PADELFORD WASH
FLOODPLAIN DELINEATION STUDY
FCDMC NO. 99-12
TECHNICAL DATA NOTEBOOK

FIELD RECONNAISSANCE AND HYDRAULIC PARAMETER ESTIMATION SUMMARY
(T.D.N. SECTION 4.4)
(VOLUME 4 of 4)

SEPTEMBER 11, 2000

PREPARED FOR:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 WEST DURANGO STREET
PHOENIX, ARIZONA 85009

Registered Professional Engineer (Civil)
CERTIFICATE NO.
15290
GREGORY A.
SCHUELKE
Date Signed 9/13/02
ARIZONA U.S.A.

PREPARED BY:

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A-N WEST NO. 7158-07

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INTRODUCTION

A-N West was contracted by the Flood Control District of Maricopa County (FCDMC) to obtain detailed mapping, prepare hydrology and perform the hydraulic analysis for the 100-year storm floodplain delineation of Padelford Wash between State Route 74 and Central Arizona Canal.

The data in support of this study has been compiled in four volumes of the Technical Data Notebook (T.D.N.) as summarized below.

T.D.N. Volume 1 of 4 Base Technical Data Notebook with correspondence, Scope of Work, Survey Notes Draft F.I.S. Report.

T.D.N. Volume 2 of 4 – Hydrology Report – Including watershed Maps, Hard and Digital Input Report – Including Hard and Digital Input/Output and Draft 200 scale work maps.

T.D.N. Volume 3 of 4 – Hydraulic Analysis Results Report – Including HEC-RAS Model and Digital input/output and Draft 200 Scale Work Maps.

T.D.N. Volume 4 of 4 – Field Reconnaissance with Photos of the structures and (N) Value Estimations, As-Built Plans etc. and Hydraulic Parameter Estimation Summary.

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FIELD RECONNAISSANCE & HYDRAULIC PARAMETER ESTIMATION

4.4.1 INTRODUCTION.

A-N West made several site visits to photograph and evaluate Manning's 'N' values for both the detailed hydraulic analysis and for the hydrologic model on a routing.

The detail study hydraulic analysis reaches are shown on Exhibit 1 and involve:

Padelford Wash – from CAP Canal to S.E. corner Section 31, T6N, R1W	5.1 Miles
Tributory 'A'; to Padelford Wash – from Confluence To S.R. 74	19 Miles
Tributory 'B', to Padelford Wash – from Confluence To S.R. 74	0.8 Miles
Tributory 'C', to Padelford Wash – from Confluence To S.R. 74	1.2 Miles
Split No. 1 – from Padelford to CAP	2.1 Miles
Split No. 2 – from Padelford to CAP	2.1 Miles
Split No. 3 – from Padelford to CAP	2.1 Miles
Split No. 4 – from Split No. 3 to CAP	0.8 Miles
Total	16.1 Miles

4.4.2 HYDROLOGIC STORAGE ROUTING

a.) Central Arizona Project (CAP) Canal

In order to evaluate storage routing at the CAP canal as well as to document this facility, design / as-built plans, specifications were obtained for the CAP Canal embankments, overchute structure design and details. These plans, specifications and details are included in Appendix 'A'.

Appendix 'B' contains the storage versus elevation data for ponding upstream of the CAP Canal embankment as developed from this study's 200 scale 2' C.I. mapping. Also included in Appendix B are discharge versus elevation calculations for each of the overchute structures. The overchute structure inverts were field surveyed on this study's elevation datum.

The following Table 1 summarizes the six CAP Canal overchute structures with Exhibit 1 location I.D., stationing, size and CAP Design Outflow. Also shown on Table 1 are the calculated capacity at ponding high-water elevation of 1553.0, or approximately 3.5 feet from the top of levee of 1556.6 ±.

TABLE 1
CAP OVERCHUTE SUMMARY

Exhibit 1 I.D. No.	CAP Sta.	Size	CAP Design 100yr – 6 hour Outflow (cfs)	Study Capacity at H. W. Eli 1553.0 (cfs)
1	240 + 00	1 – 72" Dia.	435	399.0
2.	253 + 00	1 – 72" Dia.	435	406.4
3	272 + 35	3 – 72" Dia.	1,305	1282.4
4	279 + 00	1 – 72" Dia.	435	433.6
5	298 + 70	1 – 72" Dia.	435	436.0
6	315 + 00	3 – 72" Dia.	1,305	1315.1

b.) State Route 74

In order to evaluate the potential storage-routing and capacity impact of the major hydraulic structures along State Route 74, these as-built plans were collected and are included in Appendix C.

The S.R 74 culvert inverts were field surveyed on mapping datum.

In order to model the storage – routing impact of the more significant culverts (over 42" dia.), storage – routing input parameters for the HEC – 1 hydrologic analysis were developed as shown in Appendix 'E'. There are a number of smaller 24 – 36" culverts which were not considered significant enough to warrant identifying and modeling sub-areas. Also, one 42" culvert was not modeled as it intercepted only a small portion of a sub-area, which was routed through an adjacent larger structure, again to simplify the modeling.

Appendix 'E' contains storage versus elevation calculations from available 200 scale mapping, at either 2' or 10' C.I. Also in Appendix 'E', are discharge versus elevation calculations. In some cases the detailed mapping was extra-polated based on U.S.G.S. quadrangle mapping and site observations to develop elevation versus volume calculations.

These culverts are anticipated to pass the peak discharges without overtopping. As the hydrologic modeling progresses, this assumption will be evaluated further.

The following Table 2 summarizes the Exhibit 1 I.D. proposed contributing HEC – 1 concentration point and pipe / culvert size.

TABLE 2
SUMMARY OF S.R. 74 CULVERTS OVER 42" ± DIA.

Exhibit I.D.	ADOT Sta.	HEC –1 INFLOW I.D.	PIPE SIZE
A	620 + 35	SB 36	6' x 7' RCB
B	640 + 20	SB 38	6' x 5' RCB
C	642 + 63	SB 34	3 – 10' x 8' RCB'S
D	654 + 29	CO 31	4 – 10' x 10' RCB'S
E	662 + 70	SB 32	6' x 5' RCB
F	681 + 47	CO 63	3 – 10' x 10' RCB'S
G	683 + 63	CO61	2 – 12' x 10' RCB'S
H	691 + 30	SB 64	10' x 6' RCB
I	692 + 55	SB 64	6' x 5' RCB
J	709 + 40	SB 68	2 – 8' x 6' RCB'S
K	713 + 70	SB 70	42" RCP
L	717 + 26	SB 70	54" RCP
M	720 + 55	SB 72	8' x 5' RCB
N	734 + 07	SB 76	2 – 10' x 8' RCB'S
O	782 + 95	SB 92	60" RCP

4.4.3 MANNING'S 'N' VALUE ESTIMATION

Manning's 'n' values were estimated using two references. The first document, "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona", was prepared by U.S. Geological Survey (USGS) Water Resources Division by B.W. Thompson and H.W. Hialmarson for the Flood Control District of Maricopa County, dated, April, 1991. The other reference used was "Open Channel Hydraulics" which was written by Ven Te Chow, Ph.D.; published by McGraw Hill Book Company in 1959.

Field visit observations of vegetation, and channel and overbank 'n' value characteristics were noted and representative photographs were taken. The photos are included in this report and are referenced with orientation of photo, estimated 'n' values and location by geographical proximity to landmarks such as CAP Canal, State Route 74, Section Lines, or Confluences with other washes.

Appendix 'D' contains, the basic forms for estimating 'n' values, page D – 1 – D – 2. Site visit photos follow, annotated with location, dimensions and 'n' value estimations.

Also in Appendix 'D' are additional culvert information including FEMA forms for the (3) sets of S.R. 74 culverts to be analyzed in detail as part of the hydraulic analysis by HEC – RAS model.

In general channel 'n' values were estimated to range from 0.037 to 0.040. The wash beds were generally a sand gravel material, without significant obstruction (rocks, trees). The bank generally involved heavy trees.

The overbank 'n' value was generally estimated and proposed as 0.065. Significant overbank flow is not anticipated. If overbank flow occurs it will generally be shallow and encounter significant trees brush and changing land forms.

4.4.4 INSPECTION MAINTENANCE OF LEVEES (CAP CANAL)

The CAP Canal has levees which pond floodwaters upstream of the CAP Canal. The overchute structures convey the storm water across to downstream washes.

A-N West wrote to the Bureau of Reclamation to request information on these levees and structures as shown in Appendix 'A'.

In response the attached design / as-built plans and specifications were received. The Central Arizona Water Conservation District (CAWCD) was identified as the agency that is responsible for maintenance of the levee. A copy of the contact person's business card, Mr. Randy Randolph, P.E., Central Arizona Project, Civil Engineering Division Supervisor is included in Appendix 'A'.

The CAP Canal design plans are dated August 1975. A-N West's general site visit observations of the levee, for this study were that the levee appeared to have been adequately maintained and was in adequate condition.

4.4.5 OBSERVATION OF POSSIBLE OVERFLOW AREAS

Several significant flow splits occur from the main Padelford wash, several hundred feet north of the Dove Valley Road alignment.

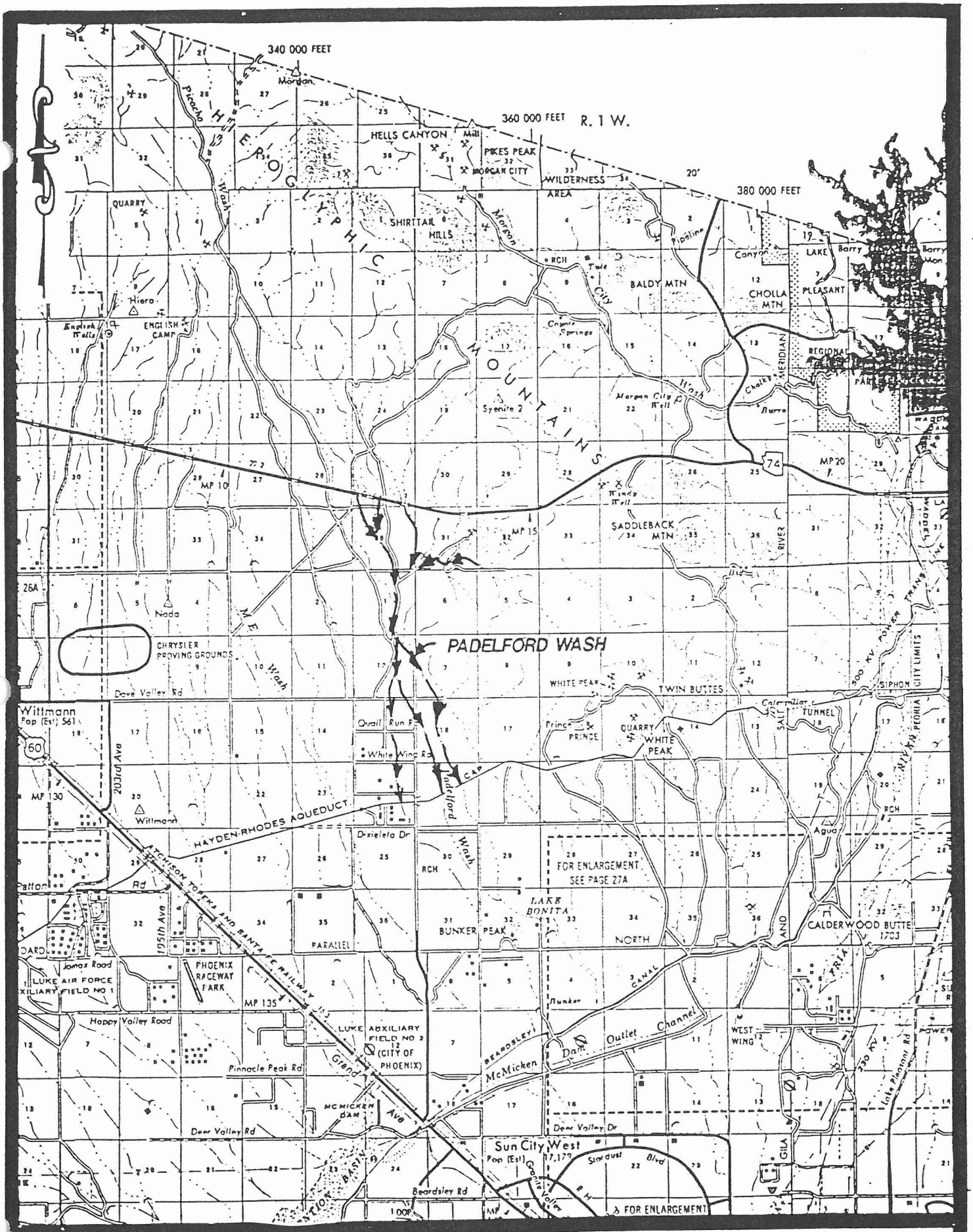
Three of these, which are proposed to be hydraulically analyzed separately, were identified as Split 1, Split 2, and Split 3. These three flow splits continue to the CAP Canal.

A fourth flow split, identified as Split 4, branches off from Split 3 near White Wing Road and continues to the CAP Canal. It also is proposed to be hydraulically analyzed separately.

Within the areas of Splits 1 – 4 are potential for shallow overflow and splits into less significant and definable washes. These more minor flow splits and shallow over flow may be appropriately defined as a shallow flooding zone "AO", which will be further evaluated as detailed hydraulic analysis progresses.

At the westerly edge of the watershed approximately 2,200 feet west of 163rd Avenue at the north edge of the CAP Canal, there is a possible breakout to the west out of the study area for ponding of the Canal above approximately elev. 1549. The flow breaking out to the west could continue flowing westerly to several other CAP overchutes. These westerly overchutes are receiving runoff from a significant additional watershed. It would therefore not be easy to assess backwater effects which may limit this breakout.

Initially, A-N West proposes a conservative assumption, that no breakout occurs due to the westerly watersheds contribution to ponding along the CAP Canal. This assumption that the backwater of the adjacent watershed's ponding will prevent significant breakouts will result in a conservative or possibly higher ponding elevation.



EXPLANATION

STUDY WASH

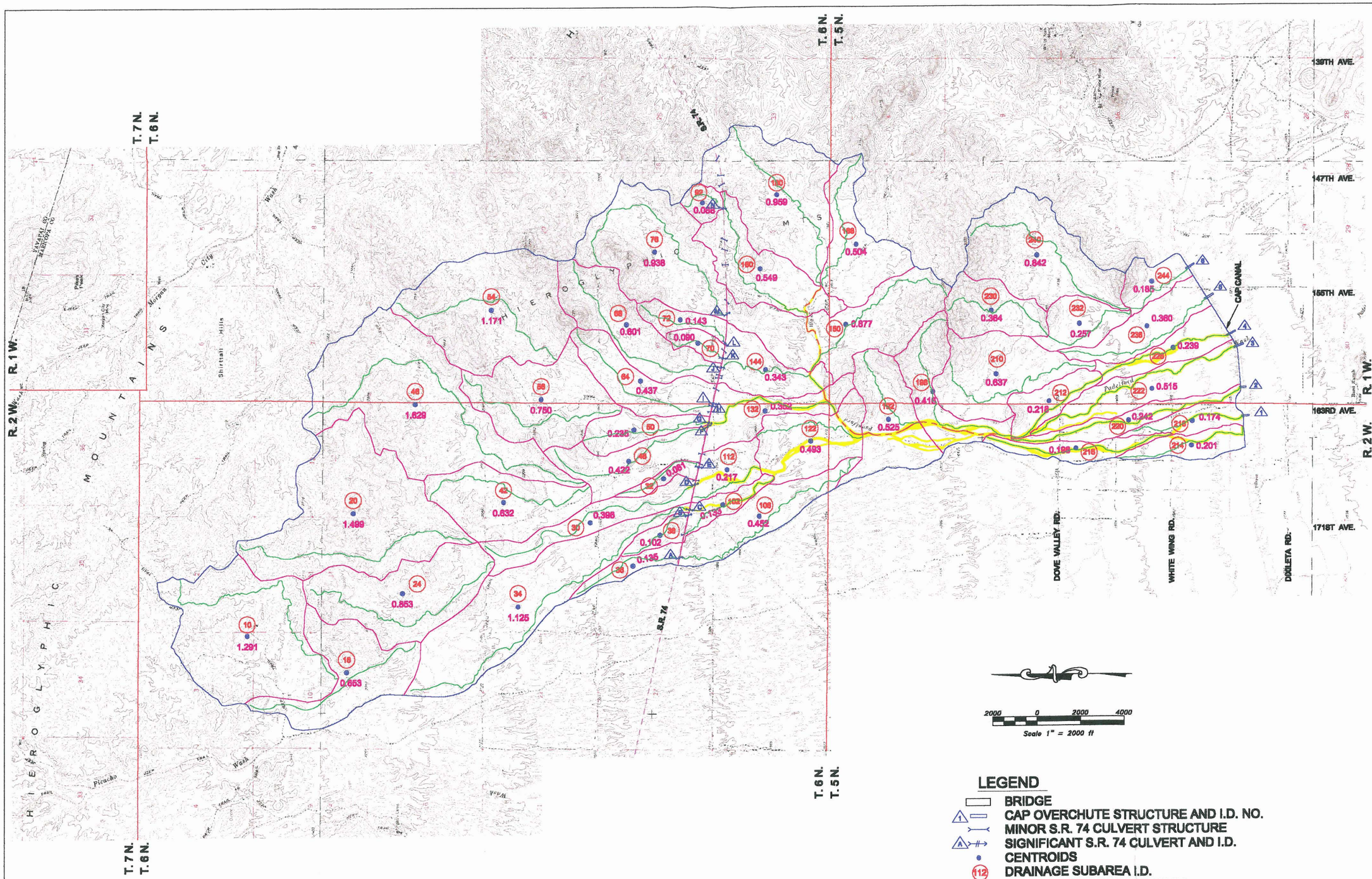
PADELFORD WASH FLOODPLAIN DELINEATION STUDY
FCD NO.99-12

LOCATION MAP

FIGURE 1

A-N WEST INC.
Consulting Engineers

A-N WEST NO. 7158-07



TOTAL WATERSHED DRAINAGE BDRY. = 23.535 SQ.ML.

LEGEND

- BRIDGE
- CAP OVERCHUTE STRUCTURE AND I.D. NO.
- MINOR S.R. 74 CULVERT STRUCTURE
- SIGNIFICANT S.R. 74 CULVERT AND I.D.
- CENTROIDS
- 112 DRAINAGE SUBAREA I.D.
- 0.867 SUBAREA SIZE SQUARE MILES
- SUBAREA DRAINAGE BDRY.
- TOTAL WATERSHED DRAINAGE BDRY.
- DRAINAGE / FLOWPATHS
- STUDY WASHES

CALL TWO WORKING DAYS BEFORE YOU DIG 263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

NO.	DATE	DESCRIPTION	BY

Registered Professional Engineer (Civil) CERTIFICATE NO. 15390 GREGORY A. SCHIEVELE Date Signed 2/19/08 ARIZONA U.S.A.

