don's visit that the maximum reduction we would use was 0.60 of natural T_c. (Based on change in RCN from 75 to 81.)

7. Where new data is available on X-section shape and size - revise the T_c based on the channel characteristics. Use X-section data from Buckhorn-Mesa Areal Mapping. Use 4.0 fps for Buckhorn-Mesa area north of Apache Trail.

8. For areas of undefined channels (alluvial fans), use Figure 15.2 of NEH 4 to determine velocity for T_c and reach routing Coef.

For slopes of 1% to 2%, this figure shows a velocity of 1.0 fps to 1.4 fps for alluvial fan areas. Use a maximum velocity of 1.5 fps for reach routing or insert X-section data for routing purposes. The August 4 estimate of T_c is based on 1.5 fps for all alluvial fans (including desert and agricultural land). Don Woodward agreed with using 1.5 fps.

9. In areas of defined washes; foothills; mountains; I used a velocity of 6.0 fps, until I got to undefined channels, and I then used 1.5 fps. This primarily applies to San Tan Mountain areas.

10. Based on conversations with Paul Monville, we will use a "V" of 5 fps for RWCD channel. Do not use Resvoir Program.

11. To evaluate the effect of future urbanization on the watershed, a two-step approach will be needed:

    A. First using MAG data for the year 2000, an ~~uncorrected~~ UNADJUSTED - FOR STORAGE RCN for each subwatershed will be calculated, and a revised T_c based on this urbanization will be determined as explained in No. 5 item.

    B. To determine the final RCN of the subwatershed, it will be necessary to reduce the ~~uncorrected~~ RCN determined in (11. A) to show the effect of storage in the new subdivisions of one-half inch and one inch of runoff. The Figure A (next page) shows the estimate of how much to reduce the RCN based on the increase in housing units after 1975. (See Attachment No. 5 for derivation.)

12. Will need a total of three alternatives with three storms each analyzed. The storms to be analyzed are the 100-year, 25-year and 10-year storms. The alternates to be considered are Alt. 1 "Present Conditions", based on MAG 1975 data; "Future Conditions", based on MAG 2000 data; Alt. 2 using one-half inch of storage on new urban; and Alt. 3 would be with one inch of storage on new urban.

12/5/84
Hem

RWCD REACH 4
INLET HYDROLOGY
PEAK DISCHARGE ESTIMATES

The Contributing Drainage area to Reach 4 can be divided into four major subareas based on inlet locations to the RWCD. These are labeled on the following Schematic Diagram as: (1) Powelson Floodway Contributing Area, (2) Williams Field Air Force Base, (3) Southern Pacific R.R. Channel(s) Drainage Area, and (4) Subarea 150.

Peak Discharges were estimated for each of these areas, with six different peaks being estimated for separate subdivisions of the Williams Field A/F Base Subarea. Each of the major subareas are discussed in turn as follows:

Powelson Floodway Contributing Area

The peak discharges for this subarea(s) were estimated by adjusting the peaks calculated in Rev. A/H #3, TR-20 program used in the design of the RWCD. The adjustment is based on increasing curve rainfall amounts and thus runoff by applying adjusted curve reduction factors to the subarea(s). Also, release rates from upstream floodwater retarding structures were added to those estimated for the uncontrolled drainage areas. The following table shows the adjusted TR-20 peaks to be used in the design of the Inlet Structure for the Powelson Floodway.

The Adj. peaks are based on a total uncontrolled drainage area (29.07 mi²) used in the TR-20 for the Powell Floodway. It was determined in the present analysis, however, that approximately one additional square mile of the Williams Air Force Base actually contributes flow to the floodway. The effect of this additional drainage area on the peak, however, should be relatively minor since runoff from the Air Force Base would generally precede the peak flow from the remaining drainage area. Also, in the area immediately upstream of the Air Base, General Motors has enlarged their parking grounds and has constructed a Sight Barrier, i.e. a levee about 5 to 15' high, around their property, beginning at their plant on Ellsworth Road and proceeding south for about 2 to 2½ miles to Pecos Road. The levee then turns north on Pecos for 1-mile and then back to the north for approximately ½ mile. Located about the mid-point of the levee (i.e. at ~~Height~~ Williams Field Rd Ext) on Ellsworth Road is a baffle configuration which allows all flows originating on the Proving Ground (about 4-mi²) to discharge across Ellsworth ~~Road~~ and enter the diversion channel located on the Air Base. All flows on the drainage area located above the Proving Ground and downstream of the Vineyard Road Fds are diverted around the south side of the Proving Ground into a small floodway located between the Sight Barrier levee and Pecos ~~Road~~ and then along Ellsworth ~~Road~~ and back into the Air Base Channel. Thus, from all indications, it appears that although the flow direction has been altered on the Proving Grounds, it could possibly be delayed to some extent, the total discharge in the Air Base

channel would be about the same as occurred prior to the Bright Barrier being constructed. That is the net effect of this levee construction should be relatively minor, but could possibly reduce the peak discharge to the floodplain flowing to some extent. This effect was ignored in the present analysis.

See calculations which follow this write-up.

12/1/87 NOTE: THE [illegible] FLOW OF THE [illegible] FLOW [illegible] AT THE RUNOFF WAS 3140 CFS (E[illegible] A located [illegible] PRESENT [illegible] CONDITIONS) THE [illegible] CALCULATIONS ARE [illegible] A 50 year [illegible] THE [illegible]. ONE OF THE MAJOR REA[illegible] THE DIFFERENCE IN [illegible] AND THOSE PRE[illegible] (270 CFS, SO THE [illegible] 75 DESERT [illegible] NEARLY [illegible] TO UNCONFIRMED [illegible] FOR A THE PRESENT ANALYSIS. THE COMPUTERS WITH CN = 80 USED IN DESIGN CALCULATIONS. ALSO IN THE DESIGN CALCULATIONS, PEAK DISCHARGE FROM INDIVIDUAL SUBAREA WERE ADDED YEAR BY PEAK INTO ONE EFFECT IN LAG TIME. INCREASES THE PEAKS FROM RUN. 4 - #3 USED IN THE DESIGN OF THE RUNOFF PROGRAM A WERE MODIFIED TO ESTIMATE THE PEAK FLOWS IN THE PRESENT ANALYSIS

POWERLINE FLOODWAY DISCHARGES AT RWCD

DESIGN Frequency (yrs)	EST. PEAK FROM RW. Alt 3, TR-20 Program for Uncontrolled Area (29.07 mi²) (CFS)	Adj Peak Est. For Uncontrolled Area (29.07 mi²) 1) (CFS)	RELEASE RATE From Structure (CFS)	Total Design Flow For Inlet Str. (CFS)
100	1600	1846	582	2428
10	400	496	468	964

1) Note, the Actual uncontrolled area for this location is ≈ 30 mi² since an additional 1.00 mi² from Williams Field AIF was determined to contribute to the Floodway. The peak however probably does not change since most of the designated flow would be in and out before the main peak of the drainage area would be contributing.

Williams Field AIF BASE

The Williams Field AIF Base (Subarea 142 in RW. Alt #3, TR-20 program) was subdivided into 8 subareas: 142A, 142B, 142C, 142D, 142E, 142F, 142G and 142H. In the RW Alt 3 Analysis, all of these subareas were assumed to contribute flow to the RWCD at SPRR Channel location. However, as can be seen on the Drainage Area Map, only Subarea 142D actually contributes flow to the RWCD at this location. Also, Subarea 142C contributes runoff to the Powerline Floodway discussed above. Peaks therefore were estimated for Subareas 142A, 142B, 142D, 142E, 142H and a combined flow for 142F & 142G. Also, an estimate was made for that portion of Subarea 142G, (Subarea 142G,) located in Section 36, T1S, R6E. These calculations were made using procedures outlined in RW Draft of TR-55 dated Aug 1984. Calculations follow this write-up.

[illegible] RWCD Revised Calc's, TR-55 dated June 1986 [illegible] 11/20/86

SOUTHERN PACIFIC RR CHANNELS

The peak discharges for this subarea were estimated using the same procedure as described for the Powerline Floodway Contributing Area, i.e. by adjusting the TR-20, Rev AH 3 peaks based on revised Curve Number and/or runoff values for the subarea. The peaks so determined were then divided between flows which stay north of the S.P. RR and those which pass thru the RR and then continue between the RR and Rittenhouse Road. The results of the calculations are as follows:

Design Frequency	Estimated Peak From Rev AH 3, TR-20 Program for Uncontrolled Area (21.92 mi²)*	Adj Peak Estimate For Uncontrolled Area (21.92 mi²)	Division of Flow: North of R.R.	Division of Flow: Bet RR and Hwy
100	584	850	750	100
10	138	250	200	50

* Note, This D.A. is that which was used in the Rev AH 3 TR-20 Program which included 5.25 mi from the Williams Field A/F Base Subarea. However, only about 1.98 mi² of the Air Base actually contributes to the RWCD at this location. The adjusted peak estimates, therefore, should be on the conservative side, although the 100-yr peak from the 1.98 mi² drainage (Subarea 142D, 700 CFS 11/20/86) was estimated at Q_{100} = 743 CFS. This would seem to say that the Agric. Lands contribute very little to current flows.

the total peak Discharge at this location. This seems to be borne out by the Rev Alt 3, TR-20 Run, since the peak from Subarea 142 was 557 CFS as compared to the total calculated peak at the RR of 584 CFS at VS-143.

SUBAREA 150

The peak for this subarea (i.e. the Reach between Ribbonhouse Road and Queen Creek Road) was originally calculated in Rev. Alt 3, TR-20 program at Q_{100} = 40 CFS. This included runoff not only from Subarea 150, but also subareas 147 and 148. However, it was found from a field reconnaissance that Subareas 147 and 148 are actually diverted into the Queen Creek channel just east of the small community of Queen Creek. Thus the peak for the designed reach would be that which flows only from Subarea 150. In the Alt 3, TR-20 program, this was estimated at 29 CFS for a drainage area of 5.93 sq miles. This is due to the fact that most of this subarea is irrigated agric. land for which a CN=50 was assumed. The CN=50 was based on level basin fields with borders. From the field reconnaissance, it was determined that only about 20% to 30% of this subarea fit this description. A revised weighted CN=65 was calculated for the subarea (See CN section of this documentation). Rainfall and/or runoff amounts were also adjusted as described earlier. Thus, using the revised

Rainfall and Curve numbers and the Graphical method as presented in Rev. Draft of TR-55, dated Aug 1984 Q_{100} = 450 CFS and Q_{10} = 80 CFS were calculated for the designated reach and/or Subarea

It should also be noted that approximately Q_{10} = 50 CFS passes from the SPRR in Section 6, T2S, R7E and enters this Subarea. It is doubtful, however, if it would add to the peak flow, although it will need to be taken into account for any inlet designed to handle the discharge from the Smith-Rittenhouse Road ditch.

