



Flood Contr  
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TRILBY WASH FIS

MANNING'S "n" VALUE ESTIMATION  
FROM FIELD INSPECTION  
11/20/90

Property of  
Flood Control District of Maricopa County  
Please Return to  
2801 W. Durango  
Phoenix, AZ 85009

TRILBY WASH FIS

MANNING'S "n" VALUE ESTIMATION  
FROM FIELD INSPECTION  
11/20/90

(Completion of Task 4.4.1)

PREPARED FOR:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
3335 WEST DURANGO STREET  
PHOENIX, ARIZONA 85009

SUBMITTED BY:

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NOVEMBER 27, 1990



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(Taken November 20, 1990).

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EXHIBIT 1: Field Inspection Location Map. Map Pocket



MANNING'S "n" VALUE ESTIMATION  
FROM FIELD INSPECTION  
11/20/90

1.0 INTRODUCTION

P & D Technologies was contracted by the Flood Control District of Maricopa County on August 13, 1990 to perform a Flood Insurance Study (FIS). The project consists of topographic mapping, as well as floodplain and floodway delineation of approximately 6.7 river miles of Trilby Wash. The downstream study limits being the Central Arizona Project Aqueduct (CAP), the upstream limits being Grand Avenue at Circle City. The hydrology portion of this study will be supplied by the Maricopa County Flood Control District.

The purpose of this report is to summarize the field inspection of the site made on Tuesday, November 20, 1990. The site inspection was conducted to evaluate and photograph the existing channel and overbank conditions in terms of Manning's roughness coefficient ("n"). The Manning's "n" values determined from this field inspection will be incorporated into the HEC-2 computer model.

2.0 EXISTING FIELD CONDITIONS

Weather conditions on this day were partially sunny with no visible rain over the site. The air temperature ranged from approximately 59 to 80 degrees Fahrenheit with an average up around 70. Winds were light at approximately 5 miles per hour.

The site was inspected by the following team:

Geave "Besian" Khatiblou *RE. HYDROLOGIST* Maricopa County FCD

Ramesh I. Patel *[Signature]* P & D Technologies

Lisa T.M. Vomero *[Signature]* P & D Technologies

## 2.1 EXISTING DRAINAGE PATTERN

The wash drains from north to south-southeast towards McMicken Dam. The immediate study area is undeveloped with the exception of a few scattered homes. The closest residential subdivision of note is unincorporated Circle City which is accessible from Grand Avenue north west of the Trilby Wash crossing. The drainage area is very flat having an average slope of roughly 0.8 percent.

The predominant soil type encountered in this reach of our study area is best characterized by Hydrologic Group "B". In addition, there is a small amount of intermixed Soil Group "C" in the northeast area of the study. Soil Group "B" is best defined as a porous soil comprised of sand, silt, and loam; while, Soil Group "C" is less porous and contains clay, loam and rock fragments. The vegetative cover density is roughly 30 to 40 percent throughout. The majority of the overbank area is well vegetated; however, the main channel bottom is predominantly without vegetation. The type of vegetation encountered includes: Palo Verde and Mesquite (Ironwood) comprise the large trees, creosote and sage are the common bush variety and there is little to no grass cover.

## 2.2 DRAINAGE CHARACTERISTICS

The channel geometry of this reach of Trilby Wash changes often within short transition distances. In the area that the study begins, at the Grand Avenue bridge, the channel is well defined. It is characterized by a broad undulating channel bottom that varies approximately 3 feet in depth across its width. The banks of the wash are composed exclusively of alluvial sediment with no rock outcroppings observed; as such, they are prone to erosion. The side slopes of the banks vary from steep, in some cases vertical, to as flat as roughly 12:1. The thalweg of the channel is characterized by meandering bends over relatively short distances. The bends are sometimes accompanied by steep vertical banks 5 to 6 feet in height on one side and small terraced benches on the opposite bank at gentle slopes.

Within the main channel itself, there are signs of channel braiding. In addition, there are several areas where the channel splits and braids forming "islands" of noticeably higher ground in the middle. There is one area of a significant split flow in which a secondary channel forms and breaks away from the main channel. This occurs in Township 5 North, Range 3 West, at approximately the northern boundary of Section Line 9. Farther downstream at the southern boundary of Section Line 9 as well as in other areas of this study, the wash appears to form natural levees where secondary channels return to the main channel as well as where there is tributary inflow. Special care will be given in modelling these existing channel conditions.

### 2.3 EXISTING STRUCTURE(S)

There is only one significant hydraulic structure to be modelled in this reach of Trilby Wash with the exception of the CAP Canal. It occurs at the intersection of Trilby Wash and Patton Road and consists of eight (8) very large 68-inch CMP culverts. For the record, P & D staff did visit the Maricopa County Highway Department on 11/8/90 for the purpose of obtaining "as-built" plans for Patton Road where it crosses Trilby Wash; however, we were informed that there are no plans for this road improvement on file. In addition, their staff informed us that it was probably an "eye-ball overlay job" which means that to their best available knowledge those existing, newly installed CMP culverts were not sized according to any recorded method. It appeared that this portion of the road was recently improved in early 1990 because it had been newly paved and striped at the time of the first field inspection on 6/5/90.

*Reference Not to Plans*

It was noted during the field inspection that the west side of Patton Road crossing the Wash has a small dip in it. Also noted, was the fact that the west side of the Patton Road crossing of Trilby Wash had been damaged from overbank flooding and erosion. This was evidenced by a very recent patch job on the West side of the wash/roadway crossing as well as undercutting of previously placed concrete bank protection. As a result, it appears that for purposes of modelling the Patton Road crossing and dip section appear to form a weir structure during periods of high flow. This is further illustrated in Photo Set 18, in Appendix I.

3/ → include the As-built survey plan of individual structures as part of this project.

and us a reference note

1/ - ~~the~~ use complete title

- the Report may need to be adjusted based upon the ~~the~~ results of HEC-2.

4/ 3rd paragraph Delete line No. 2 (hole sentence)

5/ Delete Line #2

X-section photo need to be tied down with Flood Plain Map Milage bar

KATY  
 GEORGE KHATIBLOU  
 1901 W. UTOPIA RD  
 PHX, AZ. 85027

## 2.4 CONstrictions/EXPANSIONS

Overall, it appears that the channel has a uniform width versus depth ratio throughout with very few areas of sudden expansion or contraction. Over the entire course of the wash, the width of the main channel varies from roughly 20 feet across to as wide as 135 feet 10 inches at the CAP flume crossing. The wash also widens at the Patton Road crossing where it measures roughly 95 feet. It appears that, in general, the average flow, defined width is probably 30 to 50 feet with a corresponding average depth of roughly 3 to 4 feet.