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
phoenix@anwest.com

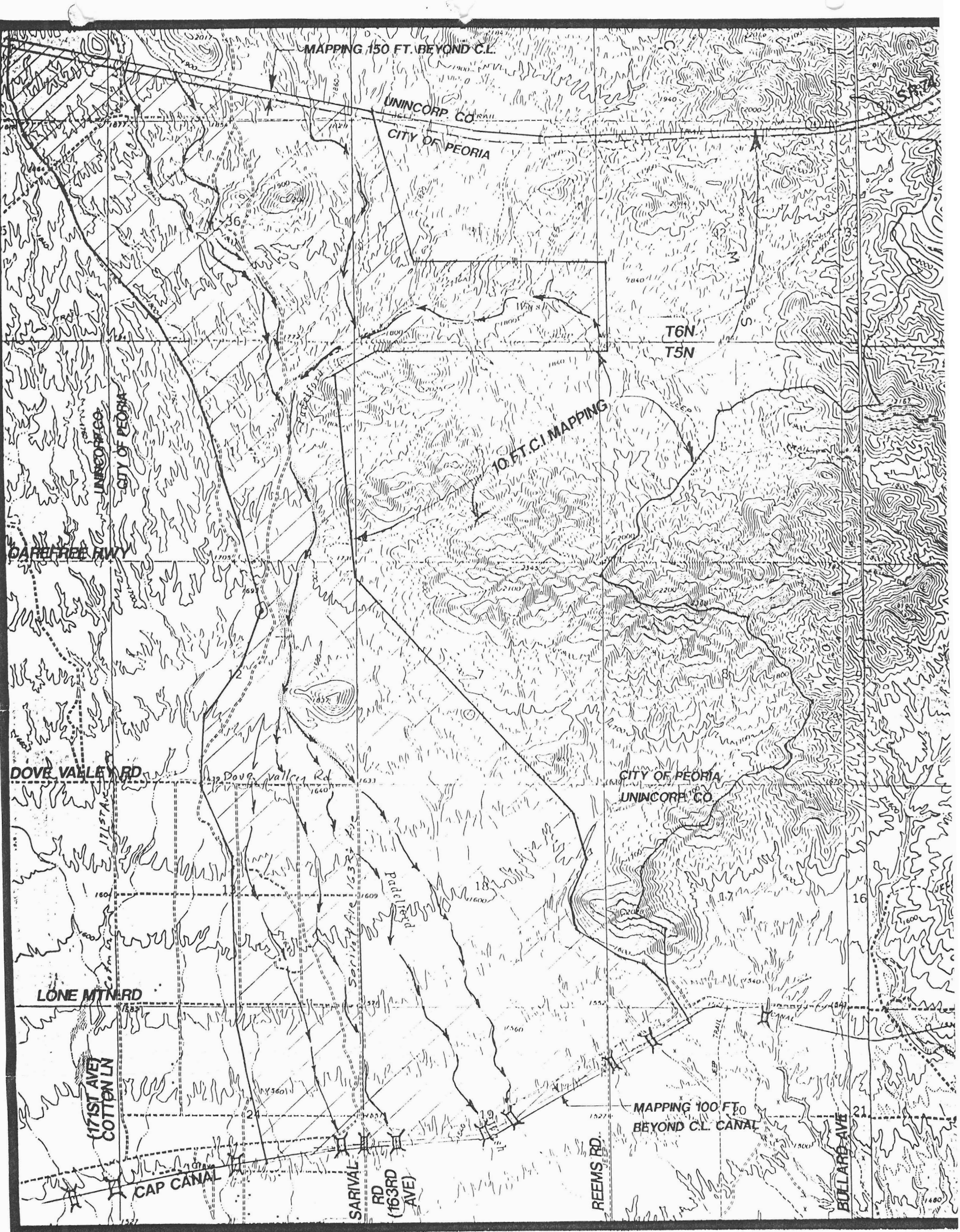
PROJECT TITLE
PADELFORD WASH FLOOD PLAIN DELINEATION STUDY
F.C.D. NO. 99-12

SHEET TITLE
EXHIBIT 1 - WATERSHED MAP
PADELFORD WASH FLOOD PLAIN DELINEATION STUDY

JOB NO.	7159-07	DESIGN	XXX
DWG. ID.	7158007/STR	DRAWN	XXX
DATE	2/19/08	CHECK	XXX

SCALE
HORIZ. 1"=2000'
VERT. N/A

SHEET 1 OF 1



2 FT.C.I. MAPPING

FCD 99-12
PADELFORD WASH
FLOOD DELINEATION STUDY

A-N WEST INC.
Consulting Engineers

PLATE 1

AVERY

Central Arizona Project

23636 NORTH 7TH STREET
PHOENIX, ARIZONA 85024
(602) 870-2333

DATE: November 27, 1999

RE: Granite Reef Aqueduct

NOV 1999
A-NWEST, INC.
PHOENIX, ARIZONA

TO: A-Nwest Inc., Consulting Engineers
7600 N 15th Street, Suite 200
Phoenix, AZ 85020-4331
Attn: Gregory A. Scheulke, PE, RLS

GENTLEMEN:

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DRAWING NO.	DESCRIPTION
1	344-330-1305	Granite Reef Aqueduct, Location Map
1		Input Data for Flood Routing, Hayden-Rhodes AQ, Reach 9
1		Input Data for Unit Hygrographs, Hayden-Rhodes AQ, Reach 9

THESE ARE TRANSMITTED as checked below:

☐ Initial Submittal ☐ Resubmittal

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

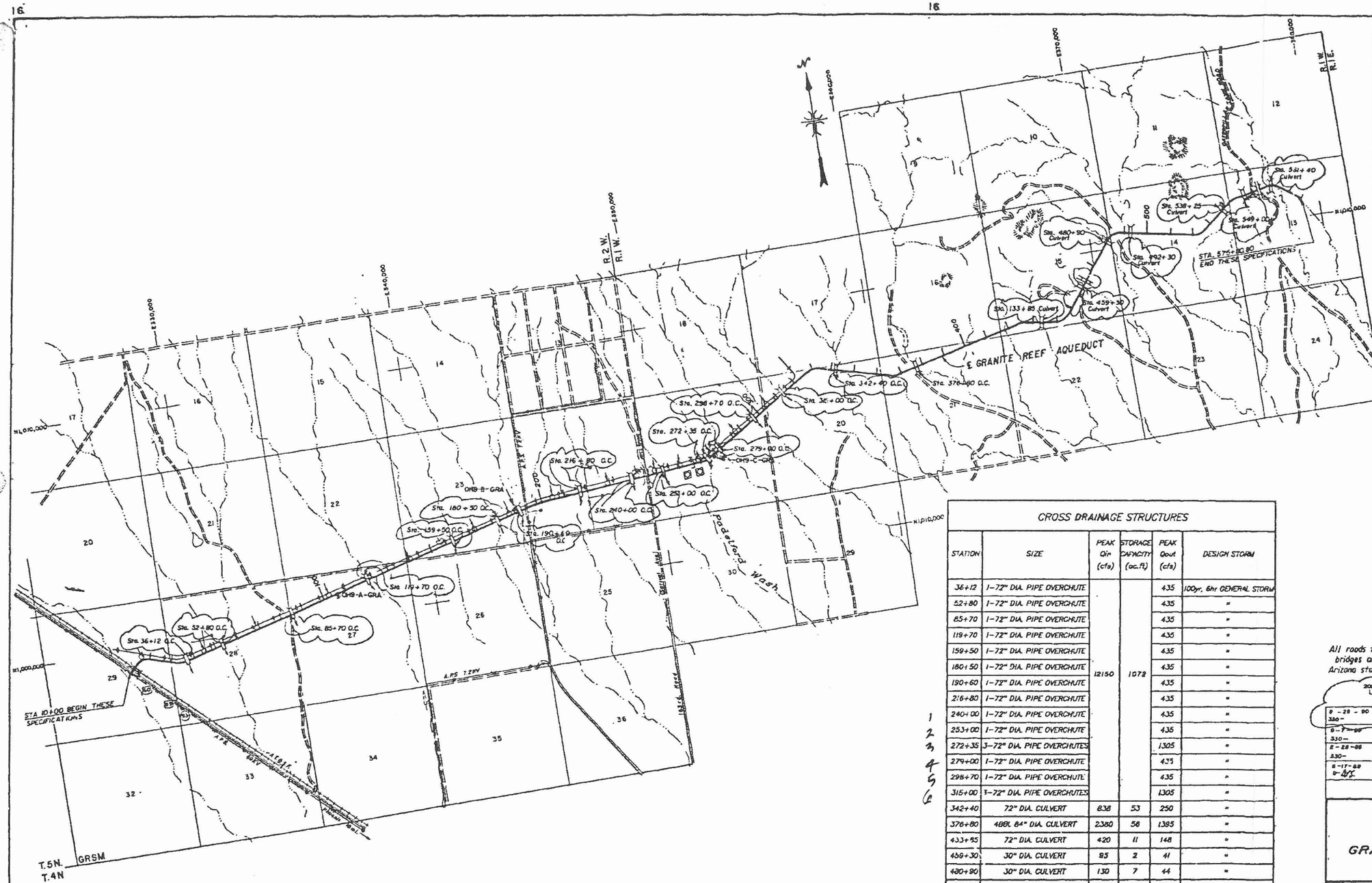
REMARKS: _____

REPLY TO: David W. Gunn, PE
Engineering Manager

SIGNED David W. Gunn

A-1

FORM FPM 500 (R 9/95)



CROSS DRAINAGE STRUCTURES

	STATION	SIZE	PEAK Qin (cfs)	STORAGE CAPACITY (ac.ft)	PEAK Qout (cfs)	DESIGN STORM
	36+12	1-72" DIA. PIPE OVERCHUTE			435	100yr, 6hr GENERAL STORM
	52+80	1-72" DIA. PIPE OVERCHUTE			435	"
	85+70	1-72" DIA. PIPE OVERCHUTE			435	"
	119+70	1-72" DIA. PIPE OVERCHUTE			435	"
	159+50	1-72" DIA. PIPE OVERCHUTE			435	"
	180+50	1-72" DIA. PIPE OVERCHUTE	12150	1072	435	"
	190+60	1-72" DIA. PIPE OVERCHUTE			435	"
	216+80	1-72" DIA. PIPE OVERCHUTE			435	"
1	240+00	1-72" DIA. PIPE OVERCHUTE			435	"
2	253+00	1-72" DIA. PIPE OVERCHUTE			435	"
3	272+35	3-72" DIA. PIPE OVERCHUTES			1305	"
4	279+00	1-72" DIA. PIPE OVERCHUTE			435	"
5	298+70	1-72" DIA. PIPE OVERCHUTE			435	"
6	315+00	3-72" DIA. PIPE OVERCHUTES			1305	"
	342+40	72" DIA. CULVERT	838	53	250	"
	376+80	48BL 84" DIA. CULVERT	2380	56	1395	"
	433+95	72" DIA. CULVERT	420	11	148	"
	459+30	30" DIA. CULVERT	95	2	41	"
	480+90	30" DIA. CULVERT	130	7	44	"
	492+30	48BL-72" DIA. CULVERT	1850	62	990	"
	538+25	30" DIA. CULVERT	135	4	44	"
	549+00	30" DIA. CULVERT	115	3	44	"
	581+40	72" DIA. CULVERT	480	16	196	"

NOTES

All roads to be abandoned at aqueduct right-of-way where bridges are not shown.
Arizona state plane coordinates system, central zone

SCALE OF FEET: 2000 0 2000 4000 6000

9-28-90 330-	ADDED STATIONING
9-7-89 330-	ADDED OBSERVATION WELLS
2-28-86 330-	ADDED CROSS DRAINAGE STRUCTURES CHART.
8-17-80 D-BYC	AS BUILT BY 330, LTR. 4-16-79

SUNDAYS THERE SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

GRANITE REEF AQUEDUCT
REACH 9
LOCATION MAP

DESIGNED D.E. Nelson SUBMITTED A.E. Melkin
DRAWN P.A.G. RECOMMENDED E.M. Tonnies
CHECKED J.L. Vocz J.R. APPROVED J. Gilbert
DIRECTOR OF DESIGN AND CONSTRUCTION

PHOENIX, ARIZONA SEPTEMBER, 1975 344-330-1305

A-2

INPUT DATA FOR FLOOD ROUTING
HAYDEN-RHODES AQUEDUCT REACH 9

STATION	STRUCT. TYPE	SIZE	INVERT ELEV.	CREST ELEV.	STORAGE CAPACITY DATA ELEV.	AC.FT	ELEV.	AC.FT.
52+80	Pipe OC	72"	1540.97	1556.0	1548	0	1549	41
85+70	Pipe OC	72"	1540.71		1550	141	1551	301
119+70	Pipe OC	72"	1542.42		1552	519	1553	796
159+50	Pipe OC	72"	1540.11		1554	1131	1555	1513
190+60	Pipe OC	72"	1540.27		1556	1927	1557	2373
216+80	Pipe OC	72"	1540.08		1558	2851		
240+00	Pipe OC	72"	1540.38					
253+00	Pipe OC	72"	1540.30					
272+35	Pipe OC	3-72"	1539.16					
279+00	Pipe OC	72"	1539.10					
298+70	Pipe OC	72"	1538.95					
315+00	Pipe OC	3-72"	1538.82					
342+40	Culvert	72"	1516.18	1537.2	1516	0	1518	0.8
					1520	2.1	1522	5.1
					1524	11.7	1526	24.0
					1528	45.8	1530	81.7
					1532	136.8		
376+80	Culvert	4-84" ~~3-72"~~	1510.00	1536.9	1510	0	1514	1.2
					1518	5.25	1522	14.3
					1526	33.9	1530	67.5
					1533	104.9		
433+85	Culvert	72"	1512.50	1536.5	1516	0	1520	0.6
					1524	2.2	1528	7.1
					1532	20.2	1534	32.7
459+30	Culvert	30"	1519.50	1536.3	1518	0	1520	0.2
					1522	0.4	1524	0.8
					1526	1.8	1528	3.4
					1230	6.3	1532	10.9
480+90	Culvert	30"	1515.83	1536.1	1516	0	1618	0.3
					1520	0.8	1522	1.8
					1524	3.8	1526	7.6
					1528	14.3	1530	25.1
492+30	Culvert	4-72"	1500.00	1536.1	1500	0	1504	2.1
					1508	7.3	1512	19.3
					1516	43.5	1520	89.5
538+25	Culvert	30"	1519.60	1535.7	1520	0	1524	0.2
					1528	0.6	1532	1.4
					1536	14.0		

INPUT DATA FOR FLOOD ROUTING
HAYDEN-RHODES AQUEDUCT REACH 9

STATION	STRUCT. TYPE	SIZE	INVERT ELEV.	CREST ELEV.	STORAGE CAPACITY DATA ELEV.	AC.FT	ELEV.	AC.FT.
549+00	Culvert	30"	1513.18	1535.6	1212	0	1514	0.2
					1516	0.4	1518	0.7
					1520	1.3	1522	2.3
					1524	3.7	1526	5.7
					1528	8.5	1530	12.1
					1532	16.8	1534	22.9
561+40	Culvert	72"	1508.00	1535.5	1508	0	1510	0.6
					1512	1.4	1514	2.6
					1516	4.6	1518	8.0
					1520	12.6	1522	19.1
					1524	28.2	1526	40.6

ADD

36+12 — 1-72" DIA. PIPE OVERCHUTE

180+50 — " " " "

INPUT DATA FOR UNIT HYGROGRAPHS
hyden-rhodes AQUEDUCT - REACH 9

STATION	AREA Sq.Mi.	GRAPH SCS/PV	CHANNEL Miles	CENTROID Miles	SLOPE ft/mi.	CURVE No.	PRECIPITATION 100-yr	50-yr	3-hr
36+12									
52+80									
85+70									
119+70									
159+50									
180+50									
190+60	DETENTION DIKE FORM STATION 10+00 TO 323+50								
216+80	79.5	PV	16.7	6.5	79.6	78	3.15	2.85	
240+00									
253+00									
272+35									
279+00									
298+70									
315+00									
342+40	0.84	SCS	1.12	0.49	141	95	3.44	3.11	
376+80	3.25	SCS	4.02	1.75	113	96	3.44	3.11	
433+85	0.39	SCS	0.92	0.43	228	96	3.44	3.11	
459+30	0.15	SCS	0.47	0.34	587	79	3.44	3.11	
480+90	0.33	SCS	1.28	0.50	308	71	3.44	3.11	
492+30	3.04	SCS	4.26	1.46	93.5	90	3.44	3.11	
538+25	0.11	SCS	0.43	0.19	1440	98	3.44	3.11	
549+00	0.16	SCS	0.78	0.40	664	82	3.44	3.11	
561+40	1.07	SCS	1.52	0.69	493	73	3.44	3.11	

A-N WEST INC.
Consulting Engineers

January 19, 2000

Mr. Richard Dent
Bureau of Reclamation
Arizona Projects Office
23636 North 7th Street
Phoenix, AZ 85024

Re: Padelford Wash Floodplain Delineation Study at
Central Arizona Project Canal
FCDMC No. 99-12
A-N West No. 7158-07

Dear Mr. Dent:

A-N West has been contracted by the Flood Control District of Maricopa County (FCDMC) to perform a 100-year floodplain delineation study of the Padelford Wash (See Location Map), between the CAP Canal and State Route 74. The attached Plate 1 shows the limits of new detailed mapping being generated for this study.

We have previously obtained from your office (Mr. David Gunn) on Nov. 27, 1999 a copy of the Granite Reef Aqueduct, Location Map near the floodplain study area and summary hydrology and overchute pipe size and locations.

Since this detailed floodplain study will be submitted to FEMA, additional information on the CAP Canal levees and overchute structures are typically required when flood flows pond at the CAP levee.

We write to further request;

a. Copies of CAP design and/or as-built plans of the upslope levee in this area and the overchutes at Stations 240+00, 253+00, 272+35, 279+00, 298+70, and 315+00.
b. Are there any design calculations for levee embankment stability or seepage analysis? If so, we would request a copy of this analysis or a summary of it.
c. Was there a percent compaction required of the levees? If so, what was it?
d. Does the Bureau have an officially adopted plan for regular inspection and maintenance of the levees? If so, can a copy be provided?

Should you have any questions, please feel free to contact me, thank you.

Sincerely,

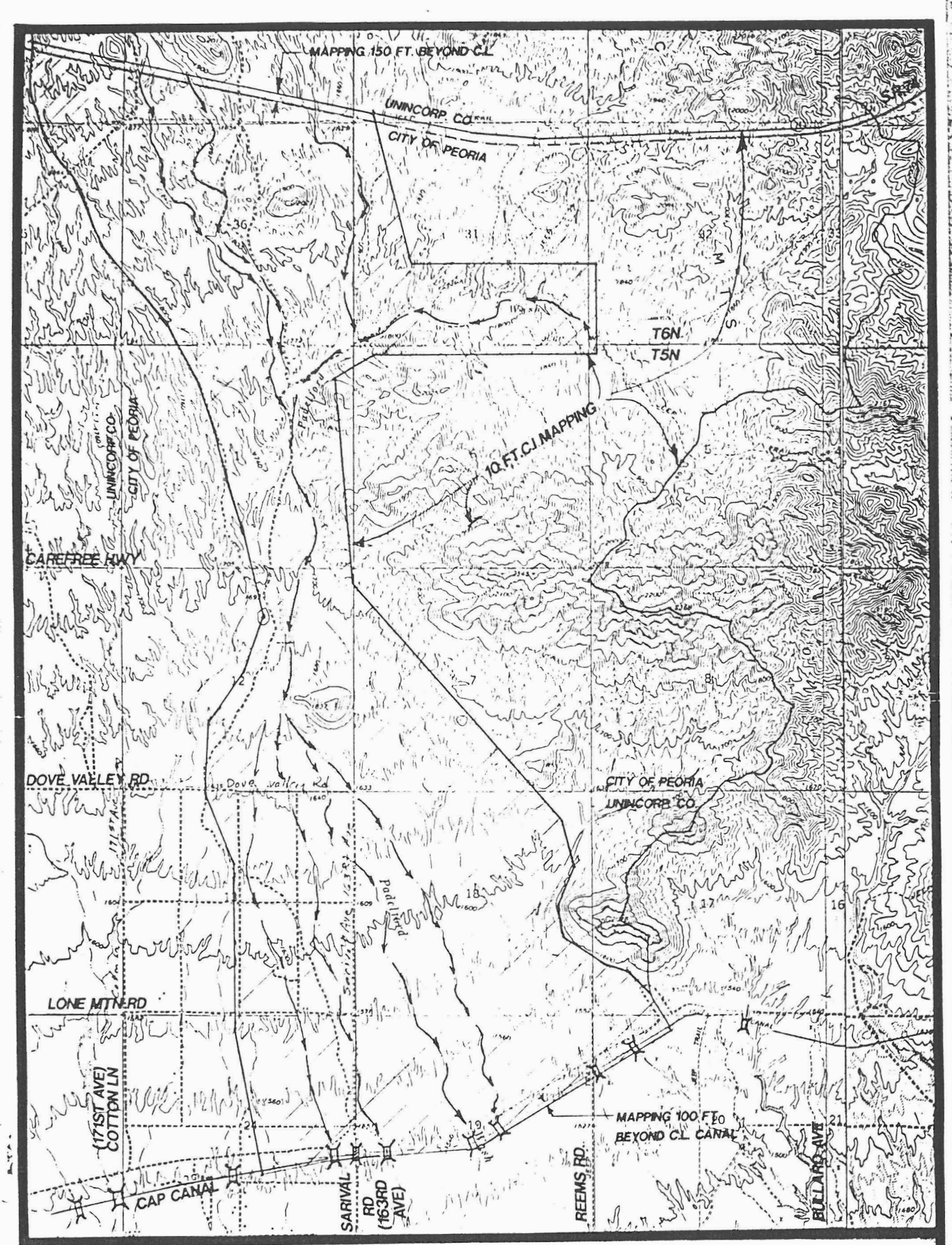
A-N WEST, INC.