SUMMARY

The following is a summary table showing computed discharges by Subarea. Approximate Inlet locations are shown on Inlet Hydrology map with 100-yr and 10-year, 24-Hour Discharges

LOCATION	10-YR FREQ (CFS)	100-YR FREQ (CFS)
Powerline Floodway @ RWCD	950	2400
William FIELD A/F Base		
142A	~~30~~ 50	~~115~~ 180
142B	~~110~~ 260	~~350~~ 600
142E	5	25
142F&G	~~90~~ 170	~~350~~
142G1	5	20
142H	45	190
S.P.RR. CHANNELS		
North of R.R.	~~200~~ 250	~~750~~ 800
Bet R.R. & Hwy	50	100
Subarea 150	80	450

NOTE: Q = 3140 CFS WAS USED FOR DESIGN OF POWERLINE FLOODWAY

ARIZ RWCD, REACH-4, Inlet Hydrology

Hem 12/3/84

Esti 100-yr peak on Powerline F/way at intersection of RWCD

From RWCD Design Hydrology, Rev Alt #3, TR-20 Program, the 100-yr $q_{p_{100}} = 1600$ CFS for the Uncontrolled Area Downstream of FRS's. This is for a weighted rainfall of $P_{100} = 3.05''$ reduced on a total Area of 100 sq. miles w/ Areal Red factor = 0.85. The Contributing Area to Powerline floodway below the Dams is 29.07 sq miles, which gives a rainfall reduction factor = 0.92. Using a point Rainfall of $P_{100} = 3.60''$ the revised weighted rainfall $P_{100} = (.92)(3.60) = 3.31''$. The ratio of runoff for the two rainfall amounts was calculated as follows:

$P_{100} = 3.05''$ $Q_{100} = 0.91''$ (V3-128 Rev Alt #3 TR-20 Dated Nov 1974)
weighted CN ≈ 73

∴ with $P_{100} = 3.31$ $Q_{100} = 1.05''$

Ratio $= 1.05/0.91 = 1.15$

Hence Rev $q_{p_{100}} = (1.15)(1600) = 1846$ CFS for Area D.S. of FRS's

Esti $q_{p_{100}}$ from Prin. Spy flow from Dams is 582 CFS as Calc by Paul Manville in his Analysis of the Adequacy of the Salt-Gila Aqueduct Reach 2A Wash Siphon Sta 2534+97.19 (Powerline Floodway dated MAR 2, 1981

Total 100-yr. peak on Powerline Floodway Assuming that 100-yr peak occurs on drainage Area below FRS's Simultaneously with ~~peak~~ discharge from Prin Spy. is 1846 + 582 = 2428 CFS

Round to $q_p \approx 2400$ CFS for Design of Inlet Structure on Powerline F/W

COMPUTATION SHEET
SCS-ENG-1224
Rev. 8-57

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE Ariz PROJ RWCD, REACH 4, Inlet Hydrology
BY Hem DATE 12/5/84 CHECKED BY DATE FOLIO
SUBJECT EST. 10-YR Peak on Powerline F/way At Intersection w/ RWCD SHEET OF

The Analysis of 10-yr peak can follow the same reasoning as that used to esti the 100-yr frequency discharges

$P_{10} = 1.80''$
$Q_{10} = 0.25''$ } From Rev. Alt #3, TR-20, dated Nov 1974 VS-128

∴ Weighted CN = 73

Point $P_{10} = 2.15''$
∴ Rev $P_{10} = (2.15)(0.92) = 1.98''$ (for powerline flooding drainage)
Rev $Q_{10} = 0.31''$

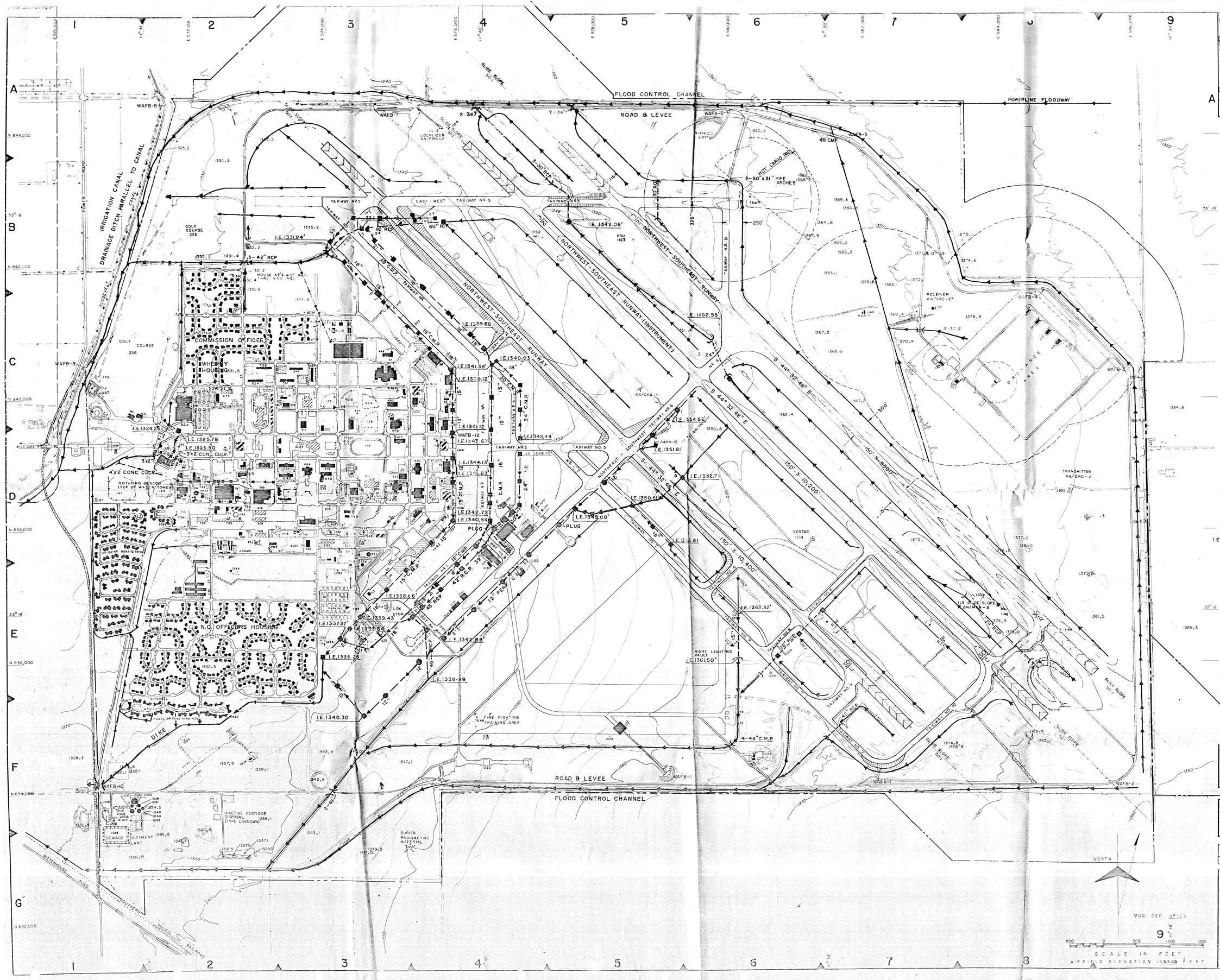
Ratio $= 0.31/0.25 = 1.24$

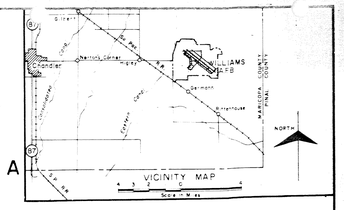
$q_{P_{10}} = 400$ CFS (From Rev Alt 3 TR-20 dated Nov 1974 (VS-128))

Rev $q_{P_{10}} = (400)(1.24) = 496$ CFS

Release Rate From FRS's 10-yr Frequency $= 468$ CFS (By Gerry Watt given in "POWERLINE CHANNEL STUDY OF ALTERNATES")

∴ Total 10-yr Peak $= 496 + 468 = 964$ CFS
SAY 950 CFS





LEGEND

AIRFIELD PAVEMENTS
- EXISTING TO BE RETAINED
- EXISTING TO BE ABANDONED
- SHOULDER STABILIZATION
- OVERRUN

STRUCTURES
- EXISTING, PERMANENT DESIGN
- EXISTING, DESIGNATED PERMANENT
- EXISTING, MOBILIZATION OR SEMI-PERMANENT
- EXISTING, TEMPORARY TO BE RETAINED
- EXISTING, TO BE ABANDONED

ROADS, PARKING & RRs
- EXISTING, TO BE RETAINED
- EXISTING, TO BE ABANDONED

BOUNDARIES
- EXISTING PROPERTY LINE (IN FEE)
- EXISTING PROPERTY LINE (Easements or Permits)
- EXISTING FENCE
- APPROACH ZONE & R/W CLEARANCE

NATURAL FEATURES
- EXISTING CONTOUR
- EXISTING TREE COVER
- CLIFF OR SEVERE GRADE DIFFERENCE
- LAKE OR POND
- STREAM OR RIVER
- DRAINAGE CHANNEL OR DITCH
- DAM
- SWAMP

UTILITIES
- CMP CORRUGATED METAL PIPE
- EXISTING UNDERGROUND DRAINAGE & DIRECTION OF FLOW
- EXISTING OPEN DITCH DRAINAGE & DIRECTION OF FLOW
- MANHOLE
- EXISTING CATCH BASIN

I.E. 1338.90' INVERT ELEVATION

CULVERT

NOTE:

PIPE IS REINFORCED CONCRETE UNLESS OTHERWISE NOTED

REV	DATE	DESCRIPTION	INITIALS
6	26 DEC 85	REVISED TO DATE	CRK
5	APR 84	REVISED	WKR
4	15 SEP 83	REVISED TO DATE	TJB
3	31 MAR 83	REVISED TO DATE	[illegible]
2	6 JUL 82	REVISED TO DATE	TJB
1	3 DEC 81	REVISED TO DATE	RLM

PLAN REVISIONS

TO ACQUIRE, CONSTRUCT, MAINTAIN, AND OPERATE REAL PROPERTY FACILITIES.

BASE CIVIL ENGINEER — DATE

DEPARTMENT OF THE AIR FORCE
DIRECTORATE OF ENGINEERING & SERVICES AF/LEE WASHINGTON DC

AIR TRAINING COMMAND
BASE COMPREHENSIVE PLAN
STORM DRAINAGE SYSTEM
WILLIAMS AIR FORCE BASE
CHANDLER, ARIZONA

SCALE: AS SHOWN | DATE: 18, AUGUST 1965
MASTER PLANNING DIRECTIVE: ATC-FY 65
WILLIAMS - STACKHOUSE & ASSOCIATES
SAN ANTONIO, TEXAS
TAB NO. G-3
SHEET 1 OF 1

DATA FROM Powerline CHANNEL DESIGN NOTEBOOK

Arizona Powerline Channel
Watt 1/4/64
Design Flow For Powerline Channel

At 72+00 10 day release

	Release 1%	Uncont. 10%	Total	Release 10%	Uncont. 2%	Total
Conc.	1095	50	1145	964	110	1074
Rock	1095	50	1145	964	110	1074
Earth	1095	50	1145	964	110	1074

38
327

At 72+00 30 day Release

Conc	552	50	602	468	110	578
Rock	552	50	602	468	110	578
Earth	552	50	602	468	110	578

AT 205 10 day Release

Conc	1095	300	1395	964	600	1564
Rock	1095	250	1345	964	530	1494
Earth	1095	170	1265	964	350	1314

At 205 30 day Release

Conc	552	300	852	468	600	1068
Rock	552	250	802	468	530	990
Earth	552	170	722	468	350	818

At 260 10 day Release

Conc	1095	360	1455	964	740	1704
Rock	1095	320	1415	964	640	1604
Earth	1095	235	1325	964	475	1539

At 260 30 day Release

Conc	552	360	912	468	740	1208
Rock	552	250	802	468	640	1108
Earth	552	235	787	468	475	943

552

STATE Arizona
BY Watt DATE 4-23-65 Powerline Channel
SUBJECT Hydrology of Inlets For individual inlet capacity.