## 3.0 MANNING'S "n" VALUES

Manning's roughness coefficients ("n") were chosen with the aid of aerial photographs as well as several selected references which are listed in Section 6.0 of this report.

From the site inspection Manning's "n" values were assigned. ~~Overall, the values ranged from a low of 0.045 to a high of 0.10.~~ The "n" values in the channel ranged from 0.045 to 0.075; the overbanks ranged from 0.065 to 0.10. In addition, this reach of the wash contained several split flow areas of varying size as well the occurrence of "islands" between the splits in the flow line. The "n" values for these island areas ranged from 0.060 to 0.10.

## 4.0 RESULTS

The results of this field inspection are the assignment of Manning's "n" values for use in the HEC-2 model. A representative sampling of the assigned values for the different conditions encountered are depicted by the photographs in Appendix I. In addition, the approximate area in which the photographs were taken are depicted on the Field Inspection Location Map which is included as Exhibit 1 in the Map Pocket at the end of this report.

## 5.0 SUMMARY

From the site inspection, Manning's "n" values were assigned. ~~Overall, the values ranged from a low of 0.045 to a high of 0.10.~~ The "n" values in the channel ranged from 0.045 to 0.075; the overbanks ranged from 0.065 to 0.10. In addition, this reach of the wash contained several split flow areas of varying size as well the occurrence of "islands" between the splits in the flow line. The "n" values for these island areas ranged from 0.060 to 0.10. These changes in values will be incorporated into the HEC-2 model.

The submittal of this report concludes the field inspection summary phase of the Flood Insurance Study and represents the completion of Task 4.4.1 as outlined in the Scope of Work. This summary report will be kept as part of the job file and will be turned over to ADWR for archive files as outlined in TR 90-3. In addition, as outlined in the Scope of the Work, this Summary Report will be included in both the draft and final Flood Insurance Study as an Appendix.

## 6.0 SELECTED REFERENCES

Aldridge, B.N., and Garrett, J.M.; 1973; Roughness Coefficients for Stream Channels in Arizona: U.S. Geological Survey, Open File Report (Prepared in cooperation with the Arizona Highway Department); 87 p.; unpublished.

Arizona Department of Water Resources (A.D.W.R.); 8/90; Instructions for Organizing and Submitting Technical Documentation for Flood Studies (TR 90-3): Engineering Division, Flood Management Section; unpublished; 13 p.

Chow, Ven, T.; 1959; Open-Channel Hydraulics; McGraw Hill (Publishing Company) Civil Engineering Series; New York; pages 98 through 127.

Barnes, H.H., Jr.; 1967; Roughness Characteristics of Natural Channels: U.S. Geological Survey, Water-Supply Paper 1849; U.S. Government Printing Office; Washington, D.C.; 213 p.

## 6.0 SELECTED REFERENCES (Cont'd)

National Flood Insurance Program; 5/11/90 (Rev.); Flood Insurance Rate Maps (FIRM), all or portions of the following: Map Numbers 04013C0679 E, 04013C0687 E, and 04013C1110 E; corresponding to Panel Numbers 679, 687 and 1110 of 4350, respectively; Maricopa County, Arizona and Incorporated Areas: Federal Emergency Management Agency (FEMA).

Soil Conservation Service; 1985; Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona: U.S. Department of Agriculture; U.S. Government Printing Office; No. 1985-167-S/20007.

THE ARIZONA REPUBLIC; November 20, 1990; Section "A"; Phoenix, Arizona.

The WLB Group, Inc.; 3/89; Wittmann Area Drainage Master Study Part A: Hydrology and Hydraulics; Prepared for The Flood Control District of Maricopa County; Phoenix, AZ; unpublished.

U.S.G.S. Quadrangle Maps of Arizona: Wittmann (1981) and White Tank Mountains, N.E. (1978)

APPENDIX I:

FIELD INSPECTION PHOTOGRAPHS  
(Taken November 20th, 1990)



**PHOTO SET 1:** AT&SF Railroad crossing at Trilby Wash north of Grand Avenue, looking north upstream. (Match to previous study by the WLB Group of 0.080 for both east and west overbank and 0.050 for the main channel).



PHOTO SET 2: Grand Avenue crossing at Trilby Wash looking north upstream. (Match to previous study by The WLB Group, Inc. of 0.080 for the east and west overbank and 0.050 for the main channel).



**PHOTO SET 3:** Dove Valley Road crossing at Trilby Wash looking north upstream. (Match to previous study by The WLB Group, Inc. of 0.080 for the east and west overbank and 0.050 for the main channel).

Mileage = 0.0

West Overbank  $n = 0.080$



Main Channel  $n = 0.050$



East Overbank  $n = 0.080$

**PHOTO SET 4:** Dove Valley Road at Trilby Wash looking south downstream.



Mileage = 0.0

East Bank n = 0.080



Main Channel n=0.065



West Bank n=0.080



PHOTO SET 5: In Trilby Wash looking south downstream.

(Mileage = 0.1)  
East Bank "n" = 0.085



Main Channel "n" = 0.050



West Bank "n" = 0.085



**PHOTO SET 6:** In Trilby Wash looking south downstream.

(Mileage = 0.45)