Gregory A. Schuelke, P.E., R.L.S.
Vice President
Project Manager

GAS/hr

A-6

7600 North 15th Street • Suite 200 • Phoenix, Arizona 85020-4331 • (602) 861-2200 • Fax (602) 943-1989



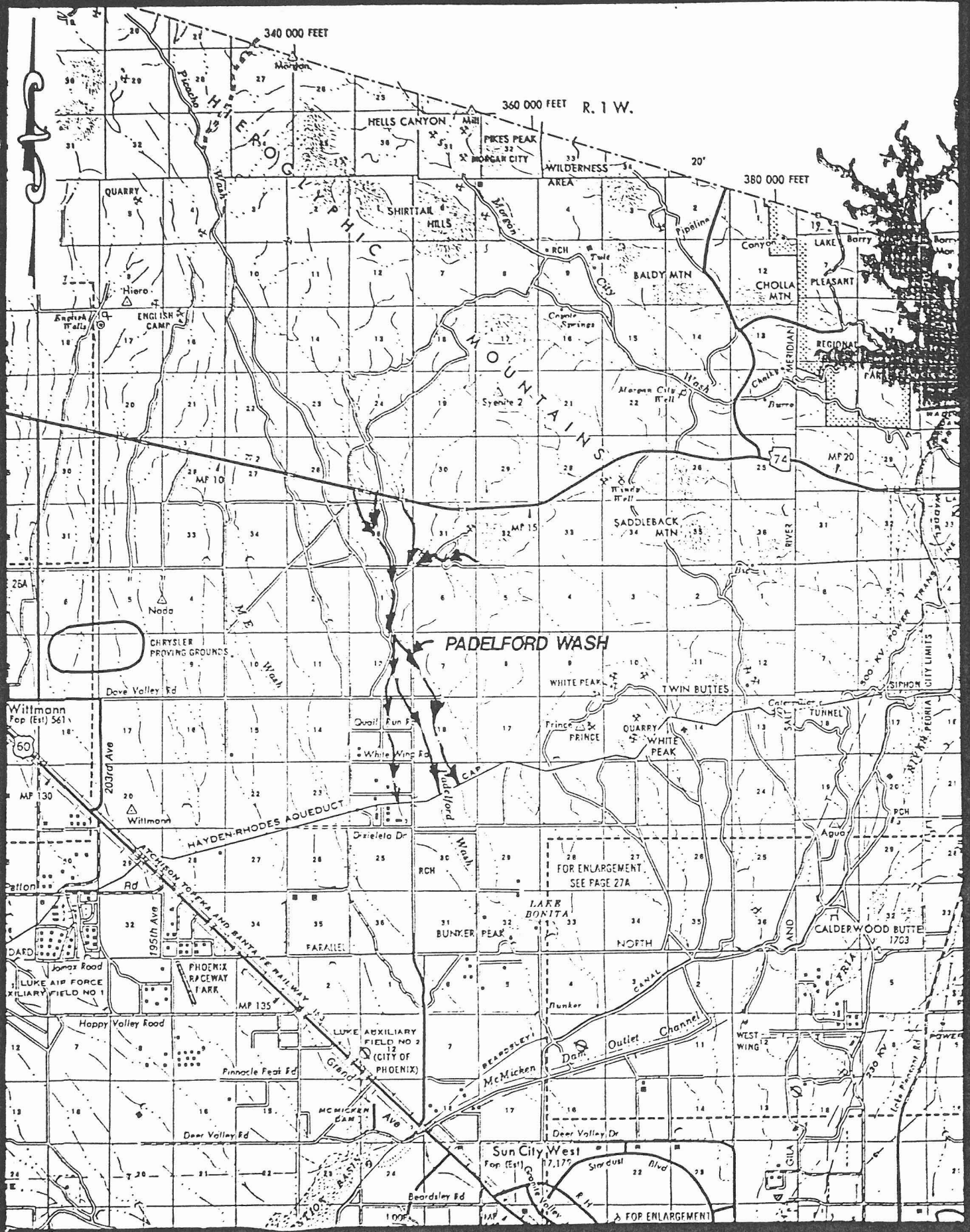
R2W R1W

2 FT.C.I. MAPPING

FCD 99-12
PADELFORD WASH
FLOOD DELINEATION STUDY

A·N WEST INC.
Consulting Engineers

PLATE 1



EXPLANATION

STUDY WASH

PADELFORD WASH FLOODPLAIN DELINEATION STUDY
FCD NO.99-12

LOCATION MAP

FIGURE 1

A-N WEST INC.
Consulting Engineers

A-N WEST NO. 7158-07

A-8

Central Arizona Project

23636 NORTH 7TH STREET
PHOENIX, ARIZONA 85024
(602) 870-2333

DATE: 3/8/00

RE: CAP INFO. YOU REQUESTED.

RECEIVED MAR 10 2000

TO: GREG SCHUELKE, PE, VP
A-N WEST INC.
7600 N. 15th St, SUITE 200
PHOENIX, AZ 85020-4331

GENTLEMEN:

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☒ Plans ☐ Samples ☒ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DRAWING NO.	DESCRIPTION
1	344-330-1325	REACH 9 - TYPICAL SECTIONS
1 eq.	344-330-1200	THROUGH 1206 R-9 PLAN & PROFILE
1	344-D-661	SARIVAL AVE BRIDGE
1 eq	344-D-579	OVERCHUTE DRAWINGS
	THROUGH	
	344-D-584	

THESE ARE TRANSMITTED as checked below:

☐ Initial Submittal ☐ Resubmittal

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☒ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

REMARKS: I HAVE ALSO ATTACHED EARTHWORK SPECIFICATIONS.

CAWCD IS THE RESPONSIBLE MAINTENANCE AGENCY FOR THE COLLECTIVE DIKE.

CALL IF YOU HAVE QUESTIONS.

THX,
RANDY

REPLY TO:

SIGNED Randy D. Rich

A-9

FORM FPM 500 (R 9/95)

Padelford Wash 3/8/00
FIS

CENTRAL ARIZONA PROJECT
23636 North Seventh Street • Phoenix, Arizona 85024
www.cap-az.com

RANDY RANDOLPH, P.E.
Civil Engineering Division Supervisor

(623) 869-2260
(623) 869-2598 Fax
rrandolph@cap-az.com

P.O. Box 43020 • Phoenix, Arizona 85080-3020

DIVISION 4—EARTHWORK

SECTION 4.1—EARTHWORK

4.1.1. EARTHWORK, GENERAL

All earthwork required by these specifications for construction of Reach 9 of the Granite Reef Aqueduct shall be in accordance with paragraphs 4.1.3 through 4.5.1, except that earthwork and surfacing for roads and bridge approaches shall be in accordance with Paragraph 5.1.1.

4.1.2. EARTHWORK DIAGRAMS AND DATA

To the extent that they exist, preliminary mass diagrams and earthwork data prepared for the Government's preliminary studies of earthwork for construction of the canal will be available for inspection by bidders in the office of the Construction Engineer. Preliminary mass diagrams include all excavation to pay lines shown on the drawings.

Such preliminary earthwork information is made available solely for the convenience of bidders. The Government does not represent that this information is accurate or complete. Bidders are cautioned that this information is subject to revision and that the Government disclaims responsibility for any interpretations, deductions, or conclusions which may be made therefrom. It is not intended that this preliminary earthwork information will limit or prescribe the excavation and hauling procedures of the contractor, and the Government reserves the right to utilize and distribute earthwork materials during the progress of the work as best serves the interest of the Government.

4.1.3. COMPACTING EARTH MATERIALS

a. General.—Where compacting of earth materials is required, the materials shall be deposited in horizontal layers and compacted as specified in this paragraph. The excavation, placing, moistening, and compacting operations shall be such that the material will be uniformly compacted throughout the required section and will be homogeneous, free from lenses, pockets, streaks, laminations, or other imperfections.

b. Compacting clayey and silty materials.—Where compaction of earth materials containing appreciable amounts of clay or silt is required, the materials shall be deposited in horizontal layers. The thickness of each horizontal layer after compaction shall be not more than 6 inches or two-thirds the length of the roller tamping feet whichever is the lesser. Where compaction is performed by hand or power tampers, the compacted layers shall not exceed 6 inches in thickness. The excavating and placing operations shall be such that the materials when compacted will be blended sufficiently to secure the highest practicable unit weight and best impermeability and stability. If the surface of any compacted layer of earthfill is too dry or smooth to bond properly with the layer of material to be placed thereon, it shall be moistened and/or scarified in an approved manner to provide a satisfactory bonding surface before the next succeeding layer is placed. All rollers used on any one layer of fill shall be of the same type and the same weight per foot of roller.

Prior to and during compaction operations, the materials shall have a moisture content of not greater than 2 percent wet or less than 2 percent dry of optimum moisture, as determined by the contracting officer and the moisture content shall be uniform throughout each layer.

Insofar as practicable, as determined by the contracting officer, moistening of the material shall be performed at the site of excavation but such moistening shall be supplemented by sprinkling at the site of compaction, if necessary. If the moisture content is less than optimum for compaction by more than 2 percentage points or is greater than optimum for compaction by more than 2 percentage points, the compaction operations shall not proceed, except with the specific approval of the contracting officer, until the material has been wetted or allowed to dry out, as may be required, to obtain optimum moisture content within the tolerances permitted above, and no adjustment in price will be made on account of any operations of the contractor in wetting or drying the materials or on account of any delays occasioned thereby.

When the material has been conditioned as hereinbefore specified, it shall be compacted by rollers or by hand or power tampers. Where hand or power tampers are used to compact soils in confined areas such as under pipe, they shall be equipped with suitably shaped heads to obtain the required density.

The density (dry) of the soil fraction in the

compacted material shall not be less than 95 percent of the laboratory standard maximum soil density (dry) as determined by the Bureau of Reclamation Proctor Compaction Test for the materials being compacted.

(1) Bureau of Reclamation Proctor Compaction Test.—The compaction tests will be made by the Government. The standard maximum soil density is the dry weight per cubic foot of the soil compacted at optimum moisture content by laboratory procedure. The compaction test is the same as ASTM Designation: D 698, Method A, except that a 1/20-cubic-foot compaction mold is used and the rammer is dropped from a height of 18 inches, resulting in the same energy of compaction per unit volume.

c. Compacting cohesionless materials.—

(1) Compacting cohesionless free-draining materials.—Where compaction of cohesionless free-draining materials, such as sands and gravels, is required, the materials shall be deposited in horizontal layers and compacted to the relative density specified below. The excavating and placing operations shall be such that the materials, when compacted, will be blended sufficiently to secure the highest practicable unit weight and best stability. Water shall be added to the materials as may be required to obtain the specified density by method of compaction being used.

The thickness of the horizontal layers after compaction shall not be more than 6 inches if compaction is performed by tampers or rollers; not more than 12 inches if compaction is performed by treads of crawler-type tractors, surface vibrators, or similar equipment; and not more than the penetrating depth of the vibrator if compaction is performed by internal vibrators.

The relative density of the compacted material shall be not less than 70 percent as determined by the standard Bureau of Reclamation relative density tests for cohesionless free-draining soils.

(a) Relative density test.—The relative density tests will be made by the Government. The relative density of a cohesionless free-draining soil, expressed as a percentage, is defined as its state of compactness with respect to the loosest and most compact states at which it can be placed by laboratory procedures. The relative density will be based on the following formula, wherein the maximum density is the highest unit weight of the soil, minimum density is the lowest unit weight of the soil, and in-place density is the unit weight of the soil in place. Tests for moisture content are made on the materials and the unit weights are expressed in terms of ovendry weights.

Rel. Den. (%) =

$$\frac{\text{max. den.} \times (\text{in-place den.} - \text{min. den.})}{\text{in-place den.} \times (\text{max. den.} - \text{min. den.})} \times 100$$

(2) Compacting cohesionless materials containing some clay and silt.—Cohesionless materials containing clay and silt may not be free draining. When compaction of cohesionless materials containing clay and silt is required, the materials shall be compacted to a dry density in accordance with either Subparagraph (a) or (b) below, using whichever test that results in the higher dry unit weight of the compacted material in the placement.

(a) Dry density using the Bureau of Reclamation Proctor Compaction Test as prescribed in Subparagraph b.(1) above.—Prior to and during compaction operations, the materials shall have a moisture content of not greater than 2 percent wet or less than 4 percent dry of optimum moisture, as determined by the contracting officer, and the moisture content shall be uniform throughout each layer: Provided, That for materials being compacted that have a moisture content of not greater than 2 percent wet or less than 2 percent dry of optimum moisture, the density (dry) of the soil fraction in the compacted material shall not be less than 95 percent of the laboratory standard maximum soil density (dry), as determined by the Bureau of Reclamation Proctor Compaction Test and that for materials being compacted that have a moisture content between 2 and 4 percent dry of optimum moisture, the density (dry) of the soil fraction in the compacted material shall not be less than 98 percent of the laboratory standard maximum soil density (dry), as determined by the Bureau of Reclamation Proctor Compaction Test.

(b) Dry density using the relative density test as prescribed in Subparagraph c.(1)(a) above.—The relative density of the compacted

material shall be not less than 70 percent as determined by the standard Bureau of Reclamation relative density tests for cohesionless free-draining soils.

Except as otherwise provided for moisture content in Subparagraph c.(2)(a) above, when density is determined by the Bureau of Reclamation Proctor Compaction Test, the materials shall be moistened, placed, and compacted in accordance with Subparagraph b. above. When density is determined by the relative density test, the materials shall be moistened, placed, and compacted in accordance with Subparagraph c.(1) above.

d. Rollers.—Rollers used for compacting earth materials described in Subparagraph b. above shall be tamping rollers meeting the following requirements. Each drum of a roller shall be not more than 6 feet in length. The roller shall have staggered and uniformly spaced tamping feet and be of sufficient weight for proper compaction. The end area of each tamping foot shall be not less than 5 square inches nor more than 10 square inches. The length of each tamping foot measured from the surface of the drum to the surface of the tamper head shall be not less than 7 inches. The distance measured on the surface of the drum between the center of any two adjacent tamping feet shall be not less than 8 inches. The total end area of the tamping feet shall not comprise more than 9 percent of the total cylindrical area based on the overall diameter and length of the roller at the outer ends of the tamping feet. The tamping heads and cleaner bars shall be properly maintained, and the spaces between the tamping feet shall be kept clear of materials which impair the effectiveness of the tamping roller.

e. Costs.—The costs of compacting earth materials as described in this paragraph shall be included in the prices bid in the schedule for compacting embankments, compacting backfill, and for other items of work where earth materials are required to be compacted under these specifications.

SECTION 4.2—EXCAVATION

4.2.1. CLASSIFICATION OF EXCAVATION

Materials excavated will not be classified for payment. Except as otherwise provided in these specifications, material excavated will be measured in excavation, to the lines shown on the drawings or as provided in these specifications, and all materials so required to be excavated will be paid for at the unit prices per cubic yard bid in the schedule for excavation. No additional allowance above the unit price bid in the schedule will be made on account of any of the material being wet. Bidders and the contractor must assume all responsibility for deductions and conclusions as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations. The Government does not represent that the excavation can be performed or maintained at the pay lines described in these specifications or shown on the drawings.

4.2.2. EXCAVATION ADJACENT TO CONTRACT BOUNDARIES

Definite stations for the boundaries of the schedule are shown on the drawings, and these definite stations are the contract limits of the work covered by these specifications. It may be necessary to perform a certain amount of excavation, as determined by the contracting officer, beyond the contract limits in order to provide space in which to work. Payment for necessary excavation outside the contract limits will be made at the unit price per cubic yard bid for the adjacent excavation within the contract limits.

4.2.3. EXCAVATION FOR CANAL

a. General.—The canal sections are shown on the drawings. The Government reserves the right, during the progress of the work, to vary the slopes of excavations or the slopes of embankments and the dimensions dependent thereon. Any increase or decrease of quantities excavated as a result of such variations will be included in the estimates. If the contracting officer determines that the contractor's costs of performing the work will be increased or decreased by reason of such variations an equitable adjustment will be made to cover his increased or decreased costs. Otherwise the work will be paid for at the unit price bid therefor in the schedule regardless of variations in quantity, except as provided in Paragraph 1.3.4. Stones and indurated materials larger than 5 inches shall be removed from materials to be used for compacted embankments as specified in Paragraph 4.4.5. Suitable material excavated for the canal and not required for constructing canal embankments shall be used to construct collective dike embankments and O&M road ramp and bridge approach embankments.

Blasting in such a manner as to cause overbreakage which, in the opinion of the contracting officer is

excessive, will not be permitted. If runways are cut into canal slopes below the top of canal lining, they shall be refilled with selected material and compacted as provided in Paragraph 4.4.5. Above the elevation of the O&M road, rock will be allowed to stand at its steepest safe angle, and no finishing will be required other than the removal of rock masses that are loose and liable to fall. Insofar as practicable, the finishing operations required on canal sections shall be performed by the contractor simultaneously with the canal excavation.

Where material suitable for selected bedding material, as determined by the contracting officer, is encountered and cannot be placed as bedding material in one continuous operation, then such material shall be stockpiled along the right-of-way where designated by the contracting officer for later use.

Care shall be taken to prevent overbreakage or loosening of material on bottoms and side slopes upon or against which lining is to be placed. Where the original ground surface is below the grade of the canal, the bottom of the canal shall be filled to the underside of the lining as prescribed for constructing and compacting the canal embankments.

Except as provided below, the canal shall be excavated to a subgrade and section as shown on the drawings or as directed to provide for the prescribed thickness of lining, and the foundation for the lining shall be prepared in accordance with Paragraph 7.3.1.

Through sections containing rock, hard compact material, coarse gravel, cobbles, and boulders that cannot be trimmed, the canal shall be excavated so that there will be not less than 3 inches between any point of the excavated surface and the underside of the lining. Surfaces so excavated shall be filled with selected bedding material conforming to Paragraph 7.3.1.

Where unsuitable material is encountered in the foundation for the canal, the contracting officer will direct additional excavation to remove the unsuitable material. This additional excavation shall be refilled to the underside of the lining as prescribed for constructing and compacting canal embankments.

b. Moisture.--Between Stations 10+00 and 370+00, all areas to be excavated for the canal prism and for structures shall be wet by sprinkler irrigation to a moisture content of optimum, plus or minus 1 percent, to 8 feet below the canal prism, or to impervious cemented material, whichever is less, as determined by the contracting officer. Application of moisture to the above areas shall be simultaneous with the application of moisture to adjacent areas on which canal, collective dike, and bridge approach embankments, and O&M road ramps are to be constructed. Wherever possible, all water to be added to the above areas shall be added in one † application before any excavation work is begun. The contractor shall check the progress of the wetting subject to the approval of the contracting officer. †

† As far as practicable, all material to be excavated in the entire Reach 9 shall have additional moisture applied, if needed, by sprinkler irrigation to condition the materials in place in accordance with the following requirements before any excavation work is begun. †

The moisture content of the earthfill materials prior to and during compaction shall be in accordance with Paragraph 4.1.3, except that the materials to be placed in embankments not to be compacted shall have a moisture content of not greater than 2 percent wet nor less than 5 percent dry of optimum. † Wherever possible, all water added to condition materials shall be added in one application. When † moisture is added to the areas to be excavated, care shall be taken to moisten the material uniformly to produce the required moisture content of the † material for the purpose of which it is to be used. The contractor is cautioned to control carefully the † application of water and to check on the depth and amount of water penetration during application so as to avoid overirrigation.

If at any location to be excavated before or during excavation operations, there is excessive moisture, as determined by the contracting officer steps shall be taken to reduce the moisture by selective excavation to secure the drier materials; by excavating and placing in temporary stockpiles material containing excessive moisture; by excavating drainage ditches; by allowing adequate additional time for drying; or by any other approved means. To minimize operations with overly wet material, the contractor will be permitted to utilize portions of the areas to be excavated which contain dry material to the greatest extent practicable consistent with obtaining suitable material.

The contractor shall be entitled to no additional allowance above the unit prices bid in the schedule on account of the requirement for excavating drainage ditches; for allowing additional time for drying; for stockpiling and rehandling excavated materials which have been deposited temporarily in stockpiles; delays or increased costs due to

stockpiling; poor trafficability on the excavated areas, the haul roads, or the embankment; reduced efficiency of the equipment the contractor elects to use; or on account of any other operations or difficulties caused by overly wet materials. No additional allowance above the unit prices bid in the schedule will be made because of variation in the portion between wet and dry materials which are required to be excavated in order to obtain adequate suitable material.

c. Measurement and payment.—Except as specified herein, measurement, for payment, of excavation † for canal will be made to the lines shown on the drawings or as prescribed by the contracting officer. †

Where the contracting officer directs additional excavation to remove unsuitable foundation material, measurement, for payment, of excavation for canal will be made to the outlines of the areas prescribed and between the bottom of the excavation required for the selected bedding material and the depth directed. The cost of refilling such additional excavation shall be included in the unit price per cubic yard bid in the schedule for excavation for canal. Payment for compacting the refill will be made at the unit price per cubic yard bid in the schedule for compacting embankments.