Area 1 = 1.05 $''^2$ Length = 2'' × 2640 = 5280
168 ac
Sta. 891

T_c @ 3'/sec = .5 hr $T_p = T_c^{1/2} + .6T_c$ = 1.0 hr Curve No. 80

	30 min P	Runoff in	Runoff Peak CFS
50 yr	1.9	.49	62
25 yr	1.7	.38	48

Area 2 = 1.75 $''^2$ Length 4'' = 10560 Curve No. 80
280 Ac
Sta. 215±

T_c = 1.0 hr T_p = 1.6 hr $q = \frac{484 AQ}{T_p \times 640} = \frac{756 AQ}{T_p}$

	P/1.6 hr		
50 yr	2.4	.81	108
25 yr	2.1	.61	81

Area 3 = 1.07 $''^2$ Length 2½'' = 5940 Curve No. 80
171 ac

T_c = 0.5 hr T_p = 1.0 hr

	30' P	Runoff in	
50 yr	1.9	.49	63
25 yr	1.7	.38	49

Area 4 = 2.97 $''^2$ Length = 6'' = 15840 Curve No. 80
475.
Sta @ 261

T_c = 1.5 hr T_p = 2.4 hr

	P/1.5 hr	Runoff in	
50 yr	2.7	1.02	175 CFS
25 yr	2.4	0.81	140 CFS

Arizona
Watt 4-23-65
Capacity Conc. Channel Revised

Discharge From Powerline Dam	188 CFS
" " Vineyard Rd	358
Total	546
Emg Sp Area	54 C.F.S.
At 15+00 ±	600 CFS
Inlet @ Sta 89+00	62
Sub Total	662
Inlets @ 215	108
	63
Sub total	833
Inlet @ 260	175
Sub total	1008

From Previous Hydrology @

Elsworth Rd ± use 1200 C.F.S.

Water may be diverted to channel at later date

COMPUTATION SHEET

SCS-520

STATE Arizona

BY Watt DATE 4-23-65

SUBJECT Grade Determination

Fequeline Channel

C

Sta	Grade	Elev	Q	D	B	t	Use
12+10		1558.7					
			600	4.67	6	4½	-9"
45+00	00588	1539.28					
50+00		1536.4					
	.00746		600	4.4'	6	4½	49'
76+00		1517.0					
85+00	.00538	1512.15	600	4.77	6	4½	-9'
89+00		1510					
			Inlet	Detail	6	4½	
89+20		1509.3					
	.005843		660	4.89	6	4½	50"
113+00		1495.40					
125+00	.005343	1488.38	660	4.89	6	4½	
132+50		1484.0					
	.00774		660	4.6	6	4½	
148		1472					
165		1461.87					
	.00596		660	4.86	6	4½	
195		1444					
205	0.005552 ~~.00562~~	1438.45	660	4.93	6	4½	5.05 around curve
215+~~43~~ 71 PK							
215+00 End		1432.5					
			Inlet			4½	
215+35		1431.4					

STATE Arizona Powerline Channel

BY Watt DATE 4-28-65

SUBJECT Grade Determination

Sta	Grade	Elev	Q	D	b	t	USE D
215+35		1431.40					
245+00	.00350	1421.00	850	5.75	8	5"	5'9"
261+00		1415.40					
			Inlet				
261+60		1413.9					
	.00385		1025	6.25	8	5"	6'3"
276+00		1408.36					
285	.00665	1402.92	1025	5.62	8	5"	
305+00		1389.00					
325+00	.00560	1379.48	1200	6.10	8	5"	6'3"
333+00		1375.00					

Arizona Powerline Channel

Watt 3-21-66

Elev - Grade

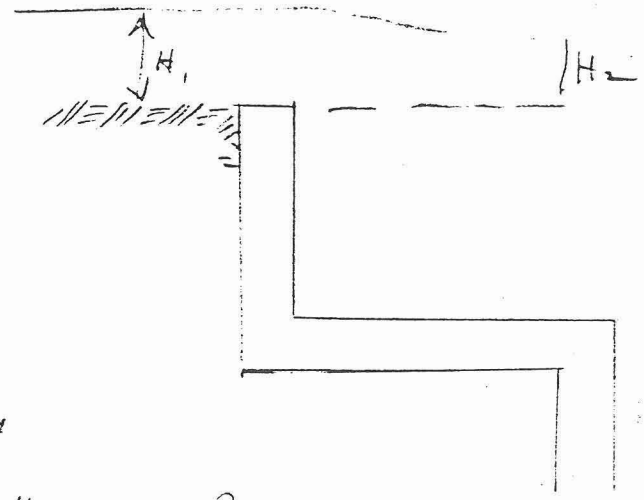
Sta	Grade	Elev	Q	D	b	Use D
333+00		1375.00				
			1210	6.42	8.0	6'6"
365+00	.00450	1360.00				
373+00		1357.00				
	SAF					
373+42		1354.00				
	.00414		3140	6.9	8.0	7'6"
400+00		1343.00				
405		1341.49				
	.00305		3140	7.45	6.0	7'6"
445		1329.28				
465+50		1323.00				

Arizona Powerline Channel

C Ware 3-27-68

Drop structure, Flow Determinations

2' Drop Station 12+30 WAFB



Design Data

Q = 1930 cfs

2.0' Drop

H_2 = 3.9'

C = 3.1 discharge coefficient

From Engr Handbook, section 11, Curve Page 3.17 and Table Page 3.19

f = 1.5

1	2	3	4	5	6	7	8	9
h	$H_1 - h - f$	$H_1^{3/2}$	$q_t = 3.1 H_1^{3/2}$	$\frac{H_2}{H_1}$	R (From Chart)	$q_s = Rq_t$	1930 cfs $L = \frac{Q}{q_s}$	L
5.5	4.0	8.00	24.8	0.98	0.12	2.97	105.7	106
6.0	4.5	9.55	29.6	0.87	0.71	21.01	91.8	92
6.5	5.0	11.18	34.7	0.78	0.85	29.49	65.4	65
7.0	5.5	12.90	40.0	0.71	0.90	36.00	53.6	54
	4.8		34.8	Interpolated for 75' width				75

$Q = 34.8 \times 75 = 2610$

$A = 4.8 \times 60 + 9.6 \times 4.8 = 334.1$

$V = \frac{2610}{334.1} = 7.78$

$D_n = 4.8 - \frac{(7.78)^2}{64.4} = 4.8 - .94 = 3.86$

WATER SURFACE PROFILE CALCULATIONS SHEET

CONSERVATION SERVICE

Project: Powerline Channel — Location: [illegible] Arizona

Date: 3-27-68 — By: C Ware — Sheet 3 of 3 — Appropriation:

Q = 1930 — b = 75 — z = 2:1 — n = .032 — n^2 =

Station	Depth, D	Bottom Width, b	Area, A	Velocity, $V = \frac{Q}{A}$	Velocity Head $h_v = V^2/2g$	$\frac{D}{b}$	d/b (table 97 King)	Hydraulic Radius R = cD	$\frac{1}{2.2083R^{4/3}}$ (table 107, King)	V^2	n^2V^2	Friction Slope $S_f = \frac{n^2V^2}{2.2083R^{4/3}}$	Invert Slope S_i ft./ft.	Energy Head $H_e = D + h_v$	$H_e'' - H_e'$	$S_f - S_i$	$l = \frac{H_e'' - H_e'}{S_f - S_i}$	Remarks
12+70	3.9	75	322.9	6.0	.559	.052	~~3.53~~	3.53						4.16				Rip Rap
				5.7				3.64	.0809		.0336	.00269	.002		0.20	.00069	287.85	is 6.0 from
15+60	4.2	75	355.3	5.1	.455	.056	~~3.75~~	3.75						4.66				channel-bottom.
	SCS Contract Ends at Station 15+60 therefore													NO				
	No Profile is considered above this station.																	
			Dn for b = 75'															
					Q = 1930 cfs					$\frac{nQ}{b^{8/3} s^{1/2}}$		$= \frac{.032(1930)}{(75)^{8/3} .0447}$			$= \frac{61.76}{b^{8/3}(.0447)}$		$= \frac{61.76}{100,051.65 \times (.0447)}$	
					n = .032													
					s = .002											$= \frac{.00061}{.0447}$		$= .01330$
					for slope			.0055		$s^{1/2} = .0745$								
					$\frac{b}{d} = .0437$					$= \frac{.00061}{.0745}$		$= .00805$				$\frac{d}{b} = .0592$		
					d = 75 × .0437				= 3.28							$d_n = 75 \times .0592 = 4.44$		

AR12 RWCD, Reach - 4

Hem 11/29/84

Estimated Capacity of Riverline Floway
Based on As-Built Plans.

STA 460+00

Given:

BW = 60' (To Top of Rip Rap) S = 0.00292
D = 6.0' r = 4.98
S:S = 2:1 A = 432
N = 0.025 to 0.030)

$$Q = \frac{1.486}{.025}(432)(4.98)^{2/3}(.00292)^{1/2} = 4049 \text{ CFS}$$

W/N = 0.030 Q = 3374 CFS
W/N = 0.034 Q = 2977 CFS
W/N = 0.032 Q = 3163 CFS ≈ 3140 Design Discharge

D = 4.0 (i.e. with 2.0' of freeboard below top of Rip Rap)
A = 272 D'
r = 3.49

$$Q = \frac{1.486}{.025}(272)(3.49)^{2/3}(.00292)^{1/2} = 2006 \text{ CFS}$$

W/N = 0.030 Q = 1673 CFS

with D = 7.6 (i.e. to top of dike)

A = 571.6 D'
r = 6.02

$$Q = \frac{1.486}{.025}(571.6)(6.02)^{2/3}(.002)^{1/2} = 6110 \text{ CFS}$$

W/N = 0.030 Q = 5091 CFS

AR12 RWCD, REACH - 4

Hen 11/29/84

Estimated Capacity of POWERLINE FLWAY
Based on As-Built plans.
STATION 385+00

Given:
N ≈ 0.025 to 0.030
BW = 60'
D = 6' (To Top of RIP-RAP)
S:S = 2:1

A = 432 □'
Y = 4.98
S = 0.002

$$Q = \frac{1.486}{0.025}(432)(4.98^{2/3})(.002)^{1/2} = 3350 \text{ CFS}$$

(2.92; .04472)

With N = 0.030 Q = 2792 CFS

With D = 7.6 (To Top of Dike)
A = 571.6 □' N = 0.025
Y = 6.08

$$Q = \frac{1.486}{.025}(571.6)(6.08^{2/3})(.002)^{1/2} = 5064 \text{ CFS}$$

(3.33)

w/ N = 0.030 Q = 4220 CFS

With D = 4.0 (i.e. 2.0' below top of Rip Rap)
A = 272 □'
Y = 3.49

$$Q = \frac{1.486}{.025}(272)(3.49^{2/3})(.002)^{1/2} = 1664 \text{ CFS}$$

(2.30)

With N = 0.030 Q = 1387 CFS

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH 4 SubArea 142A By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

Drainage Area (A_a) = 198 acres.

Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 70 See ~~other side~~ CN data for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.23	0.40		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.07	0.30		inches
7. Time of Concentration (t_c) = 0.74 hrs. See ~~other side~~ t_c data for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	350	290		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(acres)}{640(ac/mi^2)}$ $\frac{198}{640}$ =		0.31		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	116	27		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH-4 Sub-Area 142B By Hum Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

Drainage Area (A_a) = 435 acres.

Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-yr	10-yr		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 77 See ~~other side~~ CN data for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.18	0.30		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.50	0.53		inches
7. Time of Concentration (t_c) = 0.96 hrs. See ~~other side~~ tc data for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	335	300		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(acres)}{640(ac/mi^2)}$ $\frac{435}{640}$ =		0.68		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	342	108		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.--Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD REACH Subarea 142D By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = 1227 acres.

   Ponding and Swampy areas (PND) = _____ acres, _____ % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 77 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.18	0.30		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.50	0.53		inches
7. Time of Concentration (t_c) = 1.48 hrs. See other side for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	250	128		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ $\frac{1227}{640}$ =		1.98		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	743	134		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH-C1 Subarea 1/2E By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = DEVELOPED (present, developed).

Drainage Area (A_a) = 77 acres.

Ponding and Swampy areas (PND) = _____ acres, _____ % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 61 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.35	0.50		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	0.62	0.10		inches
7. Time of Concentration (t_c) = 0.69 hrs. See other side for computations				
	X			
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	325	195		cfs/mi^2 /in runoff
	X			
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ $\frac{77}{640}$ =	0.12			sq. miles
	X			
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
	=			
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	24	2		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH-4 Sub Area 142F By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = 262 acres.

   Ponding and Swampy areas (PND) = _____ acres, _____ % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 74 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-i	0.19	0.30		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.32	0.42		inches
7. Time of Concentration (t_c) = 0.51 hrs. See other side for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	488	330		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(acres)}{640(ac/mi^2)}$ $\frac{\quad}{640}$ =		0.41		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	264	57		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD REACH-4 Subarea 1426 By Hum Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = 307 acres.

   Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 77 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.35	0.50		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.50	0.53		inches
7. Time of Concentration (t_c) = 0.95 hrs. See other side for computations				
	X			
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5 —	300	176		cfs/mi^2 /in runoff
	X			
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ $\frac{\quad}{640}$ =	0.48			sq. miles
	X			
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
	=			
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	216	45		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Arizona
Hm
12/3/84

RWCD, Reach 4, Inlet Hydrology

ESTIMATED 10- & 100-YR PEAK FLOW Combined Areas 142 F & G

Sub-area No.	Tc (Hrs)	Tc (Hrs)	DA (Mi²)	100-YR Rainfall (IN.)	RCN	RUN-OFF (IN.)	Product DA X IN.	TIME - HOURS 12.3	12.4	12.5	12.6	12.7
								Discharge CSM/CFS				
								Ia/P = 0.19				
142F	0.51 (0.50)	0.0	0.41	3.60	74	1.32	0.54	429/ 232	488/ 264	459/ 248	366/ 198	278/ 150
								Ia/P = 0.35				
142G	0.95 (1.00)	0.0	0.48 / 0.89	3.60	77	1.50	0.72	45/ 32 / 264	84/ 60 / 324	132/ 95 / 343	182/ 131 / 329	221/ 159 / 309

	10-YR RAINFALL (IN)	RCN	TIME - HOURS 12.3	12.4	12.5	12.6	12.7
				Ia/P = 0.30			
142F .51 0.0 0.41	2.15	74	0.42 0.17	357/ 61	443/ 75	435/ 74	356/ 61	276/ 47
				Ia/P = 0.50			
142G .95 0.0 0.48	2.15	77	0.53 0.25	12/ 3 / 64	28/ 7 / 82	52/ 13 / 87	83/ 21 / 82	112/ 28 / 75

NOTE
DATA BASE on EXHIBIT 5-II, Draft TRSS, dated 8/84

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD REACH - 4 Subarea 142H By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Present (present, developed).

   Drainage Area (A_a) = 166 acres.

   Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 72 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.21	0.37		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.19	0.36		inches
7. Time of Concentration (t_c) = 0.33 hrs. See other side for computations				
	X			
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	615	480		cfs/mi^2 /in runoff
	X			
9. Drainage Area (A_m) = $\frac{A_a(acres)}{640(ac/mi^2)}$				
$\frac{\quad}{640}$ =	0.26			sq. miles
	X			
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
	=			
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	190	45		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project PWCD REACH-4 Subarea 1HZG1 By Hem Date 12/3/KV

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Present (present, developed).

Drainage Area (A_a) = 15 acres.

Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 77 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.35	0.50		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.50	0.53		inches
7. Time of Concentration (t_c) = $\frac{1500}{(3300)(1.5)}$ 0.28 hrs. See other side for computations				
	X			
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	560	330		cfs/mi^2 /in runoff
	X			
9. Drainage Area (A_m) = $\frac{A_a(acres)}{640(ac/mi^2)}$ $\frac{15}{640}$ =	0.023			sq. miles
	X			
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
	=			
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	19	4		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH 4 SubArea 142A By Hem Date ~~11/30/89~~ 11/20/89

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = 198 acres.

   Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 70 See ~~other side~~ CN data for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	~~0.23~~ 0.176	~~0.40~~ 0.272		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.07 1.48	~~0.30~~ 0.91		inches
7. Time of Concentration (t_c) = 0.74 hrs. See ~~other side~~ Tc data for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	350	290		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a \text{(acres)}}{640 (\text{ac/mi}^2)}$ $\frac{198}{640}$ =	0.31			sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	~~116~~ 177	~~27~~ 53		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH-4 Sub-Area 142B By Hem Date ~~11/30/84~~ 11-2012

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. **Data:** Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = ~~435~~ 515 acres.

   Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-yr	10-yr		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = ~~77~~ 86 See ~~other side~~ CN calc for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	~~0.18~~ 0.29	~~0.30~~ 0.15		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	~~1.50~~ 2.16	~~0.53~~ 0.96		inches
7. Time of Concentration (t_c) = ~~0.96~~ 1.6 hrs. See ~~other side~~ tc calc for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	~~335~~ 357	~~300~~ 341		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ = $\frac{435}{640}$ ~~515~~		~~0.68~~ 0.79		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	~~342~~ 644	~~108~~ 259		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD REACH Subarea 142D By Hem Date 11/30/84
Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = 1227 acres.

   Ponding and Swampy areas (PND) = _____ acres, _____ % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 77 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.18	0.30		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	1.50	0.53		inches
7. Time of Concentration (t_c) = 1.48 hrs. See other side for computations				
	X			
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	250	122		cfs/mi^2 /in runoff
	X			
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ $\frac{1227}{640}$ =	1.98			sq. miles
	X			
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
	=			
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	743	134		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD REACH-C1 Subarea 142E By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = DEVELOPED (present, developed).

   Drainage Area (A_a) = 77 acres.

   Ponding and Swampy areas (PND) = _____ acres, _____ % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 61 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.35	0.50		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	0.62	0.10		inches
7. Time of Concentration (t_c) = 0.69 hrs. See other side for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	325	195		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ $\frac{77}{640}$ =		0.12		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	24	2		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

See sheet for Combined Flows from Subareas 1142F & 1125 which follows.

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH-4 Subarea 142F By Hem Date 11/30/94

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = ~~262~~ 192 acres.

   Ponding and Swampy areas (PND) = _____ acres, _____ % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-yr	10-yr		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = ~~74~~ 84 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.19	~~0.30~~ 0.16		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	~~1.32~~ 1.03	~~0.42~~ 0.85		inches
7. Time of Concentration (t_c) = 0.51 hrs. See other side for computations				
		X		
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	~~488~~ 406	~~320~~ 426		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(acres)}{640(ac/mi^2)}$				
$\frac{192}{640}$ =		~~0.41~~ 0.3		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	~~264~~ 284	~~59~~ 116		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

See Est. for Combined flows from 142F & 142G which follows

Worksheet D-5.--Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCC REACH-4 Subarea 142G By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Developed (present, developed).

   Drainage Area (A_a) = 307 acres.

   Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 79 (See other side for computation)				
5. I_a/P Ratio (Use P, CN, and Table 5-1)	0.16 ~~0.35~~	0.16 ~~0.50~~		
6. Runoff Depth (Q) (Use P, CN, and Table 2-1.)	1.26 ~~1.50~~	0.51 ~~0.53~~		inches
7. Time of Concentration (t_c) = 0.95 hrs. See other side for computations				
		X		
8. Unit Peak Discharge (q_u) (Use t_c and I_A/P and Exhibit 5 ___)	300	176		cfs/mi^2 /in runoff
		X		
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ ___ / 640 =		0.48		sq. miles
		X		
*10. Ponding and Swampy Area Peak Factor (Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.)	1.0	1.0		
		=		
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	255 ~~216~~	52 ~~45~~		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

ARIZONA
Hm
12/3/84

RWCD, REACH 4, INLET HYDROLOGY

ESTIMATED 10- & 100-YR PEAK FLOW FOR CONTROL AREAS 142 F & G

Sub-Area No.	T_c (Hrs)	T_c (Hrs)	DA (Mi²)	100-YR Rainfall (IN.)	RCN	RUN-OFF (IN.)	Product DA X IN.	TIME - HOURS 12.3			12.4	12.5		12.6		12.7	
								Discharge CSM/CFS									
												$I_a/P = 0.19$					
142F	0.51 (0.50)	0.0	0.30 0.41	3.60	84 74	2.05 1.32	0.61 0.54	467 429 /	185 232	529 488 /	223 264	509 459 /	309 248	322 366 / 0.16	245 198	297 278 /	181 150
												$I_a/P = 0.35$					
142G	0.95 (1.00)	0.0	0.48 0.89 1.11	3.60	78 77	1.50 1.50	0.72 0.72	91 45 /	49 32 / 264 354	143 84 /	191 60 324 433	203 132 /	194 95 343	221 182 /	198 131 329 2143	203 221 /	220 159 309 411

Rounds to 460 cfs

				10-YR RAINFALL (IN)	RCN			TIME - HRS 12.3			12.4	12.5		12.6		12.7	
												$I_a/P = 0.30$	0.18				
142F	.51	0.0	0.30 0.41	2.15	84 74	0.45 0.42	0.26 0.17	406 357 /	105 61	491 443 /	122 75	490 435 /	125 74	302 356 /	102 61	299 276 /	77 47
												$I_a/P = 0.50$	0.26				
142G	.95	0.0	0.48 0.78	2.15	78 77	0.53 0.53	0.27 0.25	56 12 /	15 3 64 120	100 28 /	17 7 82 155	156 52 /	42 13 87 147	214 83 /	58 81 82 160	260 112 /	70 28 75 147

Rounds to 170 cfs

NOTE
DATA BASE ON EXHIBIT 5-II, TR55, Rev. 1 dated ~~8/84~~ 6/86

ARIZONA RWCD, REACH - 4, Inlet Hydrology

Hess 11/30/84

Determine effect of using Rev. weighted Rainfall for Area Contributing to Channel located immediately up stream of SP RR and its respective division of flow.