East Bank "n" = 0.080



Main Channel "n" = 0.045

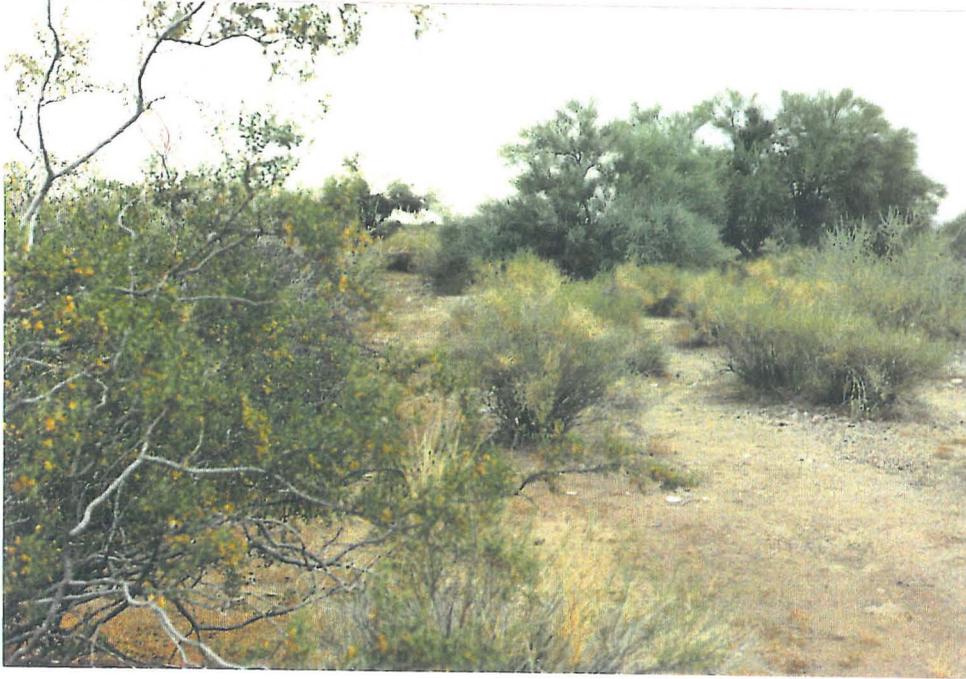


West Bank "n" = 0.080



East Bank "n" - 0.085 Main Channel "n" = 0.045 West Bank "n" = 0.070

PHOTO SET 7: In Trilby Wash looking south downstream (Mileage = 0.050).

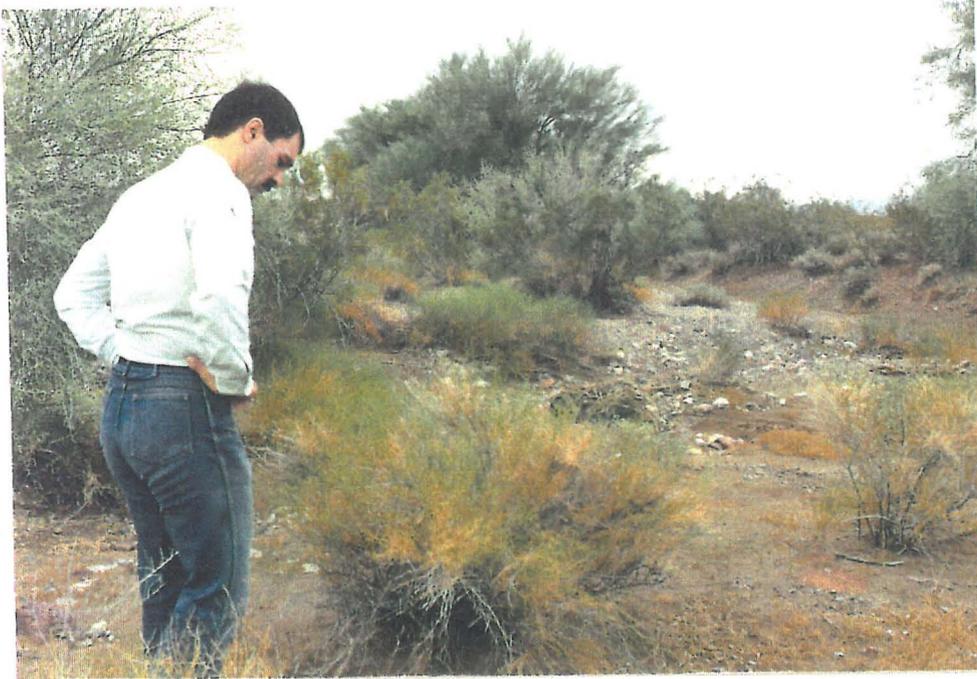


East Bank "n" 0.080



Main Channel "n" = 0.055

**PHOTO SET 8:** In Trilby Wash looking south downstream (Mileage = 0.72)



West Bank "n" = 0.080 looking west  
and downstream across secondary wash.



West Bank "n" = 0.080 looking  
north upstream.

PHOTO SET 8 (Cont.): In Trilby Wash (Mileage = 0.72).



PHOTO SET 9: At major split flow in Trilby Wash Section 9, T.5 N., R.3 W, looking south downstream.

(Mileage = 1.19)

Main Channel "n" = 0.050



West Bank "n" = 0.080



Split flow secondary channel cut in West Bank "n" = 0.050

**PHOTO SET 10:** Secondary Channel in West Bank of Trilby Wash looking north upstream.



(Mileage = 1.88)

Taken on the top of split flow "island".  
Average "n" value of 0.060.



Taken in secondary channel looking north  
upstream, average "n" value of 0.060.



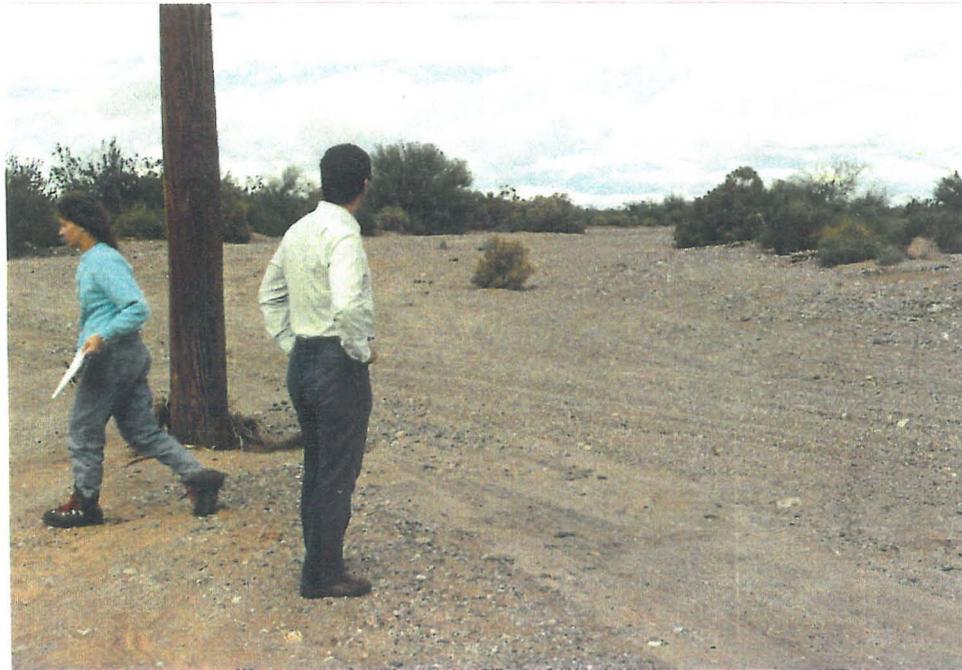
West Bank "n" = 0.10

"Island n" = 0.10

East Bank "n" = 0.10

"n" both channels 0.050

PHOTO SET 11: At split flow confluence in Trilby Wash, looking north upstream (Mileage = 2.00).