Measurement, for payment, of excavation for canal will not include materials paid for as excavation for structures in accordance with Paragraph 4.2.6.

Payment for excavation for canal will be made at the unit price per cubic yard bid therefor in the schedule. The unit price bid in the schedule for excavation for canal shall include the costs of blasting or ripping, of procuring and applying water to embankment foundations and areas to be excavated, placing the material in embankment or selected bedding material stockpiles at locations directed, of refilling the additional excavation between the bottom of the excavation required for the selected bedding material and the depth directed, or otherwise disposing of the excavated materials, of pumping or unwatering, and all work necessary to maintain the excavations in good order during construction, except that required overhaul will be paid for as provided in Paragraph 4.2.8.

No direct payment will be made to the contractor for excavation required below the underside of the concrete lining for placing selected bedding material and the cost thereof shall be included in the unit price bid in the schedule for preparing foundations for concrete lining.

4.2.4. EXCAVATION FOR CUTOFF TRENCHES FOR COLLECTIVE DIKE

a. General.—The contractor shall excavate cutoff trenches for the collective dike across washes which contain clean sands and gravels after the dike foundation has been prepared as prescribed in Paragraph 4.4.2. The depth and length of the cutoff trenches shall be as prescribed by the contracting officer. All material suitable for embankment construction, as determined by the contracting officer, shall be used in construction of the collective dike. Any materials unsuitable for dike construction shall be disposed of as prescribed in Paragraph 4.2.9.

b. Measurement and payment.—Measurement, for payment, of excavation for cutoff trench for collective dike will be made to the dimensions shown on the drawing and/or prescribed by the contracting officer, and of the total length excavated.

Payment for excavation for cutoff trenches for collective dike will be made at the unit price per cubic yard bid in the schedule for excavation for canal, which unit price shall include the costs of blasting or ripping, placing the material in collective dike embankment at locations directed or otherwise disposing of the excavated materials, of pumping or unwatering, and all work necessary to maintain the excavations in good order during construction, except that required overhaul will be paid for as provided in Paragraph 4.2.8.

4.2.5. EXCAVATION FOR DRAIN DITCHES

a. General.—The contractor shall excavate drain ditches along the canal as shown on the drawings or as directed.

Blasting in such a manner as to cause overbreakage which, in the opinion of the contracting officer is excessive, will not be permitted. Insofar as practicable, the finishing operations required on drain ditch sections shall be performed by the contractor simultaneously with the drain ditch excavation.

The alinement, grades, and sections of channels leading to drain ditches shall be as directed by the contracting officer.

b. Measurement and payment.—Measurement, for

payment, of excavation for drain ditches will be made to the lines prescribed by the contracting officer.

Payment for excavation for drain ditches will be made at the unit price per cubic yard bid in the schedule for excavation for canal, which unit price shall include the cost of blasting or ripping; placing the material in drain, canal, or dike embankments; or otherwise disposing of the excavated materials.

4.2.6. EXCAVATION FOR STRUCTURES

a. Measurement for payment.—Excavation for structures will be measured for payment to excavation pay lines shown on the drawings, or if not shown on the drawings to pay lines in accordance with the provisions of this paragraph. Regardless of quantities directed to be removed, to comply with safety requirements, measurement for payment will be made to the prescribed pay lines. No payment will be made for excavation or removal of material which is outside the prescribed pay lines.

Except for the pipe portions of structures as provided in (5) and as otherwise provided in (6), measurement of excavation will be in accordance with the following:

(1) The check which forms a continuation of the canal.—Measurement of excavation for structures will include all required excavation for the structure below the original ground surface and between vertical planes at the upstream and downstream ends of the structure or combination of adjoining structures. Such measurement will also include any excavation for the structure upstream and downstream of these vertical planes which may be required below the original ground surface and outside of the pay lines for canal excavation. Measurement of excavation upstream and downstream of the vertical planes and measurement between the vertical planes will be made to dimensions 1 foot outside of the foundations of the structures and to slopes of 1:1.

(2) Piers, overchutes which cross the canal, drain inlet, road culvert, floatwells, and other structures lying largely outside the canal prism.—Regardless of whether the excavation for and construction of the structure precedes or follows the excavation of the canal, at the site of the structure, measurement of excavation for structures will include only the required excavation outside the pay lines for the canal excavation and below the original ground surface, measured to the dimensions and slopes specified below. Measurement of excavation for structures will be made to dimensions 1 foot outside the outline of the structure foundations and to slopes of 1:1.

(3) Bridge and cattle crossing abutments.—Regardless of whether the excavation for and construction of the structure precedes or follows the excavation of the canal at the site of the structure, measurement of excavation for structures will include all excavation below the original ground surface measured to the dimensions and slopes specified below. Measurement of excavation for structures will be made to dimensions 1 foot outside the outline of the structure foundations and to slopes of 1:1.

(4) Pipe culverts, crossing under the canal prism.—Regardless of whether the excavation for and construction of the structure precedes or follows the excavation of the canal, at the site of the structure, measurement of excavation for structures will include all excavation below the original ground surface between vertical planes at the inlet and outlet ends of the structure, to lateral dimensions 1 foot outside of the foundations of the structures, and to slopes of 1:1. Such measurement will also include any excavation for the structure upstream or downstream of these vertical planes which may be required below the original ground surface to dimensions 1 foot outside structure foundations and to slopes of 1:1.

(5) Precast concrete pipe or asbestos-cement pipe portions of the structures listed in (2) and (4) above.—Excavation of the trench for a single pipe or parallel pipes will be measured to a bottom width equal to the overall distance between the outsides of the pipe along the horizontal diameters plus 1 foot and to slopes of 1:1. Where backfill above the bottom of precast concrete or asbestos-cement pipe is to be compacted by tamping, rolling, or surface vibrating methods, the bottom of the trench shall be shaped as shown on the drawings to cradle the pipe on undisturbed earth or compacted backfill. Regardless of whether the bottom of the trench is shaped to form a cradle or excavated to the bottom of the pipe, measurement, for payment, of excavation will be made to the bottom of the pipe. Where unsuitable material or rock is encountered in the bottom of the trench for pipe

portions of structures, the bottom of the trench shall be excavated, and measurement for payment will be made to a depth as prescribed to provide for placing selected bedding material under the pipe.

(6) Transitions and cutoff walls.—Where the character of the material is such that it can be cut and trimmed to the required lines of the concrete structure and the concrete placed against the sides of the excavation without the use of intervening forms, measurement will be made only for excavation within the neatlines of the structure.

(7) Fencepost footings.—Excavation for fencepost footings will be as provided in Paragraphs 2.4.1 and 2.4.2.

b. Foundations for structures.—Excavation for the foundation of structures shall be to the elevations shown on the drawings or established by the contracting officer. The contractor shall prepare the foundations at structure sites by methods which will provide firm foundations for the structures. The bottom and side slopes of excavation, upon or against which the structure is to be placed, shall be finished to the prescribed dimensions, and the surfaces so prepared shall be moistened and tamped with suitable tools to form firm foundations upon or against which to place the structure.

Where unsuitable material is encountered in the foundation for a structure, the contracting officer will direct additional excavation to remove refilled with compacted backfill to provide a firm foundation for the structure. Measurement and payment for excavation, backfill, and compacting backfill will be made to depths and dimensions prescribed by the contracting officer.

If at any point in excavation the foundation material is excavated beyond the lines required to receive the structure, the overexcavation shall be filled with suitable materials and compacted in accordance with Paragraph 4.1.3. If at any point in excavation, the natural foundation material is disturbed or loosened during the excavation process or otherwise, it shall be compacted in place or, where directed, it shall be removed and replaced with suitable material and compacted in accordance with Paragraph 4.1.3. Any and all excess excavation or overexcavation performed by the contractor for any purpose or reason except for additional excavation as may be prescribed by the contracting officer, and whether or not due to the fault of the contractor, shall be at the expense of the contractor. Fill and compacting of fill for such excess excavation or overexcavation shall be at the expense of the contractor.

c. Payment.—Insofar as practicable, the material moved in excavation for structures shall be used for backfill and embankments, otherwise it shall be wasted as directed. Payment for excavation for structures will be made at the unit price per cubic yard bid therefor in the schedule. The unit price bid in the schedule for excavation for structures shall include the cost of all labor and materials for cofferdams and other temporary construction, of all pumping and unwatering, of all other work necessary to maintain the excavations in good order during construction, of removing such temporary construction, where required, and shall include the cost of disposal of the excavated material, except that required overhaul will be paid for as provided in Paragraph 4.2.8.

The cost of excavating for fencepost footings shall be included in the unit price per linear foot bid in the schedule for furnishing and erecting chain link fence and for furnishing and erecting barbed-wire fence.

4.2.7. EXCAVATION FROM BORROW

a. General.—Where the canal excavation at any section does not furnish sufficient suitable material for embankments, additional material shall be obtained from the area between approximate Canal Stations 270 and 350 and between the uphill toe of the collective dike and the canal right-of-way. All side slopes shall be 4:1 to the bottom of the borrow pit, unless otherwise shown on the drawings or directed. The surface of borrow pits shall be scarified and left in a condition which will facilitate natural revegetation as approved by the contracting officer. Where necessary, as determined by the contracting officer, to prevent the accumulation of standing water, borrow pits shall be drained by means of open ditches.

b. Moisture.—All borrow pits shall be wet by sprinkler irrigation before any excavation work is begun. For the purpose of this subparagraph, the term "borrow pits" includes all of the borrow areas uphill from the collective dike. Wherever possible, all water to be added to the borrow pits shall be added in one application. The moisture content of the earthfill materials prior to and during compaction shall be in accordance with Paragraph 4.1.3. As far as practicable, the material shall be

conditioned in borrow pits before excavation. If required, such as in deep cuts or areas of tightly cemented materials, additional moisture shall be added to the borrow pits.

When moisture is introduced into borrow pits, care shall be taken to moisten the material uniformly to produce the required moisture content during compaction, avoiding both excessive runoff and accumulation of water in depressions. The contractor is cautioned to control carefully the application of water and check on the depth and amount of water penetration during application so as to avoid overirrigation.

If at any location in the borrow pits for earthfill material, before or during excavation operations there is excessive moisture, as determined by the contracting officer, steps shall be taken to reduce the moisture by selective excavation to secure the drier materials; by excavating and placing in temporary stockpiles material containing excessive moisture; by excavating drainage ditches; by allowing adequate additional time for drying; or by any other approved means.

The contractor will be required to excavate sufficient suitable material from the borrow areas to complete the work under these specifications, regardless of whether overly wet conditions encountered are due to ground water, precipitation, difficulty of draining, or for any other reason. To minimize operations with overly wet material, the contractor will be permitted to utilize portions of the borrow areas which contain dry material and which have been designated as suitable bottow pits to the greatest extent practicable consistent with obtaining suitable material.

The contractor shall be entitled to no additional allowance above the unit prices bid in the schedule on account of the requirements for excavating drainage ditches; for allowing additional time for drying; for stockpiling and rehandling excavated materials which have been deposited temporarily in stockpiles; delays or increased costs due to stockpiling; poor trafficability on the borrow area, the haul roads, or the embankment; reduced efficiency of the equipment the contractor elects to use; or on account of any other operations or difficulties caused by overly wet materials. No additional allowance above the unit prices bid in the schedule will be made because of variation in the portion between wet and dry materials which are required to be excavated in order to obtain adequate suitable material.

c. Measurement and payment.—Measurement, for payment, of material taken from borrow pits will be made in excavation, except that, where determined to be necessary by the contracting officer, the quantity of excavated material may be computed by application of a factor to the quantity of borrowed material as measured in embankment. Measurement, for payment, of excavation from borrow will be made of only such quantities as are required for embankments, or such as by direction of the contracting officer are excavated and wasted or laid aside. Unless the contractor is given written orders to excavate other than common excavation material from the borrow pits, no material obtained from this source will be classified for payment as rock excavation or excavation other than common regardless of its actual character. Payment for excavation of material from borrow required for embankments will be made at the unit price per cubic yard bid in the schedule for excavation from borrow, which unit price shall include the costs of all materials and work described in this paragraph, including water applied in the borrow pits, except that required overhaul will be paid for in accordance with Paragraph 4.2.8.

4.2.8. OVERHAUL

a. General.—A mile cubic yard of overhaul is defined as a cubic yard of excavated material hauled 1 mile in excess of the free-haul limit. The free-haul limit will be 1,000 feet. Payment for overhaul will be made only for excavated materials required for canal embankments; dikes; temporary and permanent embankments for roadways, railroad crossings, and road crossings; and for excavated materials directed to be wasted beyond the limit of free haul. The entire cost of hauling the above-described materials any distance up to the free-haul limit from the original position shall be included in the price bid in the schedule for excavation of the material.

Unless otherwise specifically provided, no overhaul payment will be made for haul of materials paid for as backfill about structures, riprap, gravel bedding for riprap, coarse gravel protection, or for selected bedding material used in preparing foundations for concrete canal lining.

b. Measurement and payment.—Measurement and payment for overhaul will be made as specified herein regardless of the methods and the types of equipment used in excavating and hauling.

Where material is taken from canal excavation and deposited in canal embankments, the length of haul will be measured along the centerline of the canal from the center of gravity of the material as found in excavation to the center of gravity of the material as deposited. Regardless of haul routes actually traveled, the above lengths of haul will be the distance measured along the centerline between the center of gravity of the excavation as projected on the centerline.

Where material is taken from borrow pits which are located at a distance greater than 150 feet from the centerline of the canal, the length of haul will be measured along the shortest practicable route, as determined by the contracting officer, between the center of gravity of the material as found in excavation and the center of gravity of the materials as deposited in each 100-foot station.

Where material is excavated from the canal and is deposited in embankment other than the embankment of the canal from which excavated, the length of haul will be measured along the shortest practicable route, as determined by the contracting officer, from the center of gravity of the material as found in excavation to the center of gravity of the material as deposited.

In measuring quantities of overhaul for payment, the volume of overhauled material will be measured in excavation, the length of haul will be measured in station units of 100 feet. Payment for overhaul will be made at the unit price per mile cubic yard bid therefor in the schedule.

4.2.9 DISPOSAL OF EXCAVATED MATERIALS

All suitable materials removed in excavation or as much thereof as may be needed, shall be used in the construction of canal embankments, roadway embankments, collective dike embankments, selected bedding material, or for the backfill about structures. If there is an excess of material in the excavation, it shall be used to strengthen the embankment on either side of the canal, to strengthen the collective dike embankment, deposited in low areas uphill of the canal to eliminate trapped drainage, or otherwise wasted as directed by the contracting officer.

Material removed in excavation and not suitable for embankment construction, for backfill or for the other earthwork required under these specifications, and any suitable material not required for embankments or for embankment enlargement, for backfill about structures, or for other earthwork required under these specifications, shall be deposited in waste banks on right-of-way owned by the Government at points directed by the contracting officer, and any overhaul necessary therefor will be paid for in accordance with Paragraph 4.2.8.

Unless otherwise directed, no material shall be wasted in drainage channels or within 20 feet of the edge of the prescribed or actual canal cut. Waste banks shall be left with surfaces as approved by the contracting officer.

Except as specifically provided in these specifications for payment for hauling or placing of individual items of excavated materials, the cost of all work described in this paragraph shall be included in the unit prices bid in the schedule for excavation.

SECTION 4.3—BACKFILL

4.3.1. BACKFILL ABOUT STRUCTURES

a. General.—Backfill about structures shall be placed to the lines shown on the drawings, as prescribed in this paragraph, or as directed. The type of material used for backfill, the amount thereof, and the manner of depositing the material shall be subject to approval.

Backfill shall be placed to about the same elevation on both sides of the pipe portions of structures to prevent unequal loading and displacement of pipe. The difference in elevation of the backfill on both sides of the pipe portion of structures shall not exceed 6 inches at any time. The contractor shall be responsible for providing adequate earth cover over the pipe to prevent damage to the pipe due to construction equipment loads.

Backfill material shall be obtained from material moved in excavating for structures, but when sufficient suitable material is not available from this source or from adjacent canal excavation, additional material shall be obtained from approved borrow pits. Except as otherwise provided in Paragraph 4.3.2, special compaction of the backfill will not be required.

b. Structures on fill.—Where the original ground surface is below the base of a structure or below the bottom of a pipe, except pipe culverts crossing under the canal, all fill required for the structure foundation and all fill up to the bottom of a pipeline shall be placed as embankment. Except as provided in Subparagraph 4.3.2.b.(5) for sloping

concrete walls or slabs, all fill about the structure above the base of the structure to lateral dimensions 1 foot outside the base of the structure and within slopes of 1:1 to the finished surfaces of adjacent earthwork and fill about a pipe, except pipe culverts crossing under the canal, above the bottom of the pipe to a bottom width 1 foot wider than the outside diameter of the pipe and within slopes of 1:1 to the finished surfaces of adjacent earthwork shall be placed as backfill. All fill about the structures and pipes, except pipe culverts crossing under the canal, above the original ground surface and outside the above-described backfill shall be placed as embankment.

c. Pipe culverts crossing under canal.—Backfill shall be placed about and over the pipe portions of the structure to the original ground surface or to an elevation 2 feet above the top of the pipe, whichever is the higher. Above the original ground surface backfill shall be placed to a transverse top width equal to the outside width of the pipe or pipe encasement and to slopes of 1:1 to the original ground surface. The remaining fill above the original ground surface shall be placed as embankment.

d. Gravel backfill.—Gravel backfill at bridge approaches and at weep holes shall be furnished by the contractor, and will be included in the quantities measured for payment as backfill about structures. The gravel backfill at the bridge approaches shall be selected free-draining gravelly material containing no stones larger than 1 and 1/2 inches, and may be selected from required excavation or borrow pits. Gravel pockets at weep holes shall be composed of a mixture of sand and gravel of the same grading required for the aggregates used in concrete. The proportion of sand and gravel shall be as directed.

e. Buried electrical conduit.—All buried electrical conduit shall have 2 inches of sand or fine earth around each conduit. All trenches for electrical conduits shall be backfilled to the finished lines of adjacent earthwork.

f. Backfill about fencepost footings shall be as provided in Paragraphs 2.4.1 and 2.4.2.

g. Measurement and payment.—Excavation refill required to be placed about structures that is within the pay-line limits for excavation for the structures will be measured in place for payment as backfill about structures. Except for structures described in Subparagraphs b. and c. above, fill about the structures above the original ground surface and within the slopes of excavation pay lines for such structures as extended to intersect the finished surfaces of adjacent earthwork will be measured for payment as backfill about structures: Provided, That above the original ground surface the excavation pay lines will be extended to intersect the finished surfaces at slopes of 1:1. Where the original ground surface is below the base of a structure or below the bottom of a pipe, measurement, for payment, of backfill will be made above the structure base or the bottom of the pipe and within the lines prescribed in Subparagraph b. for backfill.

Measurement, for payment, of backfill about structures will be made only for the quantities actually placed within the limits of the established pay lines.

Payment for backfill about structures will be made at the unit price per cubic yard bid therefor in the schedule, which unit price shall include the cost of all work connected therewith, including the excavation and haul of the necessary material: Provided, That material from required excavation used for backfill about structures will be paid for both as excavation when removed from original position and as backfill when placed. Where additional material is obtained from approved borrow pits and used for backfill about structures, payment will be made for the backfill only, and the costs of excavating and hauling of such material shall be included in the unit price bid in the schedule for backfill about structures: Provided, That if backfill material is not available within 1,000 feet from any point on the structure, additional haul will be ordered in accordance with Paragraph 7.

Refill of excavation performed outside of the established pay lines for excavation for structures shall be placed in the same manner as specified for the adjacent backfill, and such refill shall be placed at the expense of the contractor.

~~The cost of placing backfill in trenches for buried electrical conduit shall be included in the lump-sum price bid in the schedule for furnishing and installing materials for electrical system.~~

The cost of placing backfill about fencepost footings shall be included in the applicable unit price per linear foot bid in the schedule for furnishing and erecting chain link fence and for

furnishing and erecting barbed-wire fence.

4.3.2. COMPACTING BACKFILL ABOUT STRUCTURES

a. General.—Unless otherwise shown on the drawings, backfill about structures shall be compacted as prescribed in this paragraph or as directed.

To provide adequate protection for compacted backfill about a structure, the Government reserves the right to direct the contractor to place a sufficient amount of backfill or embankment material over the compacted backfill within 72 hours after compacting of the backfill has been completed.