$P_{100} = 2.90''$ From Rev. Alt #3, TR-20 program for RWCD Design Weighted over 122 □ miles

$P_{100} = 3.60$ (point Rainfall, 100-yr, 24 Hr)

Areal Reduction factor = 0.92 for 21.92 sq miles Estd to Contribute to Channel Above RR

∴ wt. $P_{100} = (3.60)(0.92) = 3.30''$

For $P_{100} = 2.90''$, $Q = 0.33$ & $q_p = \underline{584}$ CFS (Summary Table 2-1 TR-20 Rev Alt #3)

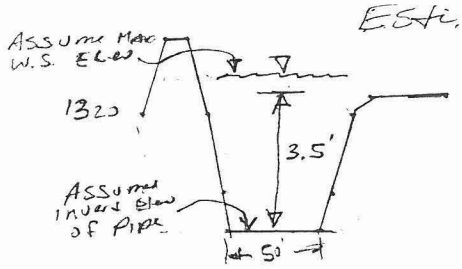
∴ weighted CN ≈ 61

With Rev $P_{100} = 3.30$ $Q = 0.48''$

Hence Rev $q_{P_{100}} = 0.48/0.33 (584) = \underline{849}$ CFS

Estimate Division of Flow between that which stays north of RR and that which passes thru RR and enters RWCD Between RR & Rittenhouse Road. There is only one Culvert which contributes to the Chan located between Road & RR. This is ≈ 3.5' X 5.5' or 4.0'' X 65' C.M. Pipe Arch L = 40, located about 1200' S.S. of Road ℄.

Estd. Max HW/D = 1.20 with projected Entrance



Q = 85 CFS (Exhibit 14-10, NEH-4, dated Aug 1972) i.e. Flow between RR & Hwy

Thus Flow along North side of RR = 849 - 85 = 764 CFS

1315

0 100

N = 0.050

A = 42.9

S = 0.00294

R = 2.86

$V = \frac{1.486}{0.05}(2.86)^{2/3}(0.00294)^{1/2} = 5.7$

Q = (42.9)(5.76) = 1396 CFS

Design

VSEA Q_{100} = 100 CFS Est RR & Hwy

Q_{100} = 750 CFS North of RR

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ARIZONA RWCD, REACH 4, INLET Hydrology

Hm 12/5/84

ESTI 10-yr Discharge on Southern Pacific R.R. Channel(s) AT RWCD

$P_{10} = 1.75''$ From Rev, AH 3, TR-20 program used in Design of RWCD

$P_{10} = 2.15$ (Point Rainfall, 100-yr, 24-hr)

Areal Reduction Factor = 0.92

Rev. wt $P_{10} = (2.15)(0.92) = 1.98''$

For $P_{100} = 1.75''$, $Q_{10} = 0.07''$ $q_{p_{10}} = 138$ CFS (X-Sect 143 Summary Table 1, Ref AH 3)
Wt. CN = 65

$\therefore$ with $P_{10} = 1.98$ CN = 65 $Q_{10} = 0.12''$

Runoff Ratio $= \frac{0.12}{0.07} = 1.71$

Rev $q_{p_{10}} = (1.71)(138) = 236$ CFS
Say 250 CFS

ESTIMATE Flow Depth in channel to Determine depth in C.M. Pipe Arch.

BW = 50', S:S = 2:1 S = 0.0037, N = 0.050
Try D = 2.0 A = 108 □' r = 1.83

$$Q = \frac{1.486}{.050}(108)(1.83)^{2/3}(.0037)^{1/2} = 292 \text{ CFS} \approx 296$$
(1.53, .0608)
Say OK

Assume open channel Flow in Pipe Arch

$A \approx (2)(5) = 10$ □'
$r = 10/9 = 1.11$
S = .0035 (Assumed)
N = 0.020

$$Q = \frac{1.486}{.02}(10)(1.11)^{2/3}(.0035)^{1/2} = 47 \text{ CFS}$$
(1.07, .0592)
Say 50 CFS

USE DESIGN FLOWS
Q_{10} = 50 CFS Bet RR & Hwy
Q_{10} = 200 CFS North of RR

Worksheet D-5.—Graphical (t_c) Peak Discharge Method (Chapter 5)

Project RWCD, REACH - 4 Subarea 150 By Hem Date 11/30/84

Checked _____ Date _____

Steps Peak Discharge Computation for up to 3 storms:

Rainfall Distribution Type II, Duration 24 hours.

1. Data: Watershed Condition = Present (present, developed).

Drainage Area (A_a) = 3795 acres.

Ponding and Swampy areas (PND) = — acres, — % of A_a

	1st Storm	2nd Storm	3rd Storm	
2. Rainfall Frequency (F)	100-YR	10-YR		yrs.
3. Rainfall Depth (P)	3.60	2.15		inches
4. Runoff Curve Number (CN) = 66 See other side for computation				
5. I_a/P Ratio Use P, CN, and Table 5-1	0.29	0.49		
6. Runoff Depth (Q) Use P, CN, and Table 2-1.	0.86	0.20		inches
7. Time of Concentration (t_c) = 5.60 hrs. See other side for computations				
	X			
8. Unit Peak Discharge (q_u) Use t_c and I_A/P and Exhibit 5-II	85	67		cfs/mi^2 /in runoff
	X			
9. Drainage Area (A_m) = $\frac{A_a(\text{acres})}{640(\text{ac/mi}^2)}$ $\frac{3795}{640}$ =	5.93			sq. miles
	X			
*10. Ponding and Swampy Area Peak Factor Only use % PND, F and Table when PND is spread out in watershed and not related to t_c flow path.	1.0	1.0		
	=			
11. Adjusted Peak Discharge where q_a = Steps #6 x 8 x 9 x 10	433	80		cfs

*If the adjustment is not applicable, enter a factor of 1.0.

ARIZONA RWCD, REACH 3, Inlet Hydrology

Hem 11/28/84

ESTIMATED 100-YEAR, 24-HRS, TYPE II

PEAK DISCHARGE, USING Draft TR-55, dated Aug 1984 FOR SUBAREA 150.

GIVEN FROM TR-20 RUN LABEL RW ALT #3, XEQ NOV 1974

D.A = 5.93 MI² P = 2.90"

CN = 51 Q = 0.09

T_c = 5.60 Hrs

USE EXHIBIT 5-II IN Draft TR-55, dated Aug 1984.

I_a/P = 0.50 (Table 5-1, p 5-3)

q_p = 67 CSM/IN (EXHIBIT 5-II, GRAPHICAL METHOD)

q_p = (67)(5.93)(0.09) = 36 CFS

This compares w/ q_p = 29 CFS from TR-20 Run

Determine effect of changing Rainfall P_{100} = 3.60" (i.e. point rainfall)

Note, T_c & CN same as above

∴ Q = 0.25"

q_p = (67)(5.93)(0.25) = 99 CFS

Determine effect of changing Rainfall P_{100} = 3.60" and CN = 66 I_a/P = 0.29 q_p = 85 CSM/IN

Note: T_c = same as above

∴ Q = 0.80"

q_p = (85)(5.93)(0.80) = 433 CFS

SAY use Design q_p = 450 CFS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ARIZONA RWCD, REACH 4, Inlet Hydrology

Hm 12/3/84

Estimated Flow Thru railroad in Middle of Section 6, T2S, R7E

GIVEN:

Small wooden BOX culvert w/earth bottom 1.5'X5'

$A = (1.5)(5) = 7.5\ \square'$ W/W Flow = 0°

$L = 40'$

$N = 0.020$

Assume MAX $\frac{HW}{D} = 2.0$

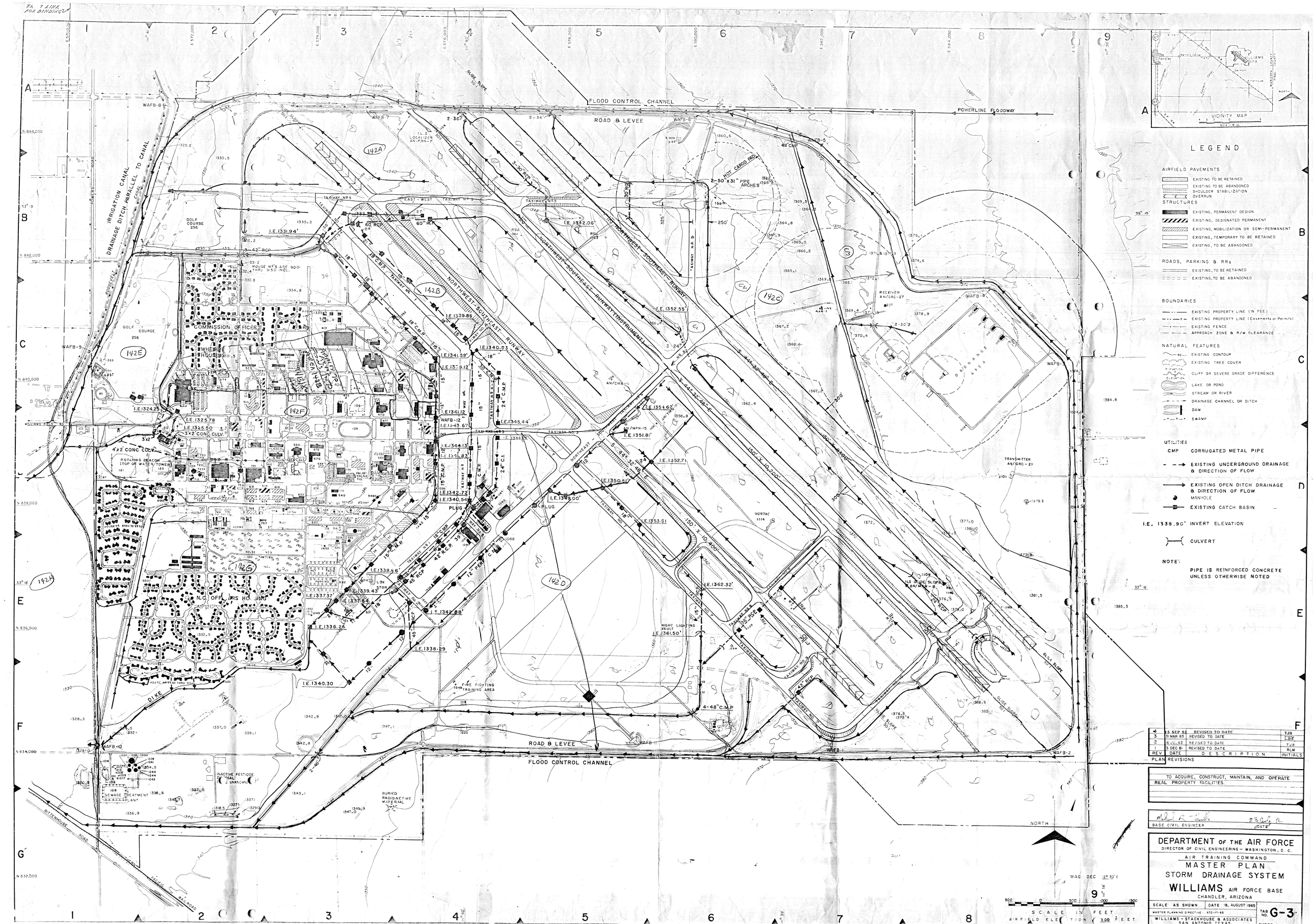
From EXHIBIT 14-6 (NEH-4, dated Aug 1972)

$q/B = 9.5$ CFS/FT

$q_p = (9.5)(5) = 47.5$ CFS

SAY 50 CFS

Note, this Flow crosses Rittenhouse road and is generally carried in barrow ditch located on south side of road and is in addition to flows from Sub area #150. Although this discharge would subtract from the hydrograph for Subarea 13b, which contributes to the flow on the North side of RR, there was no adjustment made in the design peak estimate for the inlet structure proposed on the RWCD on the North side of RR, due to this particular flow.