**PHOTO SET 12:** At Lone Mountain Road and Trilby Wash looking north upstream (Reset mileage at 0.0) Average "n" = 0.070.

**PHOTO SET 13:** In Trilby Wash looking south downstream.



(Mileage = 1.2)

East Bank "n" = 0.080



Main Channel "n" = 0.040



West Bank "n" = 0.080

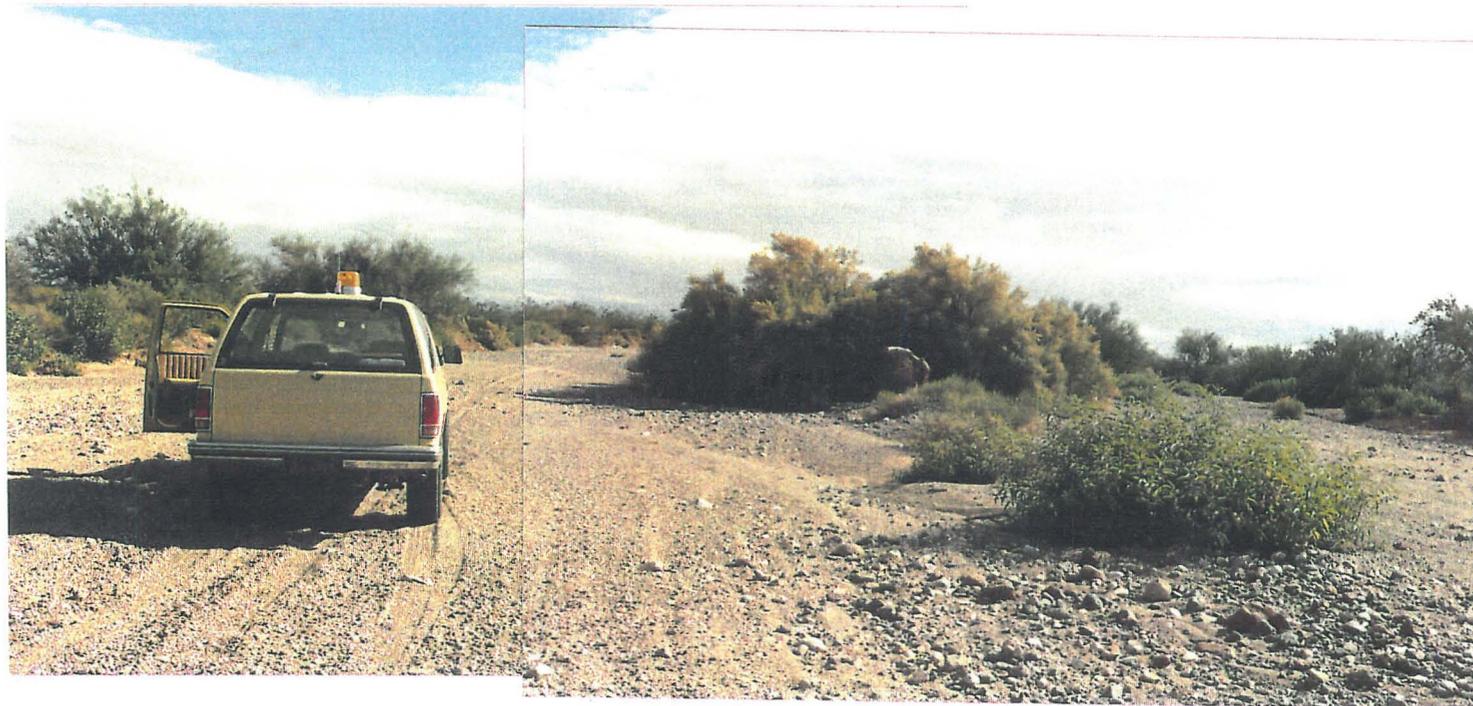


East Bank "n" =0.080

Main Channel "n" = 0.055

West Bank "n" =0.095

**PHOTO SET 14:** In Trilby Wash looking south downstream (Mileage = 1.50).



East Bank "n" =0.085    Both Channels "n" = 0.055    "Island n" =0.090    West Bank "n" =0.085

**PHOTO SET 15:** In Trilby Wash looking south downstream at minor split flow condition  
(Mileage = 1.70).



Channel "n" = 0.055

PHOTO SET 15 (Cont.): In Trilby Wash looking north upstream in main channel (Mileage = 1.70).



**PHOTO SET 16:** In Trilby Wash looking south downstream. Wash is braided forming several vegetated islands. The banks are steep to vertical (note: top of east bank, far left side, middle of photograph). (Mileage = 1.78)



PHOTO SET 17: Patton Road crossing at Trilby Wash looking south downstream.

(Mileage = 2.2)

East slope "n" = 0.075  
East bank "n" = 0.080



Main Channel "n" = 0.050



West Bank "n" = 0.080



Water appears to flow over Patton Road on the west side of culvert crossing as evidenced by road and bank undercutting.



Main Channel "n" = 0.050  
Note: sediment deposition in culverts

PHOTO SET 18: Patton Road crossing at Trilby Wash looking north upstream (Reset mileage = 0.0).



Main Channel "n" = 0.050



East Bank "n" = 0.085

PHOTO SET 18 (Cont.): Patton Road crossing at Trilby Wash looking north upstream (Reset Mileage = 0.0).