The 1:1 slopes specified below shall extend from the top of the concrete walls to their intersection with the surfaces of the excavation or embankment as the case may be.

b. Location of compacted backfill.—

(1) Backfill about the following structures or portions of structures, shall be compacted to slopes of 1:1 from the top of the concrete walls: Provided, That where the structure is located in compacted embankment, the backfill shall be compacted to the elevation prescribed for the adjacent compacted embankment:

(a) Open transitions at the ends of all structures.

(b) Headwalls at ends of culverts.

(c) Stilling basins.

(d) Check

(e) Vertical pipe for float wells.

(2) Backfill about and over the pipe portions of the structures listed below shall be compacted as follows:

(a) Pipe culverts crossing under the canal.—The backfill about and over the pipe portion of the structure shall be compacted to the original ground surface or to an elevation 2 feet above the top of the pipe, whichever is the higher. Below original ground surface the full width of trench shall be compacted and above original ground surface backfill shall be compacted to a transverse top width equal to the outside width of the pipe and to slopes of 1:1. Where concrete collars are used, the backfill shall be compacted to at least 1 foot above the top of the collars, to a longitudinal distance of 1 foot each side of the collar, and to longitudinal slopes of 1:1.

(b) Pipe portions of pipe overchutes.—The backfill about and over the pipe portions of the structure shall be compacted to the original ground surface or to an elevation 1 foot above the top of the pipe, whichever is the higher. Below original ground surface, the full width of trench shall be compacted and above original ground surface, backfill shall be compacted to a transverse top width equal to the outside width of the pipe and to slopes of 1:1.

(3) At the approach to a bridge structure and the cattle crossing, all fill or refill about the structure, that is within the slopes and limits of the established pay lines for backfill for the structure, shall be placed as compacted backfill; and fill placed outside of such pay-line limits in construction of the approach shall be placed as embankment or compacted embankment.

(4) Where additional excavation for a structure is shown on the drawings or directed to provide for a cushion or bedding of compacted material under the structure, the refill within the pay lines for such additional excavation shall be placed as compacted backfill.

(5) Where sloping concrete walls or slabs extend above the natural ground surface and it is practicable, as determined by the contracting officer, to construct the walls or slabs directly on earth foundations without the use of intervening forms, compacted embankments shall be constructed to lines and grades as directed to form suitable foundations for the sloping walls or slabs. The compacting of such earth foundations shall be in accordance with Paragraph 4.4.5 and payment therefor will be made at the unit price bid in the schedule for compacting embankments.

(7) All backfill placed about fencepost footings shall be compacted.

c. Material and compacting.—The material used for backfill to be compacted shall be selected material, containing no stones larger than 3 inches in diameter, approved by the contracting officer, and obtained from required excavation or approved borrow pits. To prevent unequal loading and displacement of a pipe, the backfill shall be placed and compacted in layers having essentially the same top elevation on each side of the barrel. All materials in backfill to be compacted shall be placed, moistened, and compacted as provided in Paragraph 4.1.3.

d. Measurement and payment.—Measurement for payment for compacting backfill about structures will be made in place to the lines shown on the drawings, as prescribed in this paragraph, or as directed by the contracting officer and will be made only for the quantities actually compacted within the limits of the established pay lines for backfill about structures, and the compacting of refill outside of excavation pay lines shall be performed at the expense of the contractor.

Payment for compacting backfill about structures will be made at the unit price per cubic yard bid therefor in the schedule and will be in addition to the payment made for backfill about structures. The unit price bid in the schedule for compacting backfill about structures shall include the costs of furnishing water and moistening the materials.

The cost of compacting backfill about fencepost footings shall be included in the applicable unit price per linear foot bid in the schedule for furnishing and erecting chain link fence and for furnishing and erecting barbed-wire fence.

4.3.3. REFILL AT TOP OF CONCRETE LINING

The contractor will be permitted to overexcavate at the top of the canal lining as shown on Drawing No. 2 (344-330-1325), if needed, to accommodate lining equipment. Refill shall be placed on the berms at the top of the lining as shown on the above drawing as soon after placing of the lining as is feasible. The material used for the refill may be obtained from required excavation or from borrow. The type of material used and the manner of depositing shall be subject to approval. The refill material shall be placed, moistened, and compacted in accordance with Paragraph 4.1.3. The refill shall be finished uniformly and neatly to the lines shown on the drawings.

The costs of all work described herein shall be included in the prices bid in the schedule for other items of work.

SECTION 4.4–EMBANKMENT

4.4.1. EMBANKMENT ADJACENT TO CONTRACT BOUNDARIES

Definite stations for the boundaries of the schedule are shown on the drawings, and these definite stations are the contract limits of the work covered by these specifications. The contractor shall construct the canal embankments beyond the contract limits as determined by the contracting officer in order to provide a firm foundation for the concrete canal lining. Payment for constructing the necessary embankments outside the contract limits will be made at the unit prices per cubic yard bid for the adjacent earthwork within the contract limits.

4.4.2. PREPARATION OF SURFACES UNDER EMBANKMENTS

The areas under the collective dike embankments and under the canal embankments between Stations 10+00 and 370+00 shall be wet by sprinkler irrigation before excavation operations or embankment construction begins. The moisture content shall be optimum, plus or minus 1 percent, to a depth of 5 feet below the original ground surface or to impervious cemented material, whichever is less, as determined by the contracting officer. Application of moisture shall be simultaneous with the application of moisture to the adjacent canal excavation. Whenever possible, all water shall be added uniformly in one application. Areas uphill of the collective dike upon which the contracting officer may direct waste banks to be constructed will not require application of moisture.

The contractor is cautioned to control carefully the application of water and to check on the depth and amount of water penetration during application so as to avoid overirrigation, accumulation of water in depressions, or excessive runoff.

If at any location on embankment foundations before or during embankment construction, there is excessive moisture, as determined by the contracting officer, steps shall be taken to reduce the moisture by excavating drainage ditches, by allowing adequate drying time, or by any other approved means.

The contractor shall be entitled to no additional allowance above the unit prices bid in the schedule on account of the requirement for excavating drainage ditches; for allowing additional time for drying; delays or increased costs due to poor trafficability on the embankment foundations or on the haul roads; reduced efficiency of the equipment the contractor elects to use; or on account of any other operations or difficulties caused by overly wet embankment foundations or haul roads.

Where the ground surface under any embankment is not suitable, as determined by the contracting officer, for a foundation for the embankment, the contractor shall strip the area under the embankment of such unsuitable material to such depth as may be directed. The material so removed shall be disposed of as provided in Paragraph 4.2.9. Measurement, for payment, of stripping unsuitable material under embankments will be made only to the lines and to such depths as may be directed, and payment therefor will be made at the applicable unit prices per cubic yard bid in the schedule for excavation for canal.

As soon as feasible, after the foundations have been wet to the required moisture content and before any embankment materials are placed, the entire surface of the foundations for all collective dike and canal embankments to be compacted shall be scarified or plowed thoroughly to a depth of 6 inches.

The ground surface under canal or collective dike embankments not to be compacted and under other embankments where directed, shall be scarified with a plow making open furrows not less than 8 inches deep below the natural ground surface or the stripped ground surface, as applicable, at intervals of not more than 3 feet.

Immediately after preparation of the collective dike foundation, the contractor shall excavate cutoff trenches in accordance with Paragraph 4.2.4. Following this operation, as soon as feasible and as approved by the contracting officer, the contractor shall place and compact embankment in the cutoff trenches and place 3 feet of embankment over the entire collective dike foundation and compact where required. This procedure will seal the foundation against loss of moisture and provide some consolidation of the foundation.

The costs of procuring and applying water to and of scarifying the foundation surfaces under the collective dike and canal embankments and under other embankments shall be included in the applicable unit prices per cubic yard bid in the schedule for compacting embankments.

Payment for excavation for cutoff trenches will be made at the applicable unit prices per cubic yard bid in the schedule for excavation for canal.

Payment for compacting embankment in the cutoff trenches will be made at the applicable unit prices per cubic yard bid in the schedule for compacting embankments.

4.4.3. CONSTRUCTION OF EMBANKMENTS

a. General.—Canal and collective dike embankments shall be constructed to top widths and side slopes as shown on the drawings and, where directed to provide an allowance for settlement, the embankment shall be built to heights as directed above those shown on the drawings. The tops of all canal embankments shall be graded to be suitable for a roadway, in accordance with Subparagraph b. below, and the tops of other embankments shall be graded as directed. All exposed embankment side slopes shall be left rough as directed. All materials shall be deposited in embankments so that cobbles, gravel, and boulders will be well distributed through the other materials and not nested in any position within or under the embankment, except that stones and indurated materials larger than 5 inches shall be removed from materials to be used for compacted embankments as specified in Paragraph 4.4.5.

Where the original ground surface is below the bottom of the canal and where construction of a fill below the bottom of the canal is prescribed, such fill shall be placed as embankment. Where the original ground surface is below the base of a structure, the fill required to form a suitable foundation for the structure shall be placed as embankment.

b. Roads and ramps.—In conjunction with construction of canal embankments the contractor shall construct operation and maintenance roads and earth ramps adjacent to the canal and structures where shown on the drawings and where directed. Suitable material from required excavation shall be placed as embankments for the roads and ramps. If sufficient material is not available from required excavation the contracting officer may direct excavation from borrow. Where the width of a road is not shown on the drawings, it shall have a width

of not less than 14 feet. The work required for construction of operation and maintenance roads and for earth ramps shall include grading to a uniform surface equal to that obtainable with a motor grader to provide for safe travel with a two-wheel-drive automobile in high gear at moderate speed. Special rolling or compaction will normally not be required: Provided, That if compaction is directed, the compacted embankments and payment therefor shall be in accordance with Paragraph 4.4.5.

c. Embankments not to be compacted.—Material for these embankments shall have a moisture content of not greater than 2 percent wet nor less than 5 percent dry of optimum before equipment is routed over the embankments. Embankments shall be built in approximately horizontal layers carried across the entire width of the embankments to the required slopes. Embankments shall not be widened with loose material dumped from the top. Embankments may be built by excavating and hauling equipment, or by excavating machinery depositing the materials directly from the excavation. Embankments built by excavating and hauling equipment shall be made in horizontal layers and shall be kept as close to level as practicable. The travel over the embankments during construction shall be routed so as to distribute the compacting effect of the equipment to the best practicable advantage.

Embankments built by excavating machinery depositing the material directly from the excavation shall be made in horizontal layers having a thickness of approximately the depth of the material as deposited by the excavating machine. Finer portions of the material excavated shall be placed in that part of the embankment nearest the water, and the coarser materials shall be placed in outer part of the embankment.

d. Embankments to be compacted.—The requirements for compacted embankments will be as specified in Paragraph 4.4.5. All materials in compacted embankments shall be placed, moistened, and compacted as provided in Paragraph 4.1.3.

e. Costs.—Except as otherwise provided for compacting of embankments, and for overhaul, the costs of all work described in this paragraph shall be included in the applicable unit prices bid in the schedule for excavation for canal or excavation from borrow.

4.4.4. CONSTRUCTION OF ROCKFILL EMBANKMENTS

a. General.—Most of the canal excavation in the reach between Stations 370+00 and 575+80.80 is expected to be through rock, hard compact material, coarse gravel, cobbles, and boulders. Suitable materials excavated in this reach shall be used to construct rockfill embankments where directed. Rockfill embankments shall be constructed to top widths and side slopes as shown on the drawings; and where directed to provide an allowance for settlement, the embankment shall be built to heights as directed above those shown on the drawings. All materials shall be deposited in embankments so that cobbles, gravel, and boulders will be well distributed through the other materials and not nested in any position within or under the embankment.

Where the original ground surface is below the bottom of the canal and where construction of a fill below the bottom of the canal is prescribed, such fill shall be placed as compacted rockfill embankment. Where the original ground surface is below the base of a structure, the fill required to form a suitable foundation for the structure shall be placed as compacted rockfill embankment.

b. Rockfill embankments not to be compacted.—Embankments shall be built in approximately horizontal layers carried across the entire width of the embankments to the required slopes. Embankments shall not be widened with loose material dumped from the top. Embankments may be built by excavating and hauling equipment, or by excavating machinery depositing the materials directly from the excavation. Embankments built by excavating and hauling equipment shall be made in horizontal layers and shall be kept as close to level as practicable. The travel over the embankments during construction shall be routed so as to distribute the compacting effect of the equipment to the best practicable advantage.

Embankments built by excavating machinery depositing the material directly from the excavation shall be made in horizontal layers having a thickness of approximately the depth of the material as deposited by the excavating machine.

c. Rockfill embankments to be compacted.—The requirements for compacted rockfill embankments will be as specified in Paragraph ~~4.4.4.~~ 4.4.6 (SN 2)

d. Costs.—Except as otherwise provided for compacting rockfill embankments, and for overhaul, the costs of all work described in this paragraph shall be included in the applicable unit prices bid in the schedule for excavation for canal.

4.4.5. COMPACTING EMBANKMENTS

a. General.—The materials used for the compacted embankments shall be suitable materials, as determined by the contracting officer, and shall be obtained from required excavation or from designated borrow pits. Before the material for the first layer of the embankment is placed, the foundation for the embankment shall be prepared as provided in Paragraph 4.4.2 and shall be moistened and compacted in the manner hereinafter specified for each layer of compacted embankment to be placed thereon. The embankments shall be compacted to the elevation and to the top widths and side slopes shown on the drawings or prescribed by the contracting officer: Provided, That where not to be covered with concrete, the density of a 2-foot thickness, horizontal measurement, of compacted embankment parallel and adjacent to the inside slope line may be less than 95 percent of laboratory standard where it is impractical to obtain the 95 percent density with standard rolling equipment. All materials in embankments to be compacted shall be placed, moistened, and compacted as provided in Paragraph 4.1.3.

The contractor's operations in the excavation of materials for the compacted embankment shall be such as will result in an acceptable gradation of materials to provide for impermeability and stability when compacted. The maximum dimensions of stones and indurated materials placed in the compacted embankment shall not exceed 5 inches. Stones or indurated materials larger than 5 inches shall be removed prior to compacting operations.

Where the original ground surface is below the bottom of the canal and where compacted fill below the bottom of the canal is prescribed, such fill shall be placed as compacted embankment. Where the original ground surface is below the base of a structure, or where sloping concrete walls or slabs extend above the original ground surface and it is practicable as determined by the contracting officer to construct the walls or slabs directly on earth foundation without the use of intervening forms, compacted embankments shall be constructed to lines and grades as directed to form suitable foundations for the structure or for the sloping walls or slabs.

b. Measurement and payment.—Measurement, for payment, of compacting embankments will be made of the embankments in place, including a 6-inch layer of the foundation for the embankment scarified or plowed as provided in Paragraph 4.4.2 and will include only such portions of the embankments and foundation as have been actually compacted at the direction of the contracting officer and as provided in this paragraph. Payment for compacting embankments will be made at the unit price per cubic yard bid therefor in the schedule, which unit price will be in addition to the unit price bid in the schedule for excavating the material placed in compacted embankments, and shall include the cost of placing the materials in layers, removing materials larger than 5 inches, furnishing water, moistening, and compacting as provided in this paragraph.

4.4.6. COMPACTING ROCKFILL EMBANKMENTS

a. General.—The materials used for compacted rockfill embankments shall be reasonably well graded cohesionless materials containing less than 15 percent fines, as determined by the contracting officer, and shall be obtained from required excavation. Before the material for the first layer of the embankment is placed, the foundation for the embankment shall be prepared as provided in Paragraph 4.4.2 and shall be moistened and compacted in the manner hereinafter specified for each layer of compacted embankment to be placed thereon. The embankments shall be compacted to the elevation and to the top widths and side slopes shown on the drawings or prescribed by the contracting officer.

The contractor's operations in the excavation of materials for the compacted embankment shall be such as will result in an acceptable gradation of materials to provide the highest practicable unit weight and best stability. The materials shall be deposited and/or spread in horizontal layers across the total width of the rockfill embankment and the thickness of the layers before compaction shall not exceed 18 inches. The travel of equipment over the embankments during construction shall be routed so as to distribute the compacting effect of the equipment to the best practicable advantage. Where the embankment material does not contain enough moisture to insure satisfactory compaction, as determined by the contracting officer, the addition of water will be required. When the material has been properly placed and moistened, each layer

shall be compacted with four passes of a crawler-type tractor tread.

b. Measurement and payment.—Measurement, for payment, of compacting rockfill embankments will be made of the embankments in place, including a 6-inch layer of the foundation for the embankment scarified or plowed as provided in Paragrpah 4.4.2 and will include only such portions of the embankments and foundation as have been actually compacted at the direction of the contracting officer and as provided in this paragraph. Payment for compacting rockfill embankments will be made at the unit price per cubic yard bid therefor in the schedule, which unit price will be in addition to the unit price bid in the schedule for excavating the material placed in compacted rockfill embankments, and shall include the cost of placing the materials in layers, furnishing water, moistening, and compacting as provided in this paragraph.

SECTION 4.5—SLOPE PROTECTION

4.5.1. RIPRAP AND COARSE GRAVEL PROTECTION

a. General.—The contractor shall furnish and place riprap and coarse gravel protection to the prescribed outlines and thicknesses as shown on the drawings for the protection of channels and structures, and elsewhere as required.

b. Material.—The rock shall be hard, dense, and durable. Either quarried rock or boulders may be used for riprap. The rock in riprap and the gravel protection shall be reasonably well graded from the maximum size down to the minimum size as shown in the table.

Any royalties or other charges required to be paid for materials taken from deposits not owned by the Government and controlled by the Bureau of Reclamation shall be paid by the contractor. The approval of deposits by the contracting officer shall not be construed as constituting approval of all or any specific materials taken from the deposits and the contractor will be held responsible for the suitability of all materials used in the work.

The sizes of rock to be used in the different thicknesses of riprap and the range of grading for coarse gravel protection are as follows:

	Riprap protection		Coarse gravel protection
*Nominal thickness	24 inches	12 inches	Thickness shall be as prescribed on the drawings
Maximum size rock	1/4 yd^3	1 ft^3	1/8 ft^3
Minimum size rock	1/10 ft^3	1 and 1/2 inches	3/16 inch

*Thickness of riprap not including bedding.

c. Placing.—The rock in riprap and coarse gravel need not be hand placed, but shall be dumped and smoothed by moving rocks into position in such a manner as to insure that the material when in place is stable and without tendency to slide, and so that there will be no unreasonably large unfilled spaces within the riprap. The inclusion of rock spalls or gravel in an amount to fill the voids in riprap, but not in excess of that amount, as determined by the contracting officer, will be required. The inclusion of earth, sand, or rock dust in excess of 5 percent, by volume, in riprap or coarse gravel protection will not be permitted.

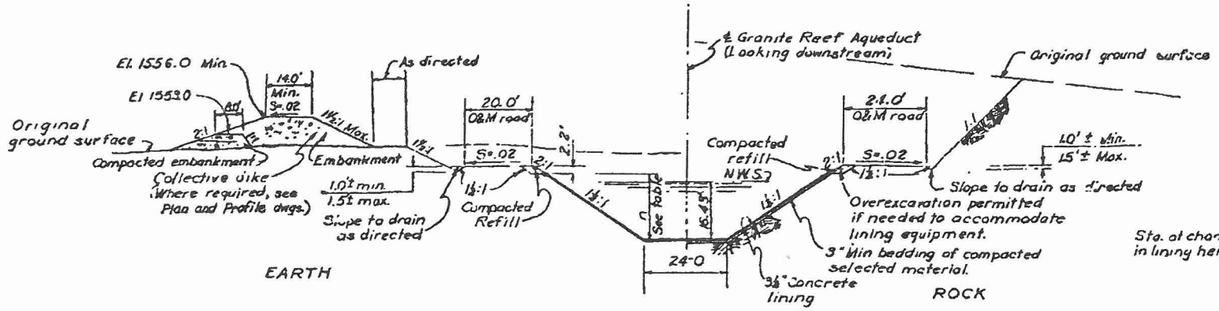
All riprap shall be bedded in a continuous layer of sand and gravel or sand and crushed rock of the thicknesses shown on the drawings, reasonably well graded to a maximum of 1 and 1/2 inches in size.

d. Measurement and payment.—Measurement, for payment, of riprap or of coarse gravel protection will be made to the outlines of the riprap or coarse gravel protection directed to be placed on the basis of the nominal thickness prescribed. Payment for riprap or for coarse gravel protection will be made at the applicable unit price per cubic yard bid therefor in the schedule, which unit price shall include the cost of procuring or furnishing, hauling, and placing the rock for riprap or gravel for coarse gravel protection, including the rock spalls and gravel to fill the voids in the riprap.