LEGEND

AIRFIELD PAVEMENTS
- EXISTING TO BE RETAINED
- EXISTING TO BE ABANDONED
- SHOULDER STABILIZATION
- OVERRUN

STRUCTURES
- EXISTING, PERMANENT DESIGN
- EXISTING, DESIGNATED PERMANENT
- EXISTING, MOBILIZATION OR SEMI-PERMANENT
- EXISTING, TEMPORARY TO BE RETAINED
- EXISTING, TO BE ABANDONED

ROADS, PARKING & RRs
- EXISTING, TO BE RETAINED
- EXISTING, TO BE ABANDONED

BOUNDARIES
- EXISTING PROPERTY LINE (IN FEE)
- EXISTING PROPERTY LINE (Easements or Permits)
- EXISTING FENCE
- APPROACH ZONE & R/W CLEARANCE

NATURAL FEATURES
- EXISTING CONTOUR
- EXISTING TREE COVER
- CLIFF OR SEVERE GRADE DIFFERENCE
- LAKE OR POND
- STREAM OR RIVER
- DRAINAGE CHANNEL OR DITCH
- DAM
- SWAMP

UTILITIES
- CMP CORRUGATED METAL PIPE
- EXISTING UNDERGROUND DRAINAGE & DIRECTION OF FLOW
- EXISTING OPEN DITCH DRAINAGE & DIRECTION OF FLOW
- MANHOLE
- EXISTING CATCH BASIN

I.E. 1338.90' INVERT ELEVATION

CULVERT

NOTE:

PIPE IS REINFORCED CONCRETE UNLESS OTHERWISE NOTED

REV	DATE	DESCRIPTION	INITIALS
4	25 SEP 83	REVISED TO DATE	TJB
3	31 MAR 83	REVISED TO DATE	LEY
2	6 JUL 82	REVISED TO DATE	TJB
1	3 DEC 81	REVISED TO DATE	RLM

PLAN REVISIONS

TO ACQUIRE, CONSTRUCT, MAINTAIN, AND OPERATE REAL PROPERTY FACILITIES.

BASE CIVIL ENGINEER — DATE

DEPARTMENT OF THE AIR FORCE

DIRECTOR OF CIVIL ENGINEERING – WASHINGTON, D. C.

AIR TRAINING COMMAND

MASTER PLAN
STORM DRAINAGE SYSTEM
WILLIAMS AIR FORCE BASE

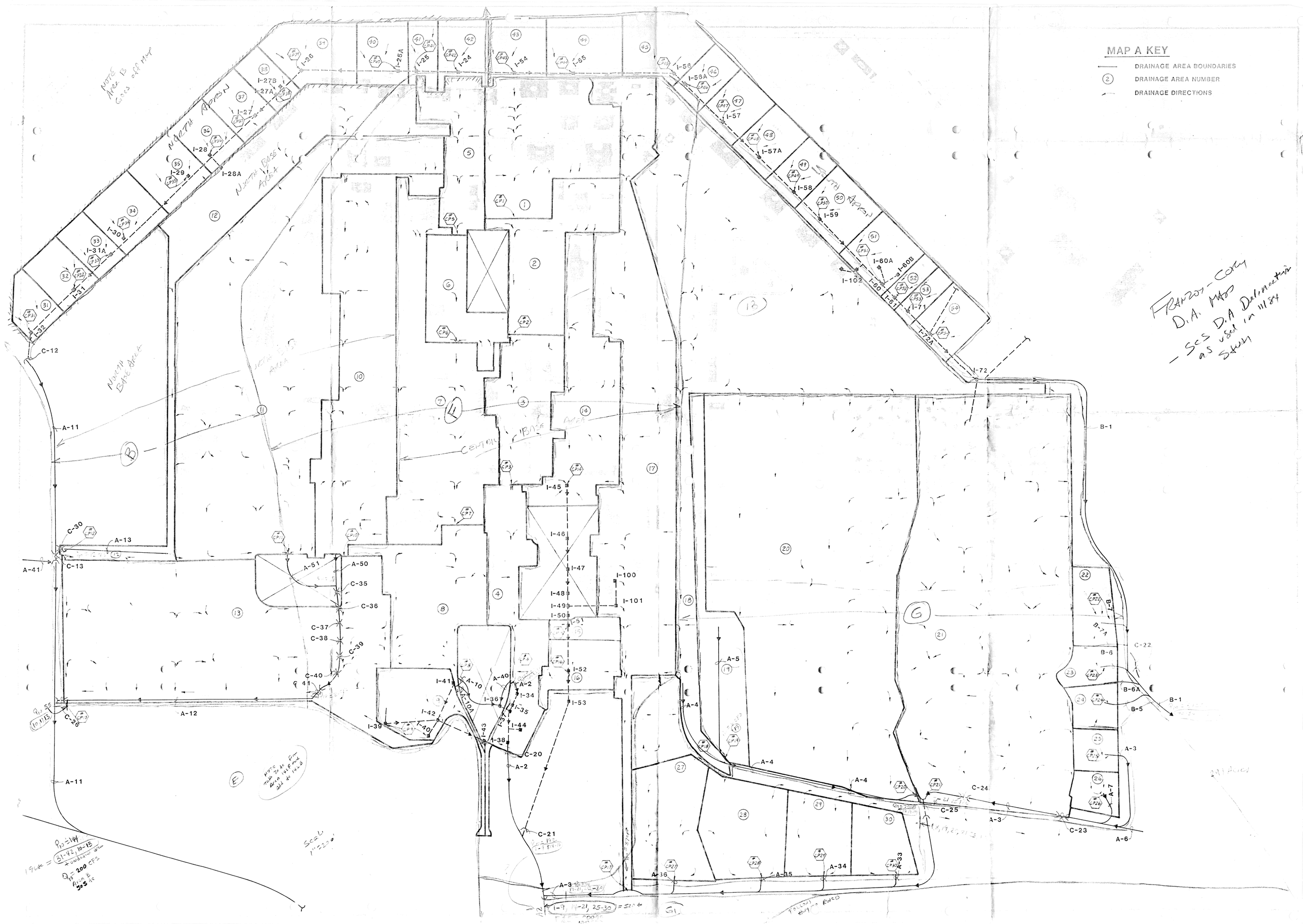
CHANDLER, ARIZONA

SCALE AS SHOWN | DATE 18, AUGUST 1965

MASTER PLANNING DIRECTIVE ATC-FY-65

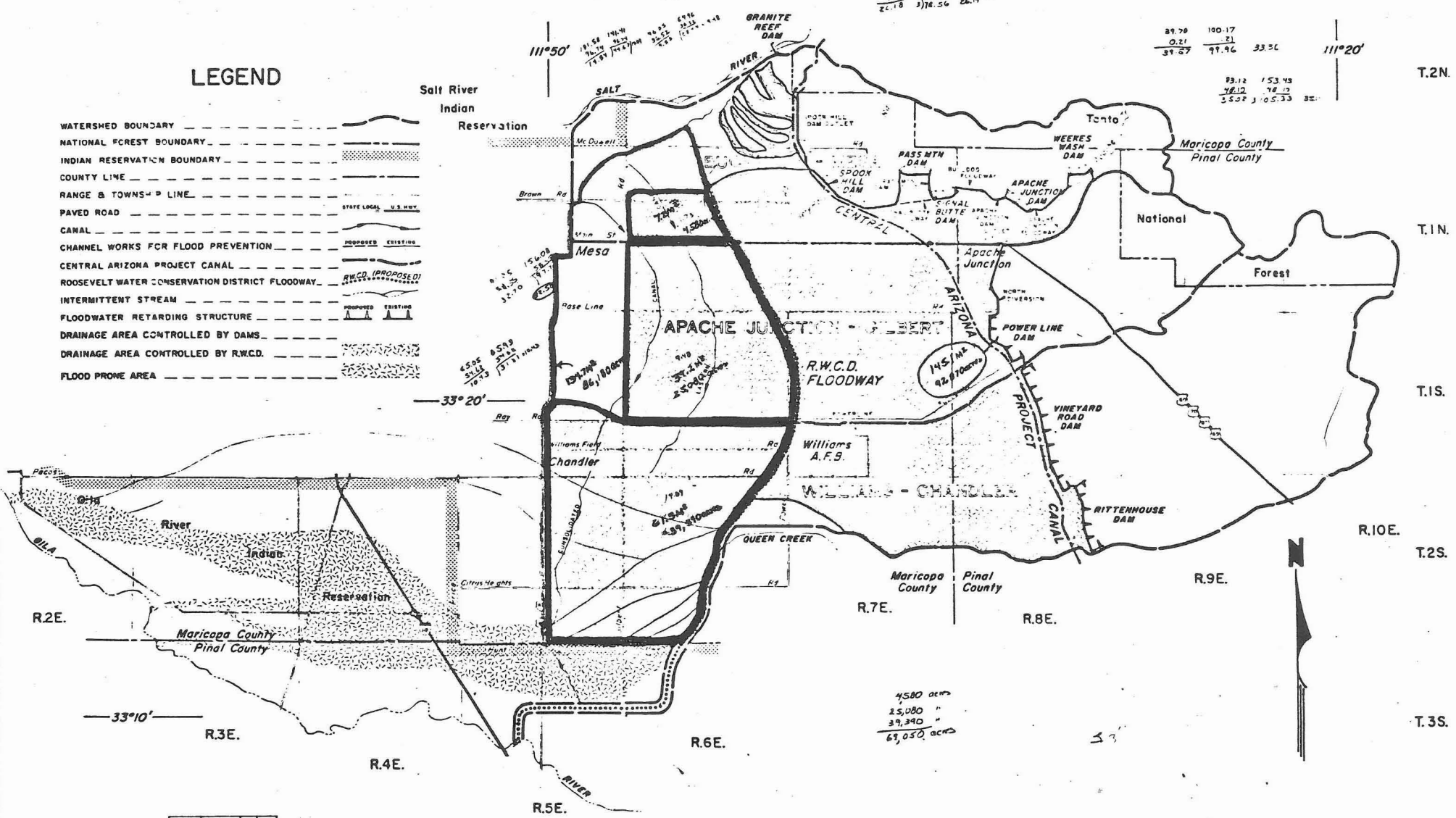
WILLIAMS – STACKHOUSE & ASSOCIATES SAN ANTONIO, TEXAS

TAB NO. G-3


MAP A KEY
DRAINAGE AREA BOUNDARIES
DRAINAGE AREA NUMBER
DRAINAGE DIRECTIONS
NORTH APRON
NORTH BASE AREA
CENTRAL BASE AREA
I-25A
I-25
I-24
I-54
I-55
I-56
I-56A
I-57
I-57A
I-58
I-59
I-60A
I-60B
I-100
I-101
I-72A
I-72
I-71
I-27B
I-27A
I-27
I-26
I-28
I-28A
I-29
I-30
I-31A
I-31
I-32
C-12
A-11
C-30
A-13
C-13
A-41
A-51
A-50
C-35
C-36
C-37
C-38
C-39
C-40
A-12
C-26
A-10
A-40
A-2
I-41
I-36
I-34
I-35
I-42
I-40
I-39
I-43
I-38
I-44
C-20
C-21
I-45
I-46
I-47
I-48
I-49
I-50
I-51
I-52
I-53
A-5
A-4
A-36
A-35
A-34
A-33
C-24
C-25
A-3
C-23
A-6
B-1
B-7
B-7A
B-6
B-6A
B-5
C-22
A-7
FRANZOS COPY
D.A. MAP
- SCS D.A Delineation
as used in 1984
Study