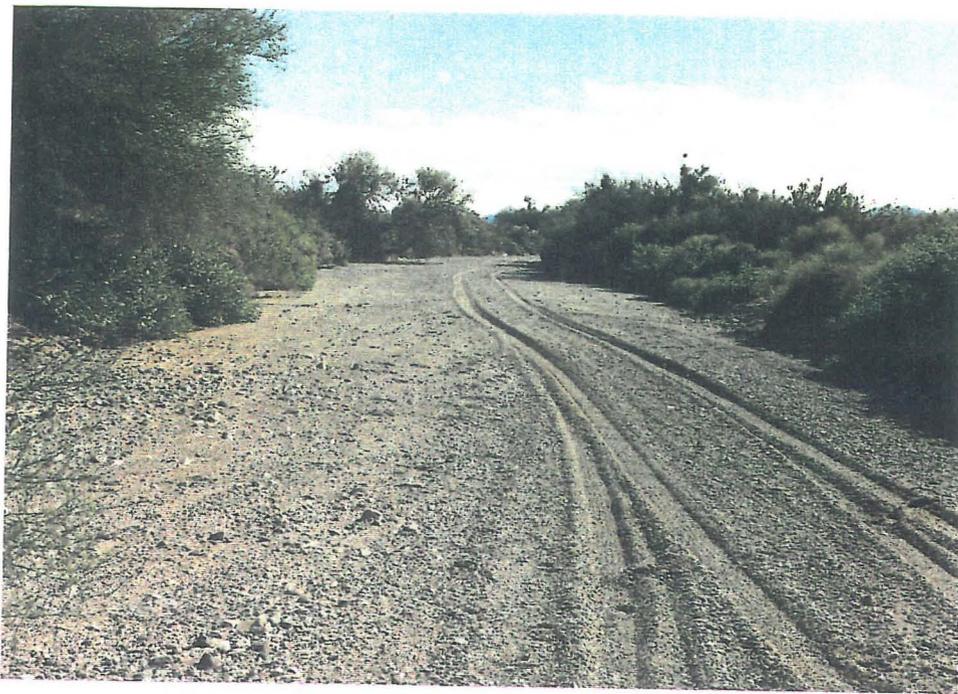


PHOTO SET 19: Photo taken at centerline of Patton Road crossing Trilby Wash looking south downstream.

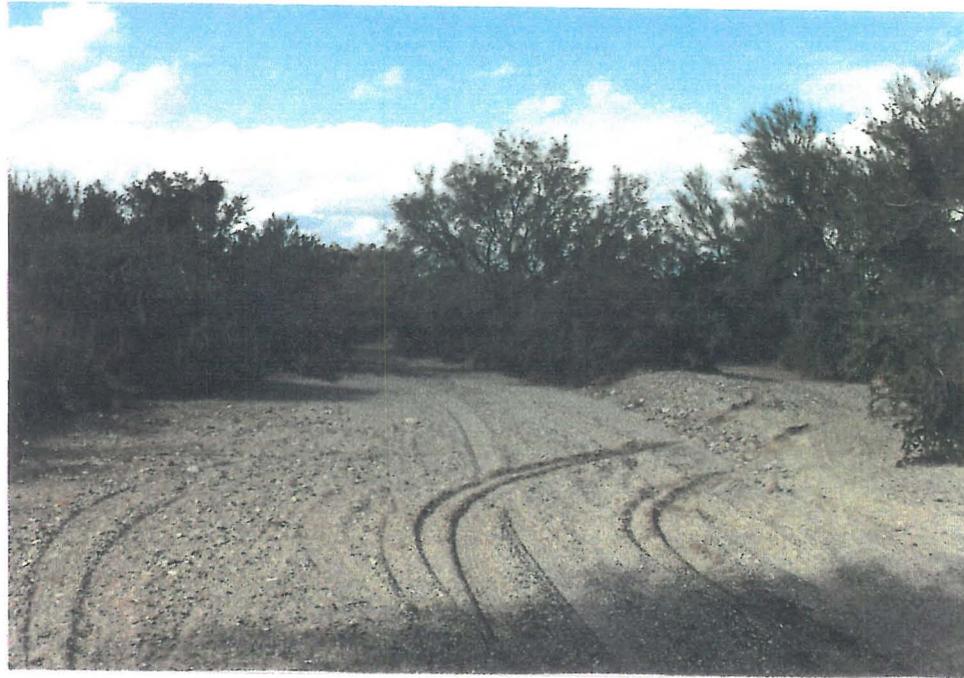
(Mileage = 0.0)

East Bank "n" = 0.085

Channel "n" = 0.050



Channel "n" = 0.050  
West Bank "n" = 0.085



West Bank "n" = 0.085      Channel "n" = 0.055      East Bank "n" = 0.090

**PHOTO SET 20:** In Trilby Wash looking north upstream at typical island (Mileage = 1.09).

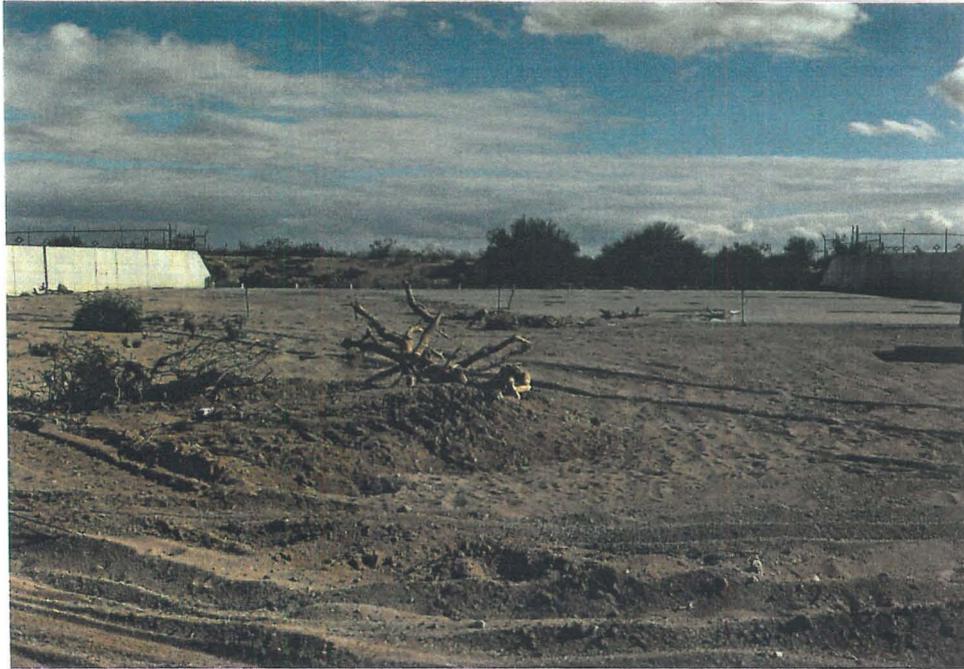


West Bank "n" = 0.085

Channel "n" = 0.060

East Bank "n" = 0.090

**PHOTO SET 21:** CAP crossing at Trilby Wash looking north upstream. Photo taken from on top of west wall of CAP Flume Structure. (Mileage = 1.25)



Prior to concrete CAP crossing, channel "n" = 0.065  
At CAP crossing Flume is a concrete lined rectangle channel "n" = 0.013 (Match "n" values with previous study by The WLB Group, Inc.)