Measurement, for payment, of sand and gravel or sand and crushed-rock bedding for riprap will be made to the specified ~~6-inch~~ thickness, and to the prescribed outlines of the bedding directed to be

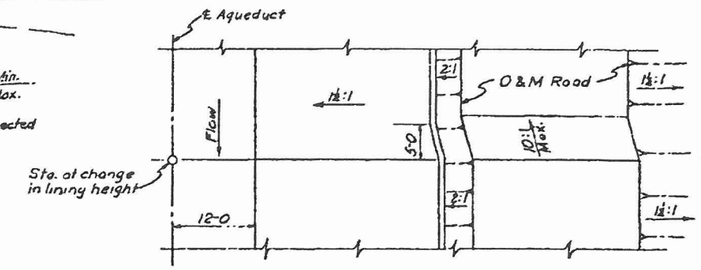
placed. Payment for sand and gravel or sand and crushed-rock bedding for riprap will be made at the unit price per cubic yard bid in the schedule for sand and gravel bedding for riprap, which unit price shall include the cost of procuring or furnishing, hauling, and placing the bedding.

Excavation, backfill, and compacted backfill required for the placing of bedding, riprap, or coarse gravel protection will be measured to the prescribed outlines and depths and will be paid for as excavation for structures, backfill about structures, and compacting backfill about structures.



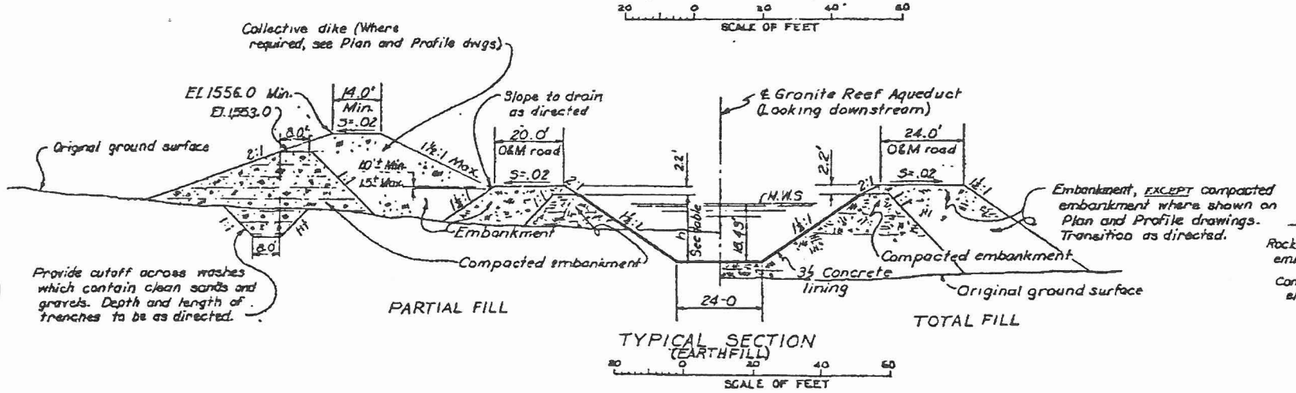
TYPICAL SECTION (THOROUGH CUT)

SCALE OF FEET



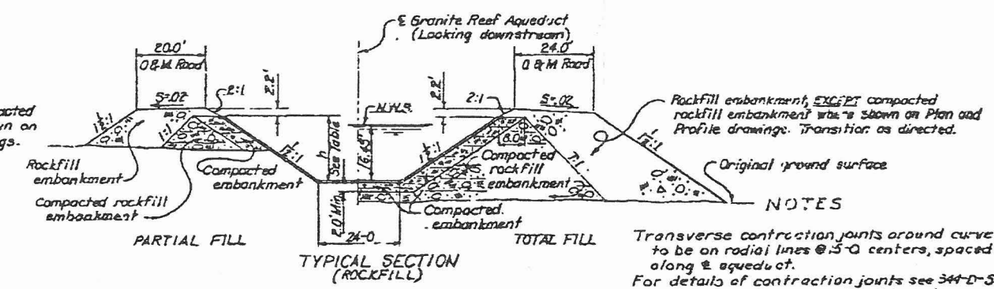
TYPICAL PLAN - LINING TRANSITION

SCALE OF FEET



TYPICAL SECTION (EARTHFILL)

SCALE OF FEET



TYPICAL SECTION (ROCKFILL)

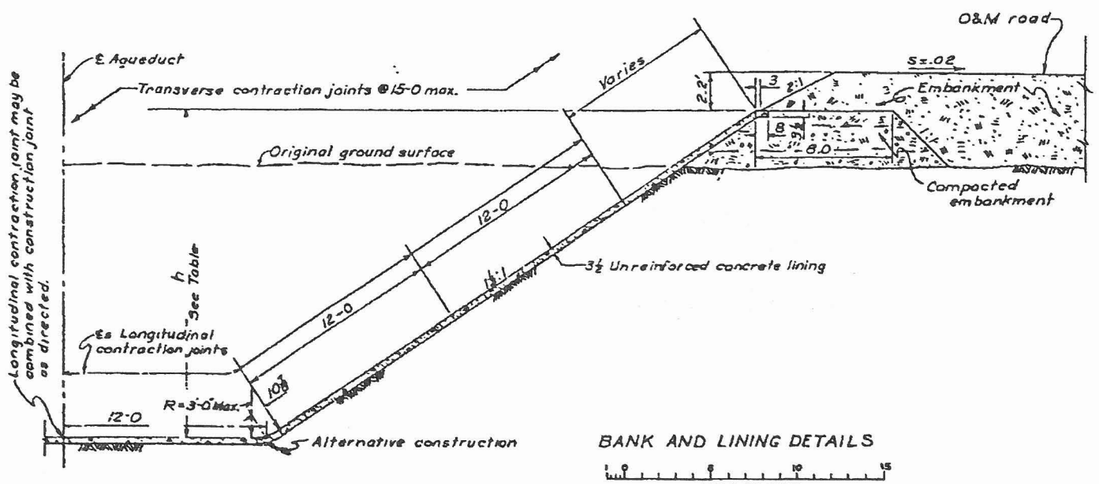
NOTES

Transverse contraction joints around curves to be on radial lines @ 15-0 centers, spaced along ℄ aqueduct.

For details of contraction joints see 344-D-577.

For details and spacing of safety ladders see 40-D-612

Concrete lining design is based on a compressive strength of 3000 p.s.i. @ 28 days.



BANK AND LINING DETAILS

SCALE OF FEET

HYDRAULIC PROPERTIES

A	V	Q	r	n	s	b	d
799.24	3.75	3,000	3.60	.016	.00008	24.0	16.43

LINING HEIGHT TABLE

STATION	h
10+00 to 187+00	18.6
187+00 to 217+00	19.0
217+00 to 267+00	19.5
268+16.29 to 501+00	18.6
501+00 to 531+00	19.0
531+00 to 575+80.80	19.5

6-17-60	AS BUILT BY 330, LTR 4-18-79
0-4/5	

RAILWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION-ARIZONA

GRANITE REEF AQUEDUCT

REACH 9

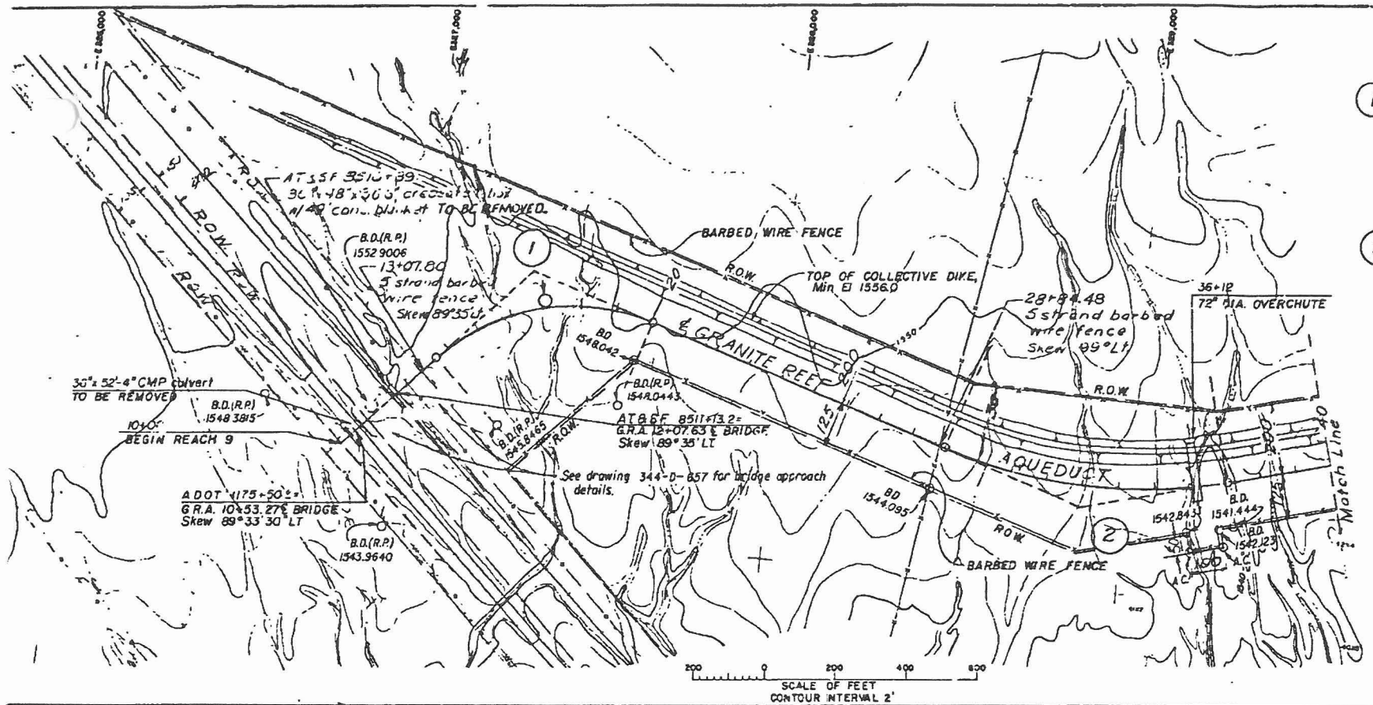
TYPICAL AQUEDUCT AND DIKE SECTIONS

DESIGNED G.E. Nelson SUBMITTED Chief L. Yarnell
DRAWN RECOMMENDED Joseph Nichols
CHECKED J.L. Rodgers APPROVED C.E. Trimble
CHIEF, WATER CONVEYANCE BRANCH

PHOENIX, ARIZONA OCTOBER 1958 344-330-1325

21" x 36"

A-28



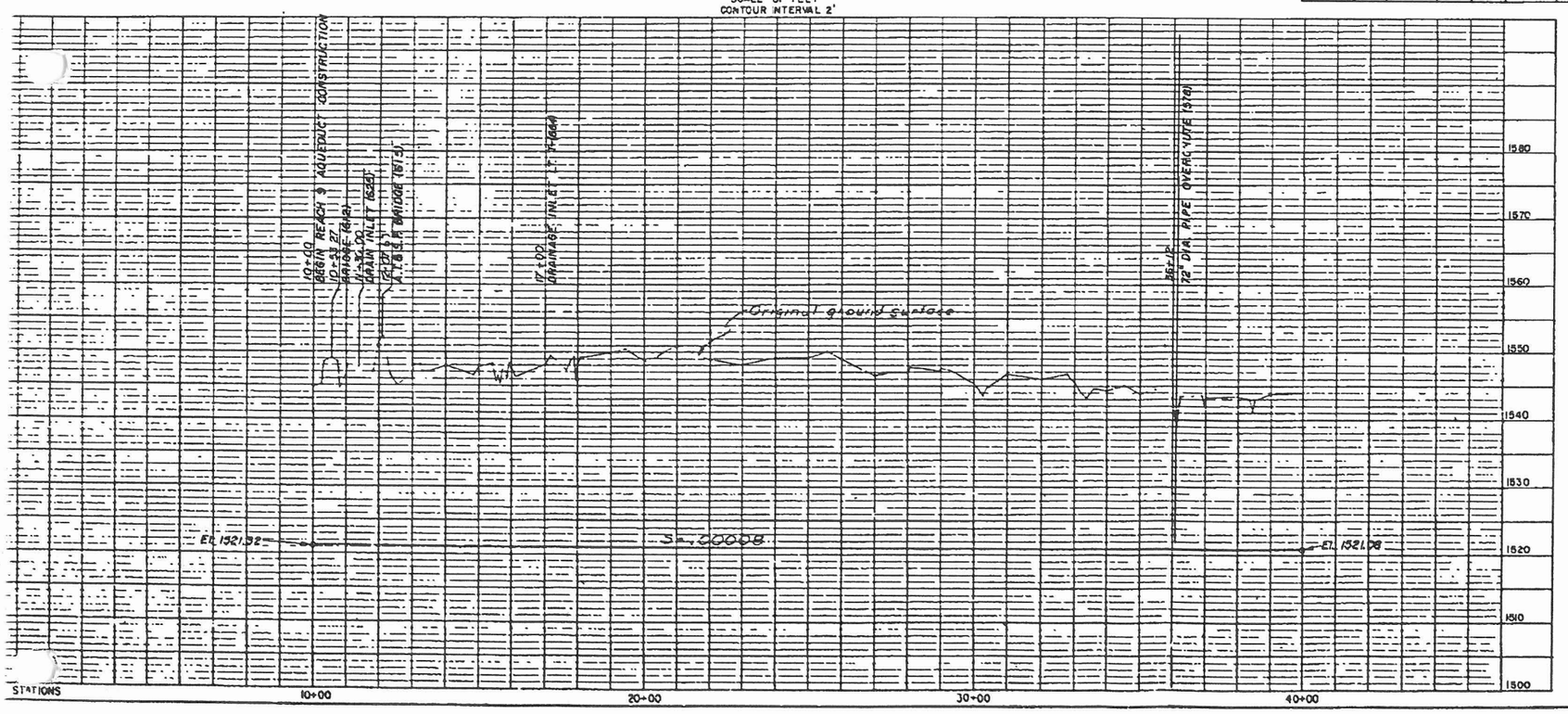
(1) PI. 17+19.69
Δ=64°46'11" Rt
D=10°
R=572.96
T=363.40
L=647.70
PC 13+55.29
PT 20+02.99

(2) PI. 33+11.69
Δ=32°34'57" Lt.
D=4°
R=1432.40
T=418.62
L=814.57
PC 28+93.07
PT 37+07.64

○ BD	Brass disk
AC	Aluminum cap
1548	Elevation

HYDRAULIC PROPERTIES

A	V	Q	r	n	s	b	d
799.24	3.75	3.000	9.60	.016	.00008	24.0	16.43



NOTES

For typical aqueduct sections, see 344-330-1325.
Barbed wire fence to be located as shown or as directed
For fencing details, see 40-D-6270.
For other notes and explanation, see dwg no 344-330-1305

SINGULAR REVISIONS

6-29-60 D-GLS	AS BUILT BY 330, L79, 4-16-79

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

GRANITE REEF AQUEDUCT
REACH 9
STA. 10+00 TO STA. 40+00
PLAN AND PROFILE

DESIGNED J.W.H. R.L. Helvey SUBMITTED
DRAWN RECOMMENDED
CHECKED APPROVED
CHIEF WATER CONVEYANCE BRANCH

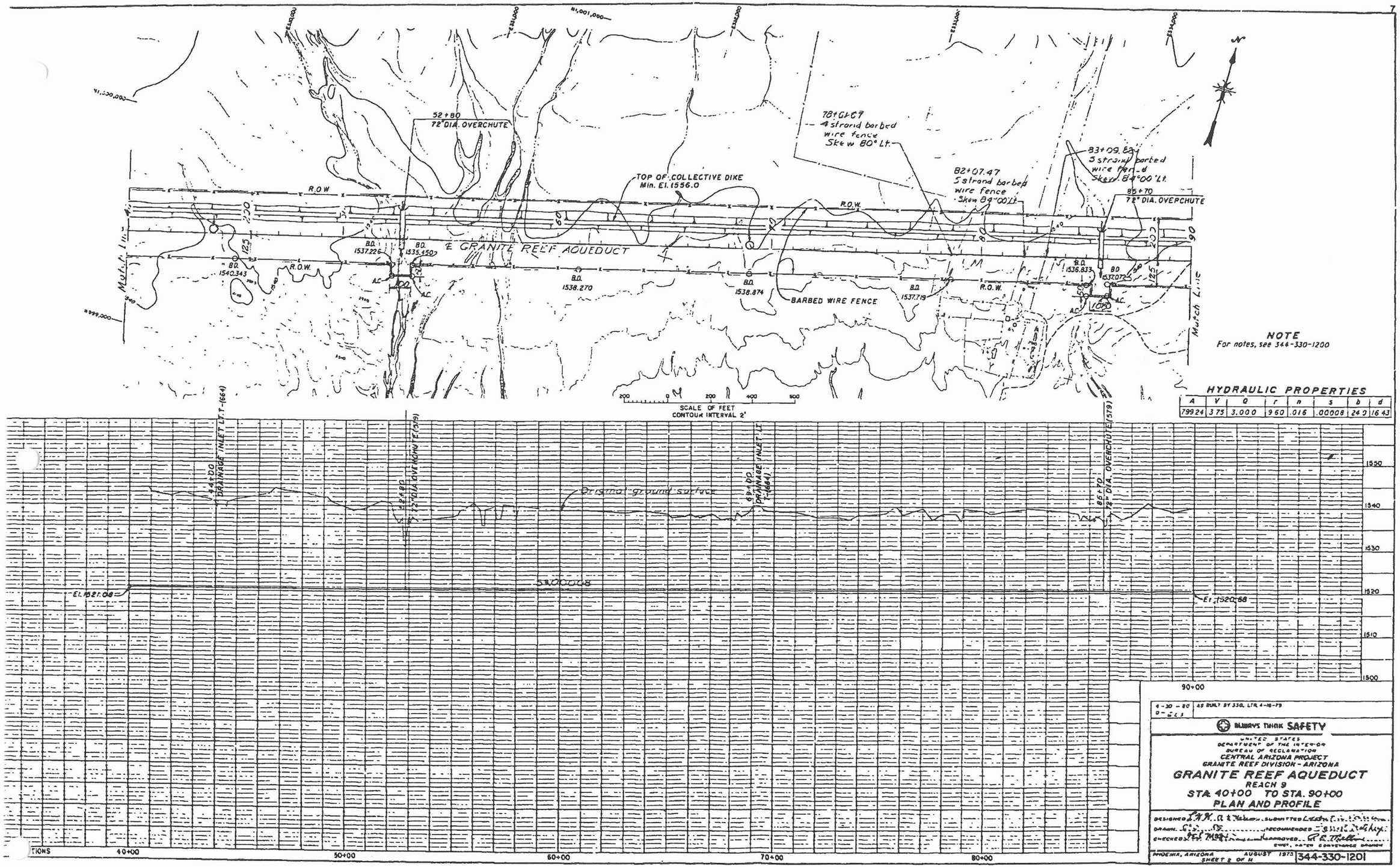
PHOENIX, ARIZONA AUGUST 1973 SHEET 1 OF 11