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

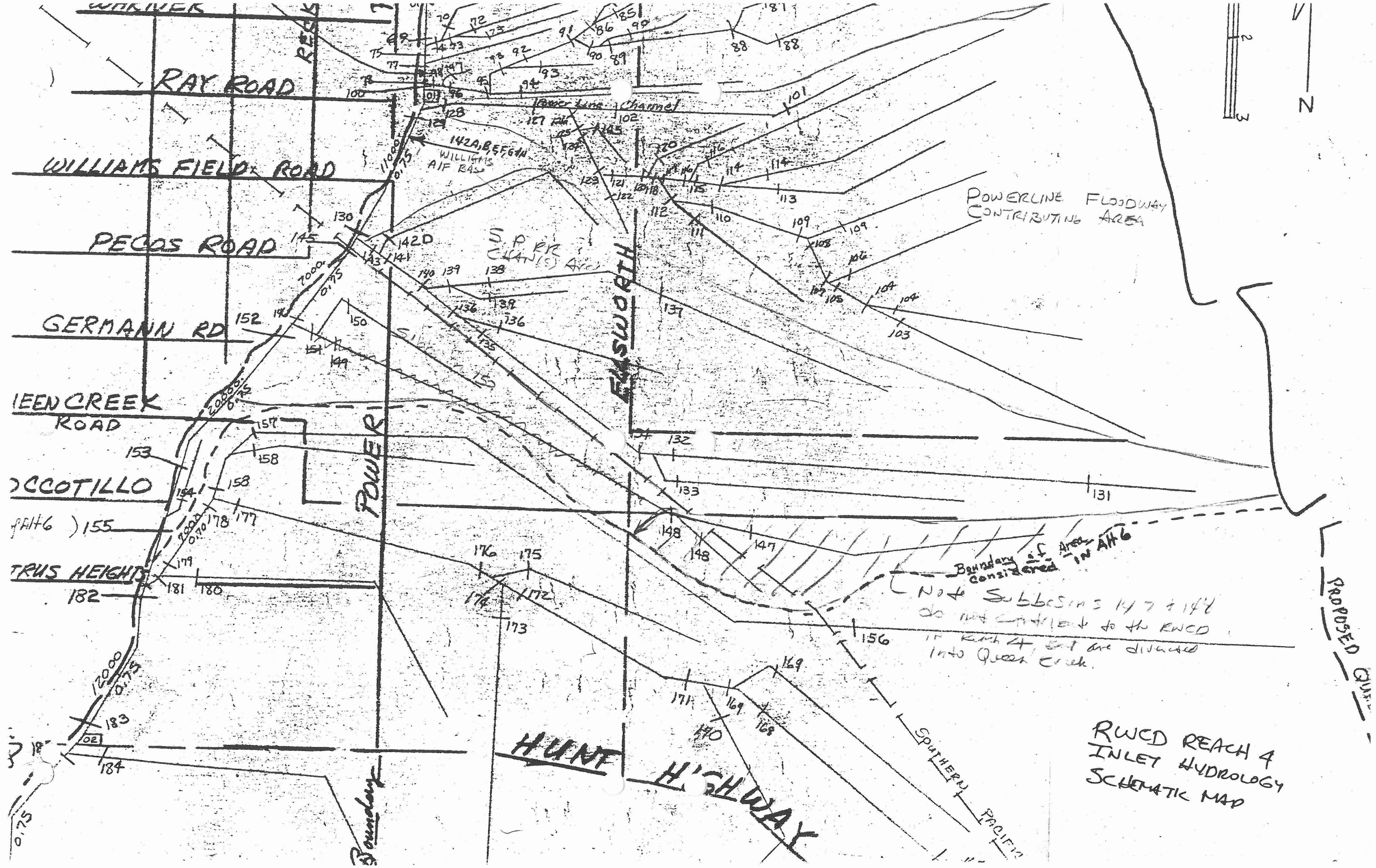


PROJECT AND FLOOD PRONE AREA MAP

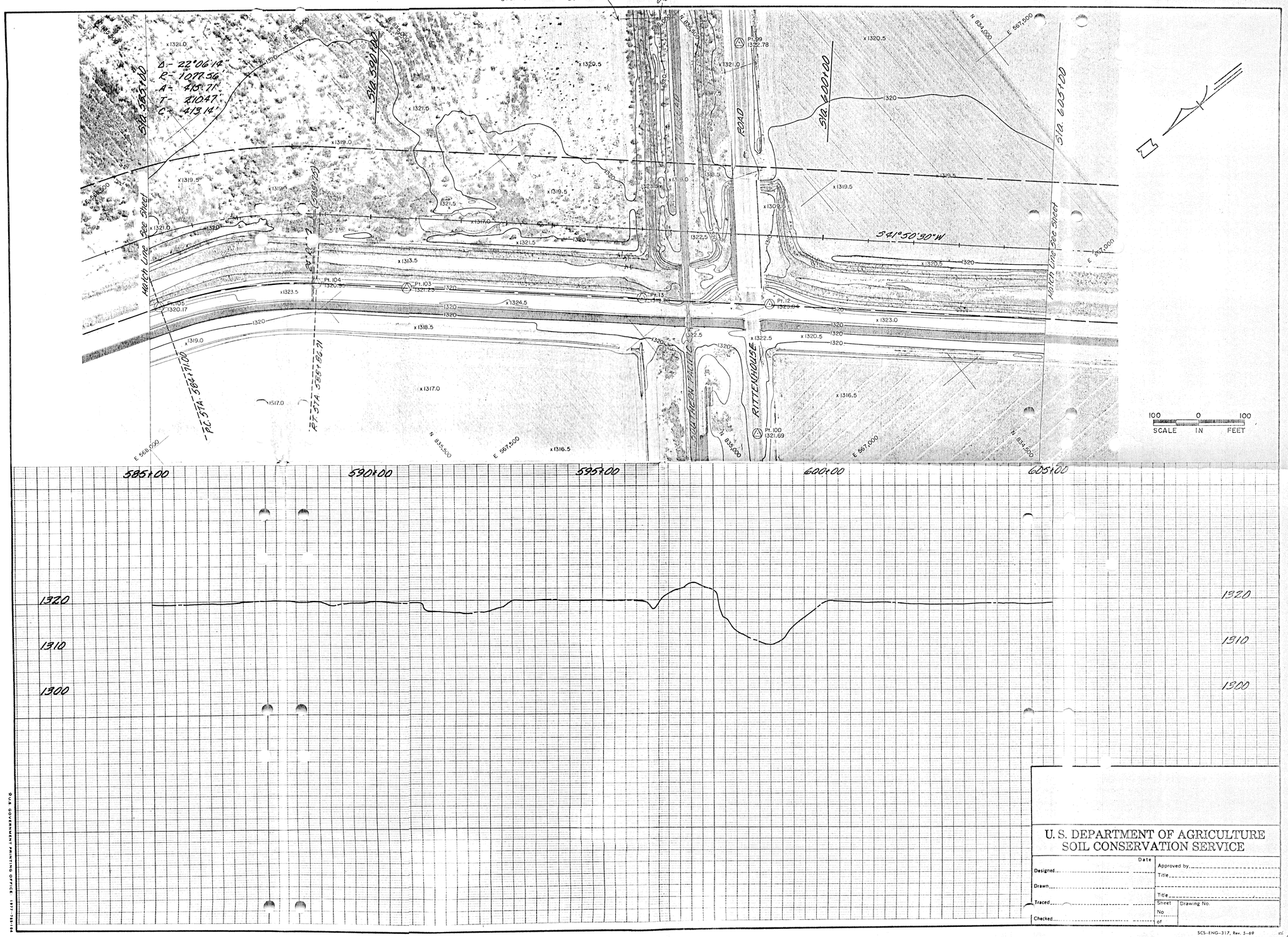
ROOSEVELT WATER CONSERVATION DISTRICT FLOODWAY

MARICOPA AND PINAL COUNTIES, ARIZONA

MAY 1975



RWCD REACH 4
INLET HYDROLOGY
SCHEMATIC MAP



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed		Approved by	
		Title	
Drawn			
		Title	
Traced		Sheet No.	Drawing No.
Checked		of	