PHOTO SET 22: CAP Crossing at Trilby Wash looking south downstream (Mileage = 1.25)

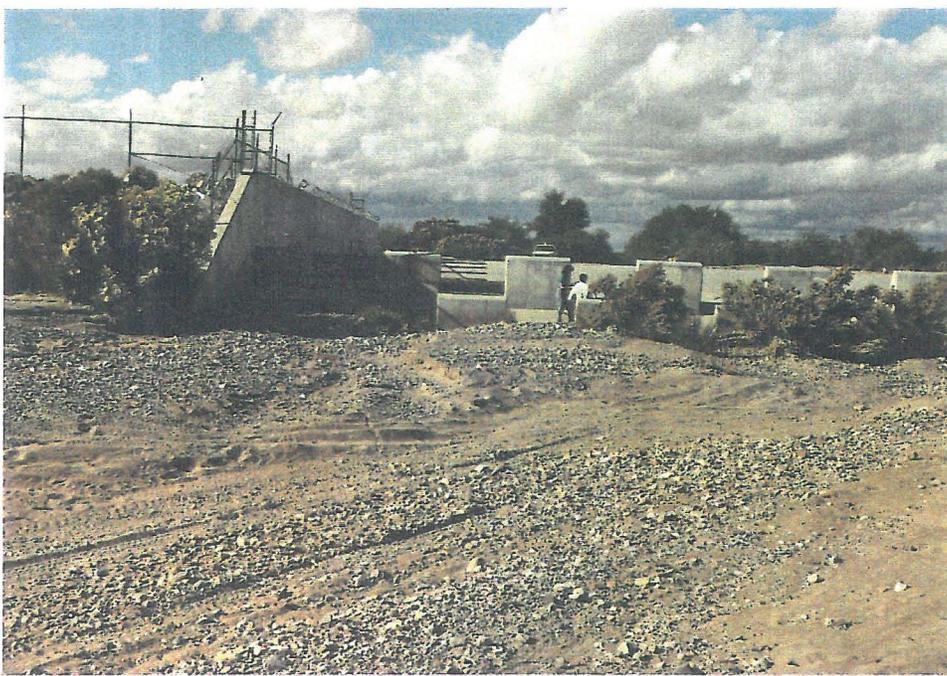
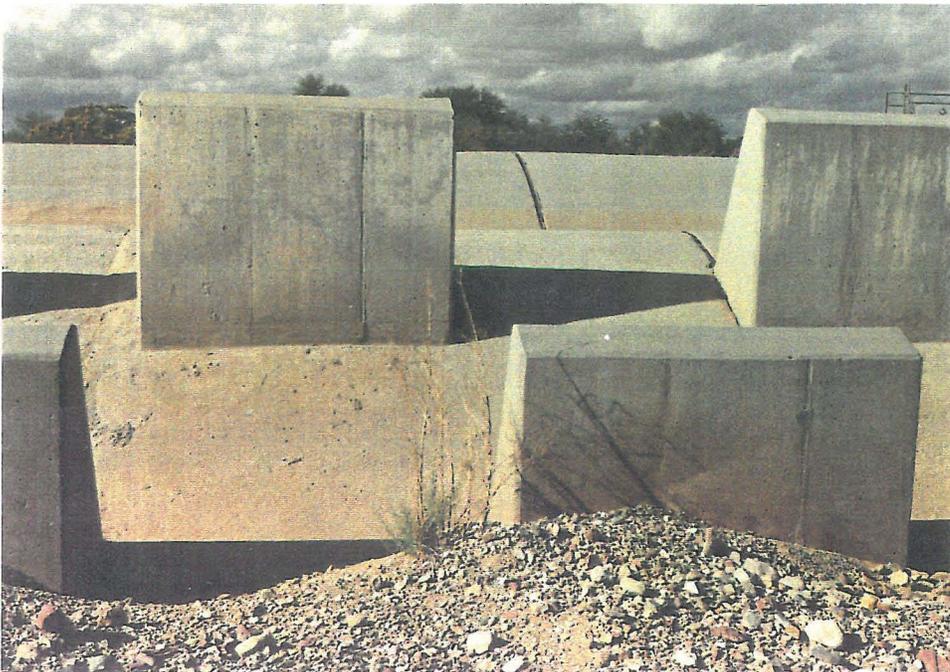


PHOTO SET 23: Downstream from concrete CAP crossing at Trilby Wash looking north upstream. (Match "n" values with previous study by The WLB Group).



Close up of energy dissipators.



PHOTO SET 24: Earthen dam stock pond on west bank of tributary to Trilby Wash located in T.5 N, R. 3 W., Section 27.

# FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

## D.E. SAGRAMOSO, CHIEF ENGINEER AND GENERAL MANAGER

### TRILBY WASH FLOOD INSURANCE STUDY 6.7 RIVER MILES FROM THE CAP AQUEDUCT TO GRAND AVENUE AT CIRCLE CITY

#### LEGEND

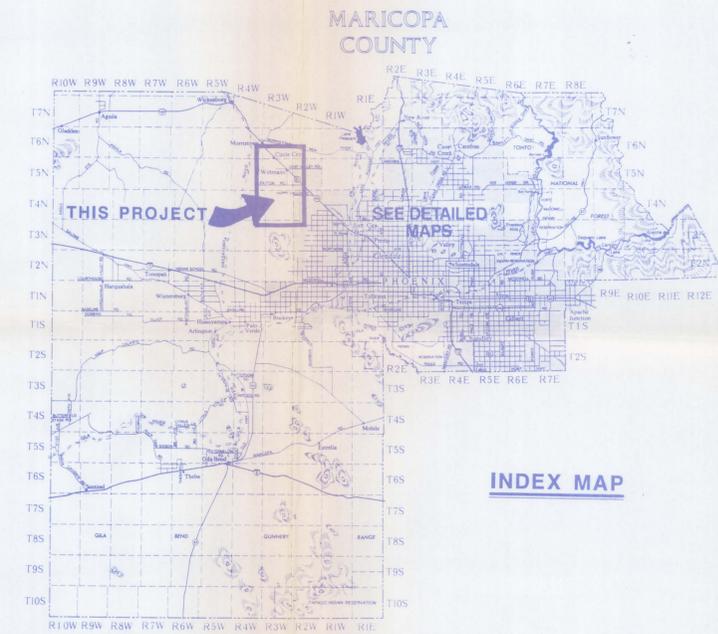
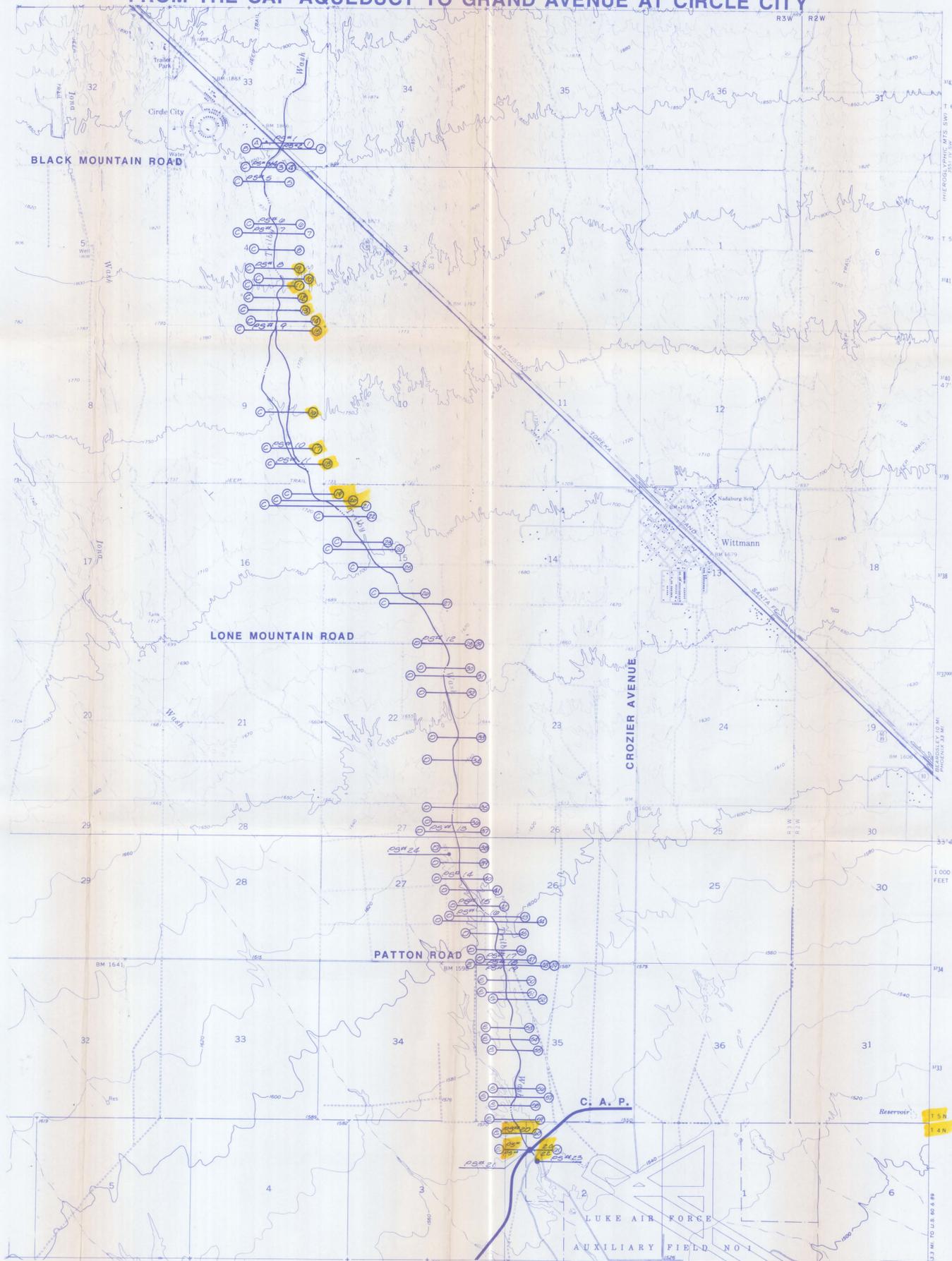
- T4N INDICATES TOWNSHIP
- R3W INDICATES RANGE
- (A)---(C) SECTION "A" RAILROAD CROSSING
- (B)---(C) SECTION "B" GRAND AVENUE
- (C)---(C) "C" DENOTES APPROXIMATE MILEAGE DOWNSTREAM FROM LONE MOUNTAIN ROAD
- (D)---(C) "D" DENOTES APPROXIMATE MILEAGE DOWNSTREAM FROM DOVE VALLEY ROAD
- (E)---(C) "E" DENOTES APPROXIMATE MILEAGE FROM PATTON ROAD
- (PS1)---(1) "PS1" DENOTES PHOTO SET NUMBER
- (1)---(1) "1" DENOTES CROSS-SECTION NUMBER