344-330-1200

ONE OVERLAY-INFORMATION

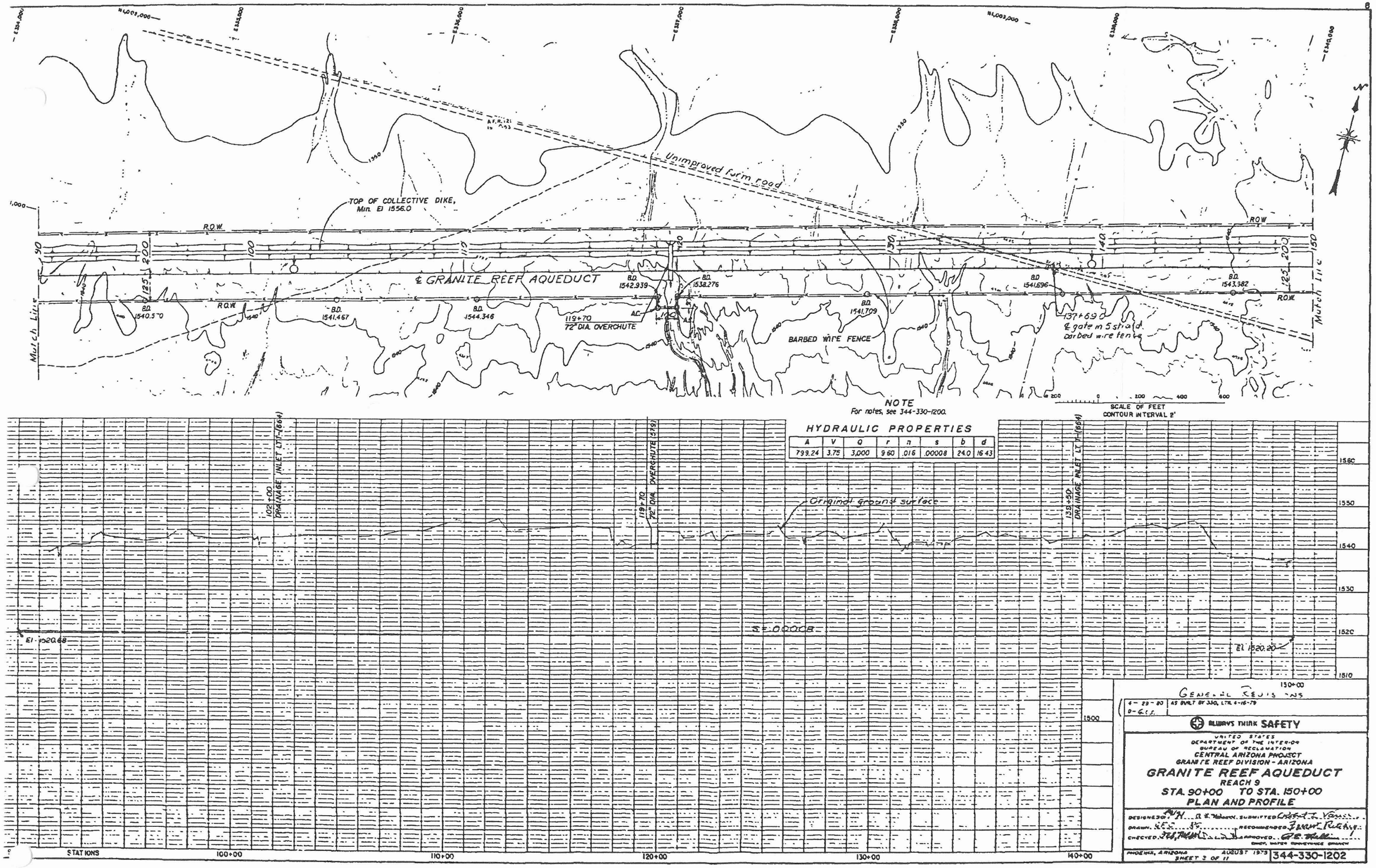
-4-

A-29



ONE OVERLAY - INFORMATION

A-30


Unimproved farm road
TOP OF COLLECTIVE DIKE, Min. El 1556.0
R.O.W.
℄ GRANITE REEF AQUEDUCT
B.D. 1540.570
B.D. 1541.467
B.D. 1544.346
B.D. 1542.939
B.D. 1538.276
119+70
72" DIA. OVERCHUTE
B.D. 1541.709
BARBED WIRE FENCE
B.D. 1541.696
B.D. 1543.982
137+69
℄ gate in 5 strand barbed wire fence
Match Line
SCALE OF FEET
CONTOUR INTERVAL 2'
NOTE
For notes, see 344-330-1200.
HYDRAULIC PROPERTIES
A V Q r n s b d
799.24 3.75 3,000 9.60 .016 .00008 24.0 16.43
102+00 DRAINAGE INLET LT. (664)
119+70 72" DIA. OVERCHUTE (379)
135+50 DRAINAGE INLET LT. (664)
Original ground surface
S=.00008
El 1520.68
El 1520.20
STATIONS
100+00
110+00
120+00
130+00
140+00
150+00
GENERAL REVISIONS
4-29-80 AS BUILT BY JJO, LTR. 4-16-79
D-G.L.S.
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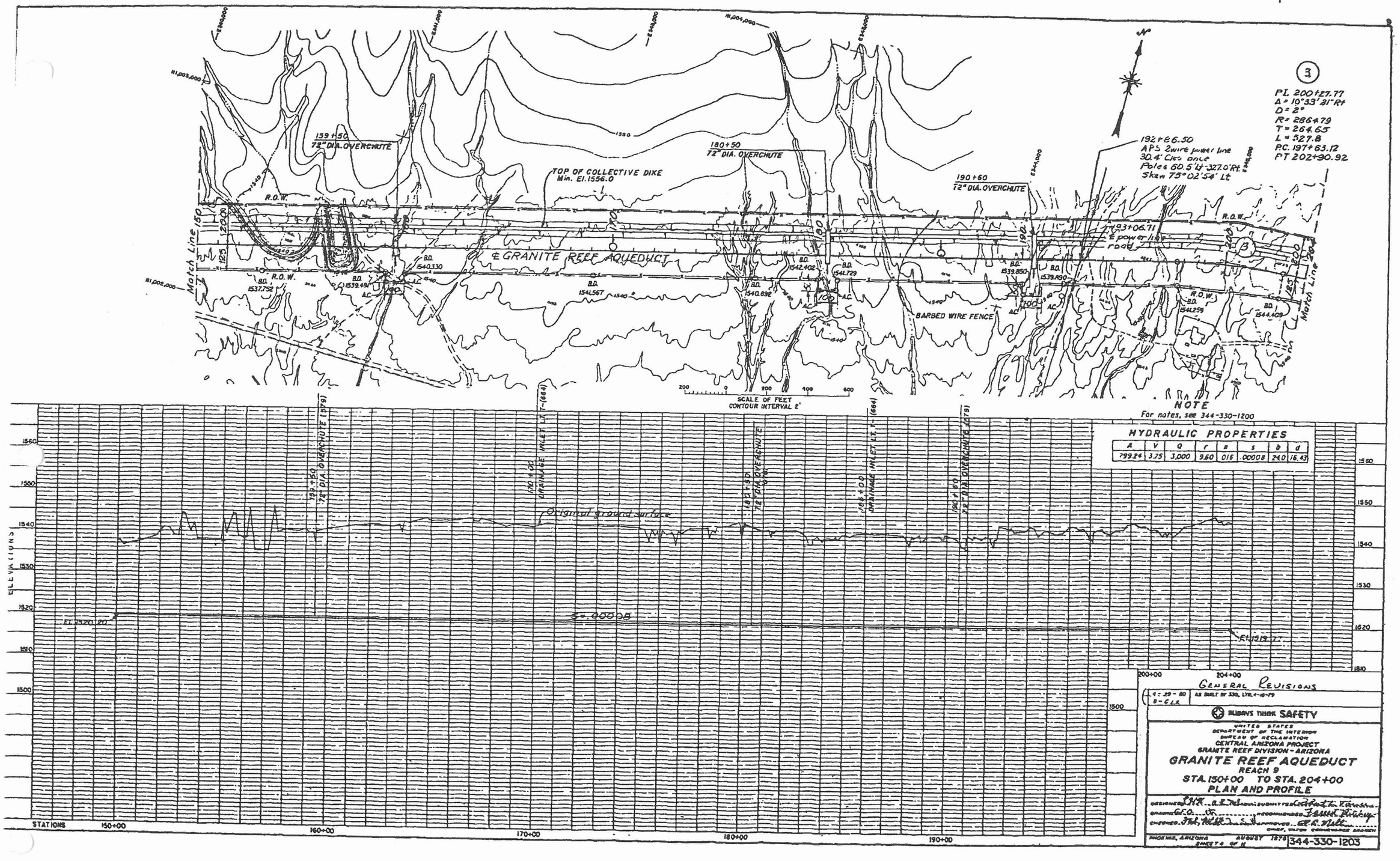
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA
GRANITE REEF AQUEDUCT
REACH 9
STA. 90+00 TO STA. 150+00
PLAN AND PROFILE
DESIGNED
DRAWN
CHECKED
SUBMITTED
RECOMMENDED
APPROVED
CHIEF, WATER CONVEYANCE BRANCH
PHOENIX, ARIZONA
AUGUST 1975
SHEET 3 OF 11
344-330-1202
ONE OVERLAY-INFORMATION

A-31


159+50
72" DIA. OVERCHUTE
180+50
72" DIA. OVERCHUTE
190+60
72" DIA. OVERCHUTE
TOP OF COLLECTIVE DIKE
Min. El. 1556.0
℄ GRANITE REEF AQUEDUCT
R.O.W.
Match Line
BARBED WIRE FENCE
192+66.50
APS 2 wire power line
30.4' Clear once
Poles 60.5' Lt - 327.0' Rt
Skew 75°02'54" Lt
193+06.71
℄ power line road
SCALE OF FEET
CONTOUR INTERVAL 2'
NOTE
For notes, see 344-330-1200
P.I. 200+27.77
Δ = 10°33'31" Rt
D = 2°
R = 286.79
T = 264.65
L = 527.8
P.C. 197+63.12
P.T. 202+90.92
HYDRAULIC PROPERTIES
A | V | Q | r | n | s | b | d
799.24 | 3.75 | 3,000 | 9.60 | .016 | .00008 | 24.0 | 16.43
ELEVATIONS
Original ground surface
EL 1520.20
S = .00008
EL 1519.77
STATIONS
150+00
160+00
170+00
180+00
190+00
200+00
204+00
GENERAL REVISIONS
AS BUILT BY SSR, LTR. 4-16-79
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UNITED STATES
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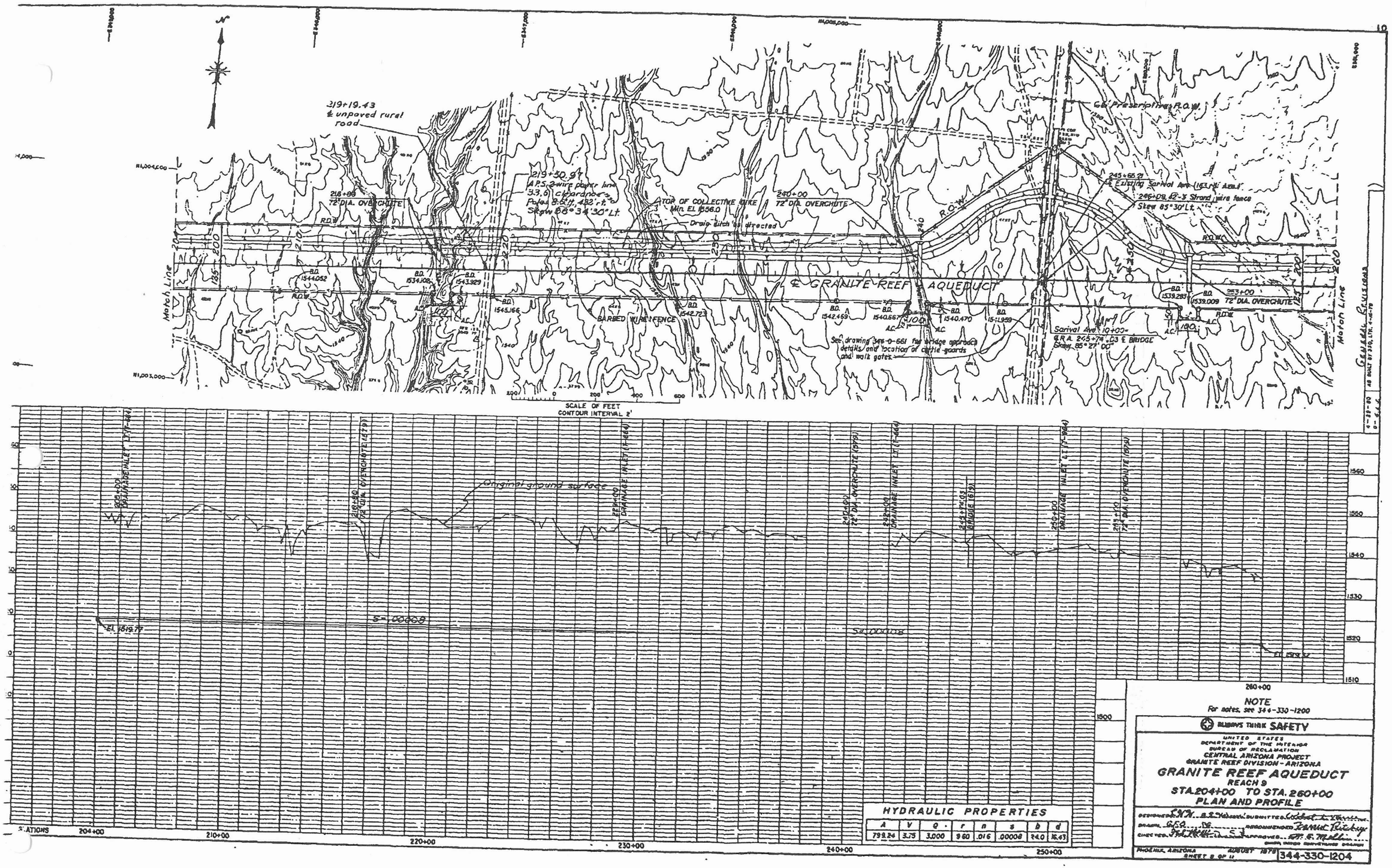
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA
GRANITE REEF AQUEDUCT
REACH 9
STA. 150+00 TO STA. 204+00
PLAN AND PROFILE
PHOENIX, ARIZONA
AUGUST 1978
344-330-1203
ONE OVERLAY - INFORMATION

A-32



NOTE
For notes, see 344-330-1200

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CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

GRANITE REEF AQUEDUCT

REACH 9
STA. 204+00 TO STA. 260+00
PLAN AND PROFILE

DESIGNED E.N.W. B.S. Nelson SUBMITTED Robert A. Wilson
DRAWN G.C.G. D.G. RECOMMENDED Frank Ritchey
CHECKED Fred Hall S.J. APPROVED Jeff C. Mello
CHIEF, DESIGN DIVISION CHIEF, DESIGN CONSTRUCTION DIVISION

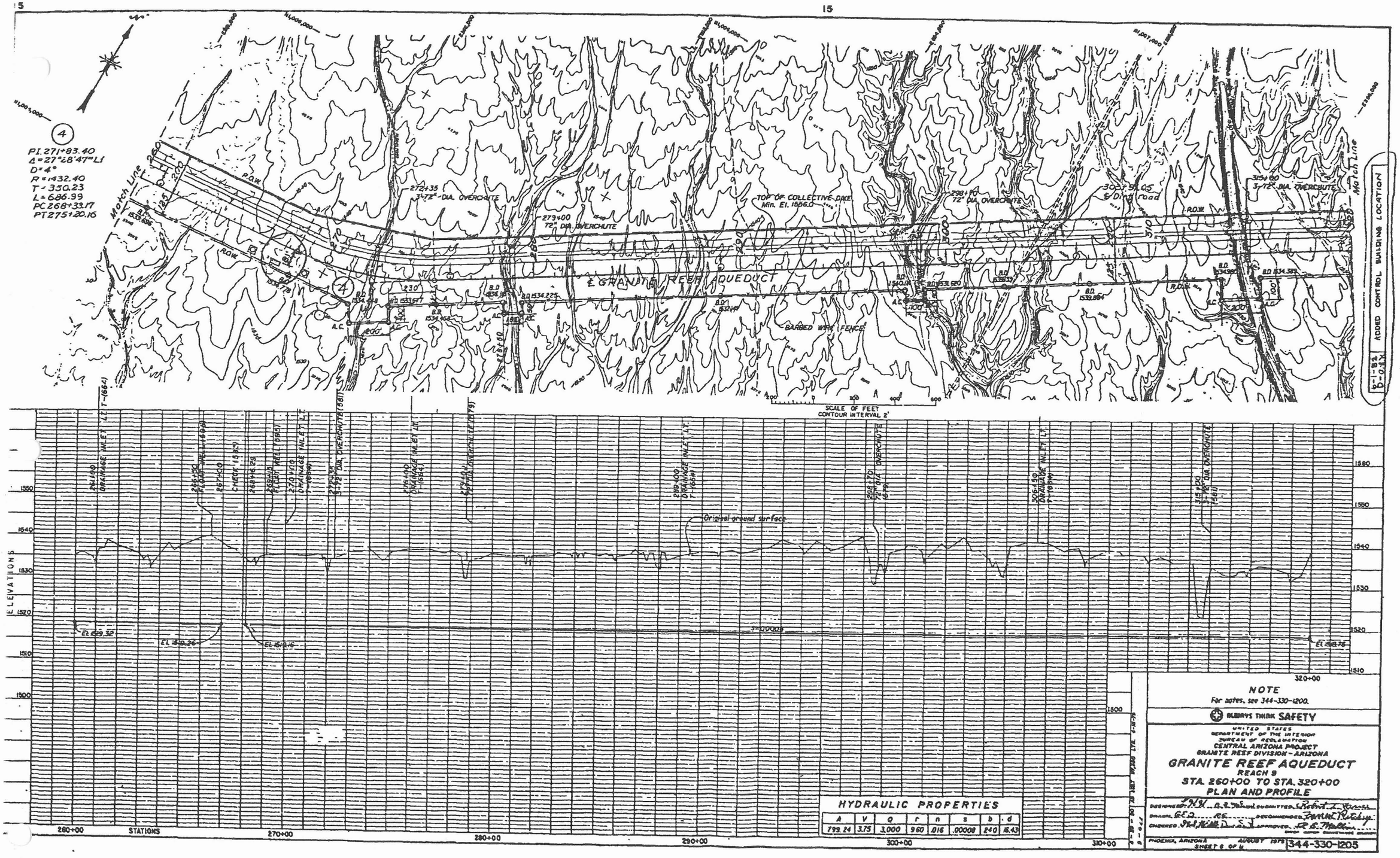
PHOENIX, ARIZONA AUGUST 1979 SHEET 8 OF 11 344-330-1204

HYDRAULIC PROPERTIES

A	V	Q	r	n	s	b	d
799.24	3.75	3,000	9.60	.016	.00008	24.0	16.43

DO NOT OVERLAY-INFORMATION

A-33



HYDRAULIC PROPERTIES

A	V	Q	r	n	s	b	d
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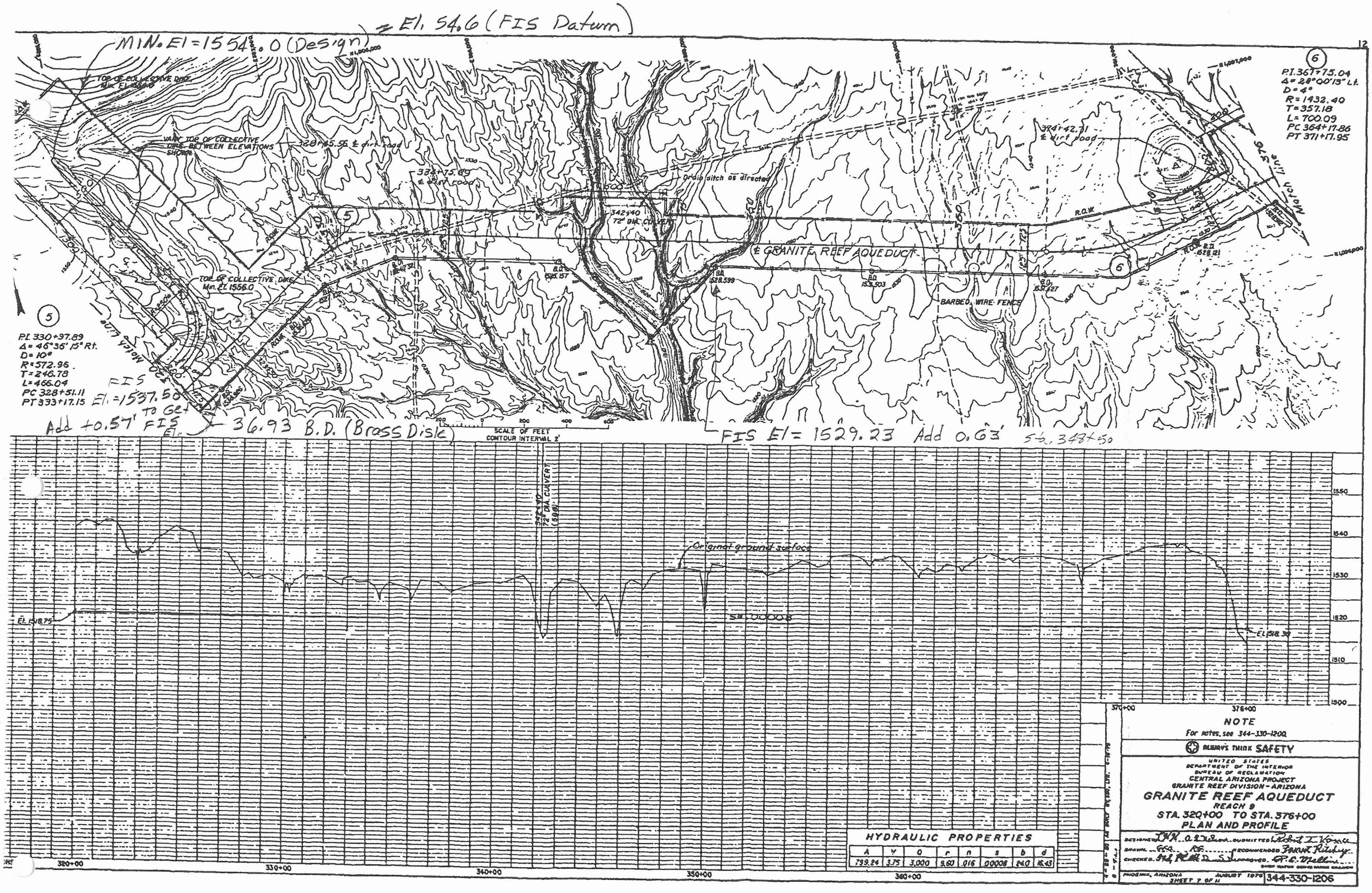
A-34