SCS-ENG-317, Rev. 5-69

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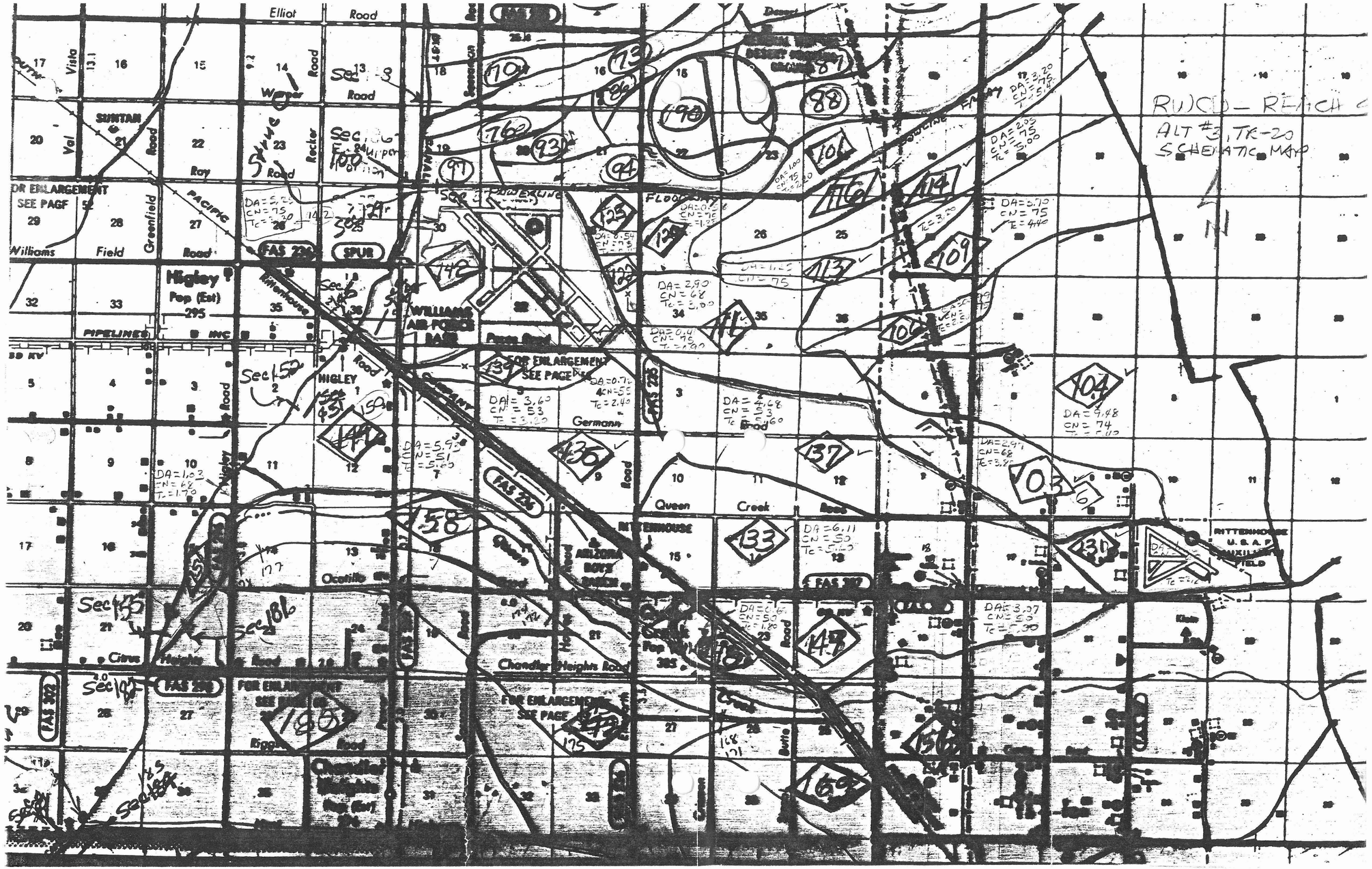
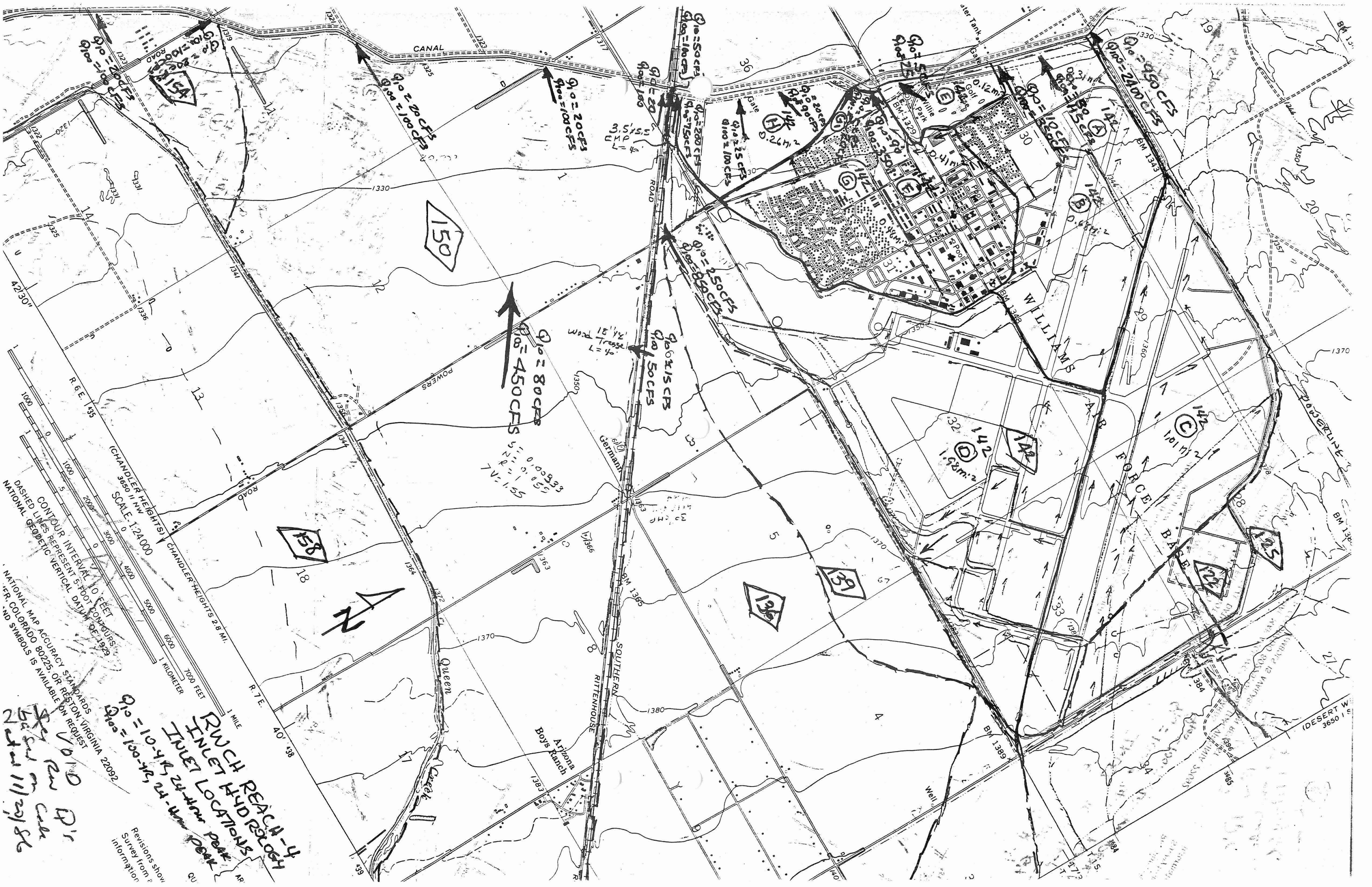
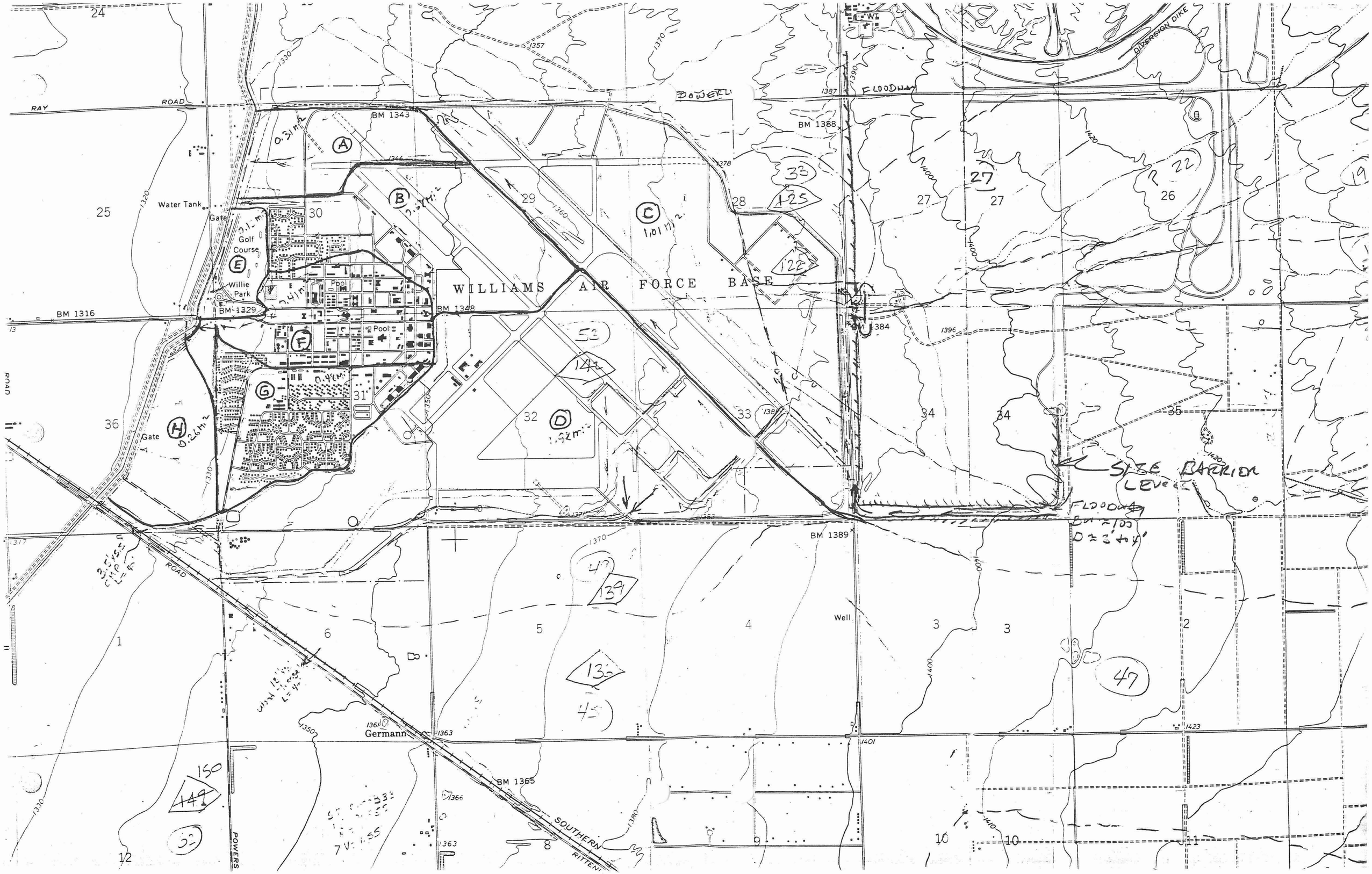

RWCD – RMCH
ALT #3, TR-20
SCHEMATIC MAP
Elliot Road
Higley
Pop (Est)
295
WILLIAMS AIR FORCE BASE
HIGLEY
Germann
Queen Creek Road
RITTENHOUSE
ARIZONA BOYS RANCH
Chandler Heights Road
RITTENHOUSE U.S.A.F. AUXILIARY FIELD
FOR ENLARGEMENT SEE PAGE
FAS 236
FAS 302
DA=9.48
CN=74
DA=6.11
CN=50
DA=3.07
CN=50

WILLIAMS AIR FORCE BASE
POWERS
SOUTHERN
RITTENHOUSE
ROAD
CANAL
Queen Creek
Arizona Boys Ranch
Germann
Golf
Pool
Park
Gate
Well
BM 1343
BM 1348
BM 1329
BM 1389
BM 1365
Q=2400CFS
115CFS
240CFS
25CFS
350CFS
90CFS
100CFS
50CFS
850CFS
RWCD REACH-4
INLET HYDROLOGY
12/3/84
100-YR 24-hour
DISCHARGES
Void
See new Q's
based on Calc's
dated 11/20/86
(CHANDLER HEIGHTS) CHANDLER HEIGHTS 2.8 MI.
3650 II NW
SCALE 1:24 000
CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
FS WITH NATIONAL MAP ACCURACY STANDARDS
KEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
C MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
Revisions show
Survey from a
information



RWCH REACH-4
INLET HYDROLOGY
INLET LOCATIONS
Q10 = 10-YR, 24-HOUR PEAK
Q100 = 100-YR, 24-HOUR PEAK
CANAL
WILLIAMS
AIR
FORCE
BASE
POWERS
ROAD
SOUTHERN
RITTENHOUSE
Germann
Queen
Creek
Arizona
Boys Ranch
POWERLINE
Golf
Park
Pool
Gate
Well
(CHANDLER HEIGHTS)
3650 II NW
SCALE 1:24000
CHANDLER HEIGHTS 2.8 MI.
1 MILE
1 KILOMETER
7000 FEET
CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
NATIONAL MAP ACCURACY STANDARDS
DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
AND SYMBOLS IS AVAILABLE ON REQUEST
R. 6 E.
R. 7 E.
42'30"
40'
(DESERT W
150
158
139
136
142
125
124
15A
Q10 = 80 CFS
Q100 = 450 CFS
Q10 = 250 CFS
Q100 = 850 CFS
Q10 = 950 CFS
Q100 = 2400 CFS
Q10 = 20 CFS
Q100 = 100 CFS
Q10 = 50 CFS
Q100 = 100 CFS
Q10 = 110 CFS
Q100 = 15 CFS
Q100 = 50 CFS
Wood 15' 4' Tressel L = 40'
3.5' x 5.5' CMP L = 40'
0.12 mi 2
0.26 mi 2
0.41 mi 2
0.65 mi 2
1.01 mi 2
1.98 mi 2
BM 1329
BM 1343
BM 1348
BM 1365
BM 1389
1330
1350
1370
1380


RAY ROAD
BM 1343
BOWELL
FLOODWAY
BM 1388
DIVERSION DIKE
Water Tank
Gate
Golf Course
Willie Park
BM 1329
BM 1316
Pool
Pool
WILLIAMS AIR FORCE BASE
BM 1348
BM 1384
Gate
BM 1389
SIDE BARRIER LEVEE
FLOODWAY
Well
Germann
BM 1365
SOUTHERN
POWERS
ROAD