#### MANNING'S 'n' VALUES

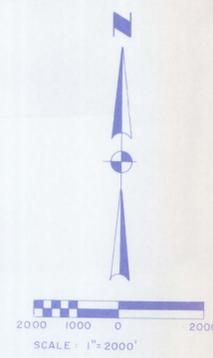
CROSS SECTION NUMBER	WEST OVERBANK	MAIN CHANNEL	EAST OVERBANK	OTHER	PHOTO SET NUMBER
1	Match with previous study at Railroad Crossing				1
2	0.080	0.050	0.080	at Grand Ave	2
3	0.080	0.050	0.080	Black Mtn. Rd.	3
4	0.080	0.055	0.080	Black Mtn. Rd.	4
5	0.085	0.050	0.085		5
6	0.080	0.045	0.080		6
7	0.070	0.045	0.085		7
8	0.080	0.045	0.070		8
9	0.080	0.055	0.080		9
10	0.080	0.050	0.080		10
11	0.075	0.050	0.090		11
12	0.080	0.050	0.055		12
13	0.080	0.065	0.080		13
14	0.080	0.050	0.090		14
15	0.080	0.050 (2)	0.080	island "n"=0.080	15
16	0.080	0.060	0.080		16
17	0.10	0.060	0.10	island "n"=0.10	17
18	0.10	0.050 (2)	0.10	island "n"=0.10	18
19	0.075	0.075	0.075		19
20	0.085	0.055	0.085		20
21	0.070	0.065	0.070		21
22	0.080	0.050	0.080		22
23	0.085	0.050 (2)	0.085	island "n"=0.085	23
24	0.085	0.050	0.085		24
25	0.085	0.050 (2)	0.085	island "n"=0.090	25
26	0.085	0.050	0.080		26
27	0.080	0.050	0.080		27
28	0.070	0.070	0.070	At Lone Mtn. Rd.	28
29	0.080	0.050	0.080		29
30	0.090	0.055	0.080		30
31	0.085	0.055	0.075		31
32	0.085	0.055	0.085		32
33	0.085	0.060	0.085		33
34	0.080	0.060	0.080		34
35	0.080	0.050	0.080		35
36	0.080	0.040	0.080		36
37	0.080	0.040	0.080		37
38	0.080	0.060	0.080		38
39	0.080	0.050	0.080		39
40	0.095	0.055	0.080		40
41	0.085	0.060	0.085		41
42	0.085	0.055 (2)	0.085	island "n"=0.090	42
43	0.080	0.055	0.080		43
44	0.080	0.055	0.085		44
45	0.070	0.050	0.085		45
46	0.085	0.055	0.080		46
47	0.080	0.050	0.080	east slope "n"=0.075	47
48	0.080	0.050	0.080	Patton Road	48
49	0.085	0.050	0.085	Patton Road	49
50	0.085	0.060	0.080		50
51	0.085	0.070	0.080		51
52	0.085	0.050	0.085		52
53	0.085	0.050 (2)	0.085	island "n"=0.090	53
54	0.085	0.055	0.085		54
55	0.085	0.055 (2)	0.085	island "n"=0.090	55
56	0.090	0.055	0.080		56
57	0.090	0.055 (2)	0.080	island "n"=0.090	57
58	0.090	0.050	0.085		58
59	0.090	0.055 (2)	0.085	island "n"=0.090	59
60	0.090	0.055	0.085		60
61	Match with previous study				20, 23*

(2) Denotes presence of both a main and secondary channel having the same "n" value.

\* Note: PHOTO SET 21 (Last one) is taken at the earthen dam stock pond on the west bank of tributary to Trilby Wash in T.5 N., R.3W., Section 27.



INDEX MAP



Ramona S. Pates  
1/21/88

**P&D Technologies**  
1702 East Highland Ave., Suite 410  
Phoenix, AZ 85016 602-264-3335

**FIELD INSPECTION  
LOCATION MAP**

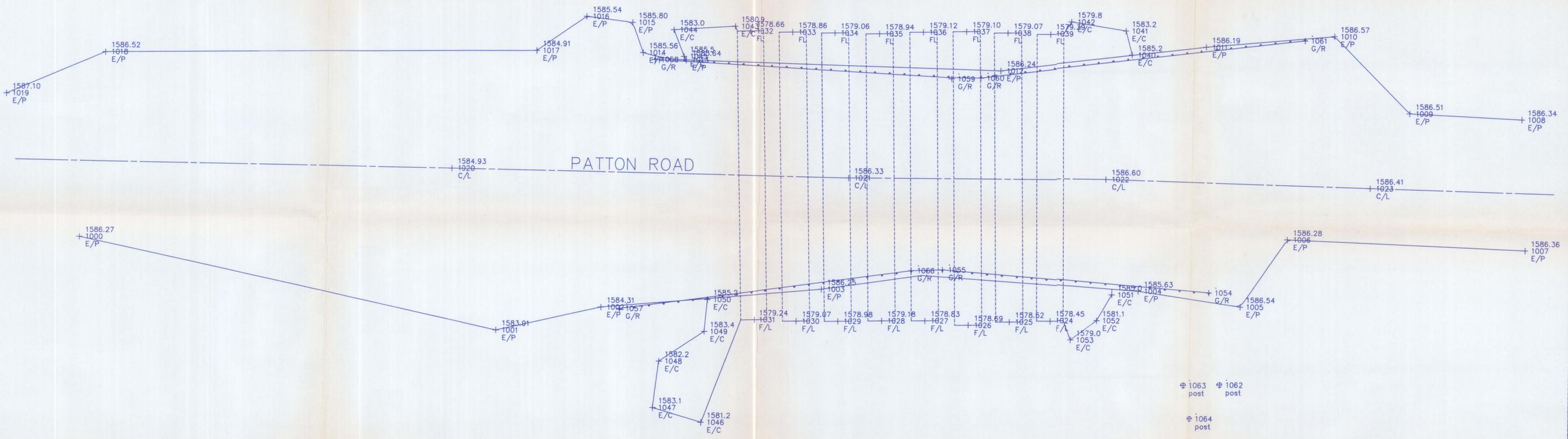
VICINITY MAP

# TOPOGRAPHIC SURVEY OF 8 - 68 INCH CMP'S ON TRILBY WASH CROSSING PATTON ROAD

+ N 996900.00  
E 308100.00

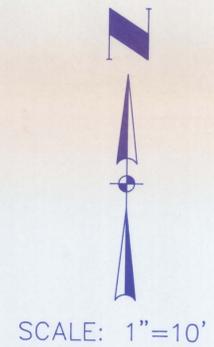
+ N 996900.00  
E 308350.00

WASH FLOWLINE



### LEGEND

- E/P EDGE OF PAVEMENT
- C/L CENTERLINE OF PAVEMENT
- F/L FLOW LINE OF PIPE
- G/R GUARD RAIL
- E/C EDGE OF CONCRETE



+ N 996750.00  
E 308100.00

+ N 996750.00  
E 308350.00

<p>DRAFTED BY: <b>THOMAS ROPE</b></p> <p>DATE PREPARED: <b>NOVEMBER 12, 1990</b></p> <p>PROJECT ENGINEER:</p> <p>SURVEY SUPERVISOR: <b>THOMAS ROPE</b></p> <p>PROJECT MANAGER: <b>FRED FLEET</b></p>	<p style="text-align: right;">FILE: PATTON.DWG</p> <p style="text-align: center;"><b>P&amp;D Technologies</b></p> <p style="font-size: small; text-align: center;">An Ashland Technology Company 1702 East Highland Suite 410, Phoenix, Arizona 85016 Telephone (602) 264-3335</p> <div style="text-align: center; border: 1px solid black; padding: 2px;"> <p><b>CULVERT AS-BUILTS</b></p> <p><b>PATTON RD/TRILBY WASH</b></p> </div> <p style="font-size: x-small; text-align: center;">JOB NO. 10320   SHEET 1 OF 1</p>
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