HYDRAULIC PROPERTIES

A	Y	Q	r	n	s	b	d
799.26	3.75	3,000	9.60	.016	.00008	240	16.43

NOTE

For notes, see 344-330-1200

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CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

GRANITE REEF AQUEDUCT

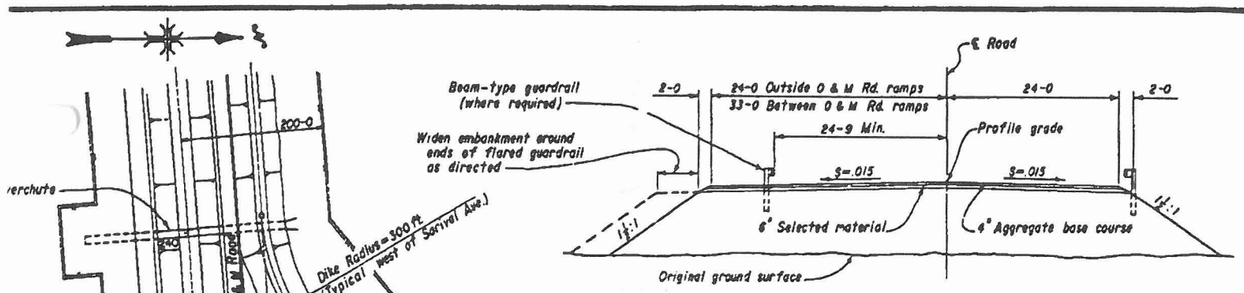
REACH 9
STA. 320+00 TO STA. 376+00
PLAN AND PROFILE

DESIGNED JWK 0.2.78 SUBMITTED Robert L. Vance
DRAWN GSA RS RECOMMENDED Frank Ridley
CHECKED JWK RMR D. S. APPROVED G. E. Mellen

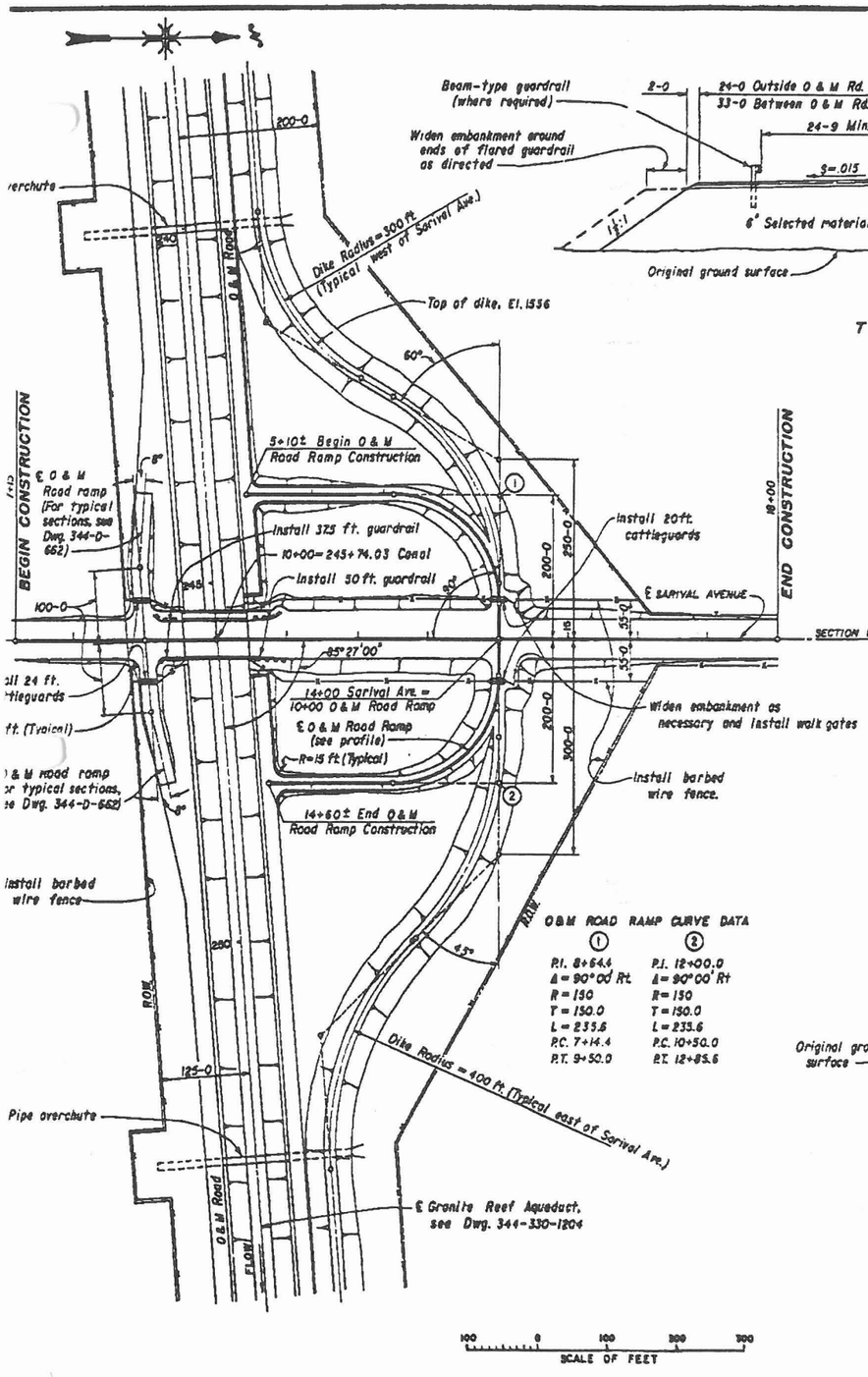
PHOENIX, ARIZONA AUGUST 1979 SHEET 7 OF 11 344-330-1206

ONE OVERLAY—INFORMATION

A-35

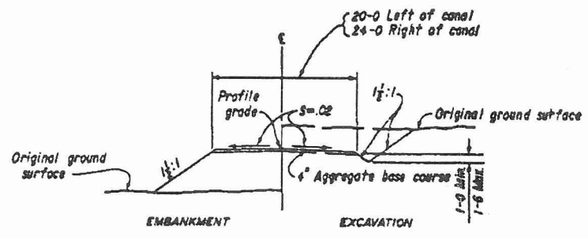


TYPICAL SECTION
SARIVAL AVENUE

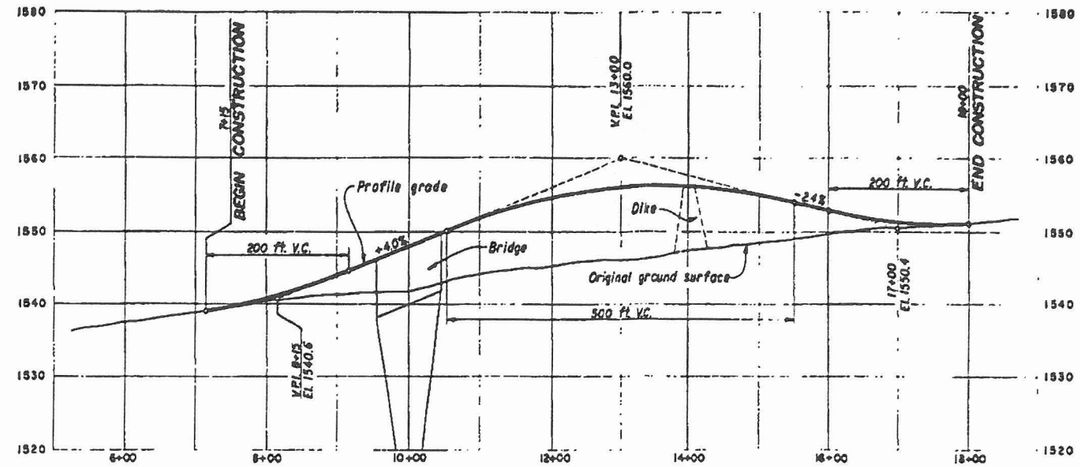


O & M ROAD RAMP CURVE DATA

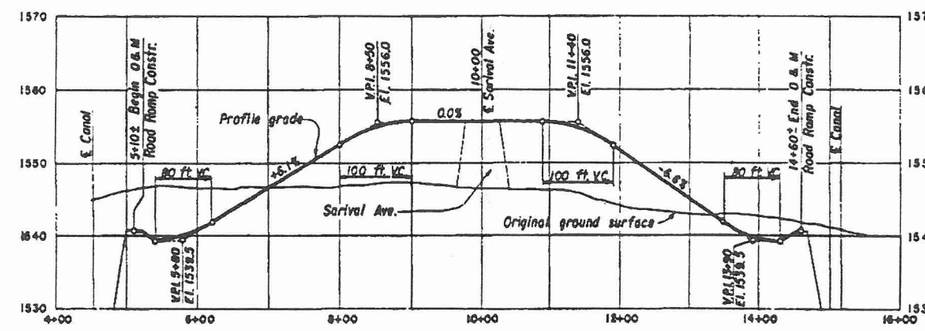
①	②
P.I. 8+64.4	P.I. 12+00.0
Δ = 90°00' Rt.	Δ = 90°00' Rt
R = 150	R = 150
T = 150.0	T = 150.0
L = 235.6	L = 235.6
P.C. 7+14.4	P.C. 10+50.0
P.T. 9+50.0	P.T. 12+85.6



TYPICAL SECTIONS
O & M ROAD RAMPS



PROFILE
SARIVAL AVENUE



PROFILE
O & M ROAD RAMPS

NOTES

For bridge details, see Dwg. 344-D-812.
For guardrail details, see Dwg. 344-D-662.
For fencing details, see Dwg. 40-D-6270.

5-17-80	AS BUILT BY 330, LTR. 8-18-80
5-7-80	

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CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

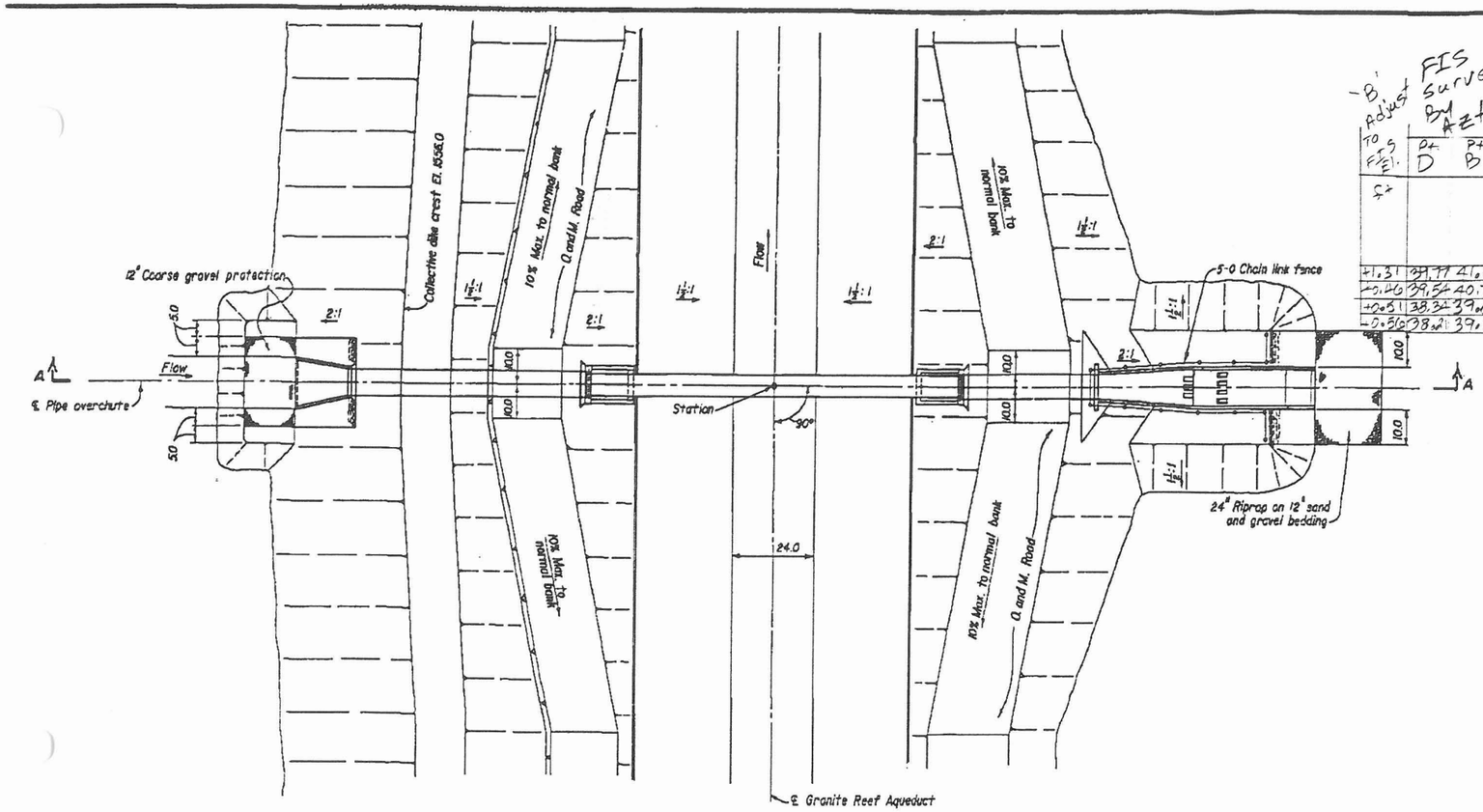
GRANITE REEF AQUEDUCT
REACH 9
SARIVAL AVENUE BRIDGE APPROACHES
CANAL STA. 243+74.03
PLAN AND PROFILE

DESIGNED C.K. Tang SUBMITTED
DRAWN N.C.L. RECOMMENDED
CHECKED APPROVED E. J. Glauch
CHIEF, DESIGN BRANCH

DENVER, COLORADO, SEPT. 1, 1978 | 344-D-661

ONE OVERLAY- INFORMATION

A-36



TYPICAL PLAN

SCALE OF FEET

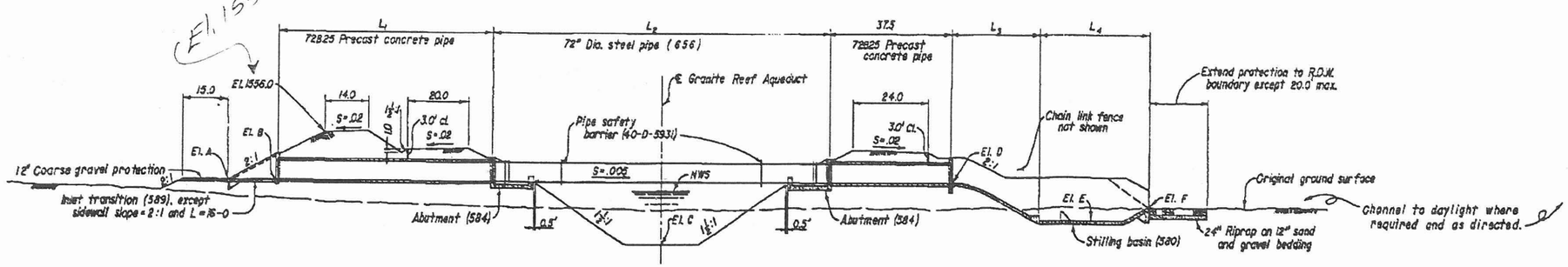
-B' Adjust FIS survey By Aztec Error. 2/00

TO FIS El.	Pt. D	Pt. B	STATION	ELEVATIONS A	B	C	D	E	F	DIMENSIONS L_1	L_2	L_3	L_4
			52+80	1540.97	1540.97	1520.98	1539.89	1528.20	1532.00	69.5'	108.8	28.25'	35-6
			85+70	1540.71	1540.71	1520.71	1539.82	1532.85	1536.00	70.5	108.8	18.42	31-6
			119+70	1542.42	1540.42	1520.44	1539.35	1532.85	1536.00	67.5	108.8	17.88	31-6
			153+50	1542.11	1540.11	1520.12	1539.03	1532.85	1536.00	69.0	108.8	17.24	31-6
			190+50	1542.27	1540.27	1519.88	1539.19	1532.85	1536.00	68.0	110.0	17.55	31-6
			216+80	1540.08	1540.08	1519.66	1538.97	1529.55	1533.00	73.0	110.0	23.72	34-0
+1.31	39.77	41.07	240+00	1542.38	1540.38	1519.48	1539.29	1531.75	1535.00	68.0	111.5	19.96	32-6
+0.46	39.54	40.76	253+00	1540.30	1540.30	1519.38	1539.19	1532.85	1536.00	72.0	111.5	17.55	31-6
+0.51	38.34	39.01	279+00	1539.10	1539.10	1519.07	1537.98	1525.00	1529.00	76.0	108.8	30.83	37-0
-0.51	38.02	39.51	298+70	1538.95	1538.95	1518.92	1537.83	1525.00	1529.00	77.0	108.8	30.53	37-0

NOTES

For general notes, see 344-D-578.
For chain link fencing details, see 40-D-6268, EXCEPT barbed wire supporting arms shall be oriented vertically.

(El. 1556.0 (FIS Datum



SECTION A-A

6-17-80 | AS BUILT BY 330, L.F.R. 4-18-80
D-40

ALWAYS THINK SAFETY

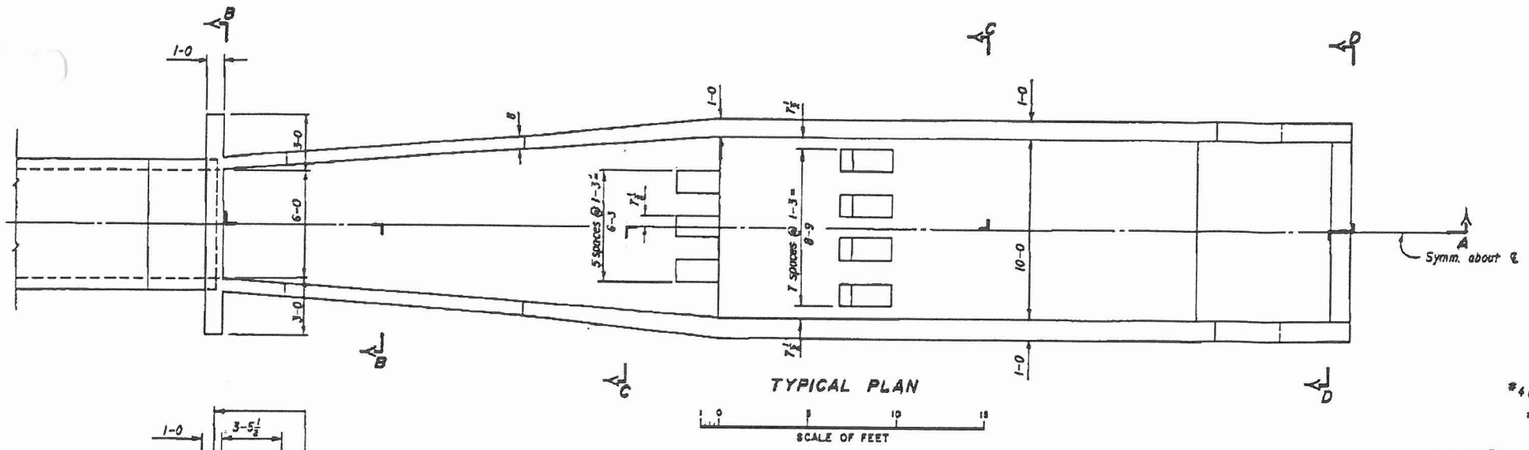
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

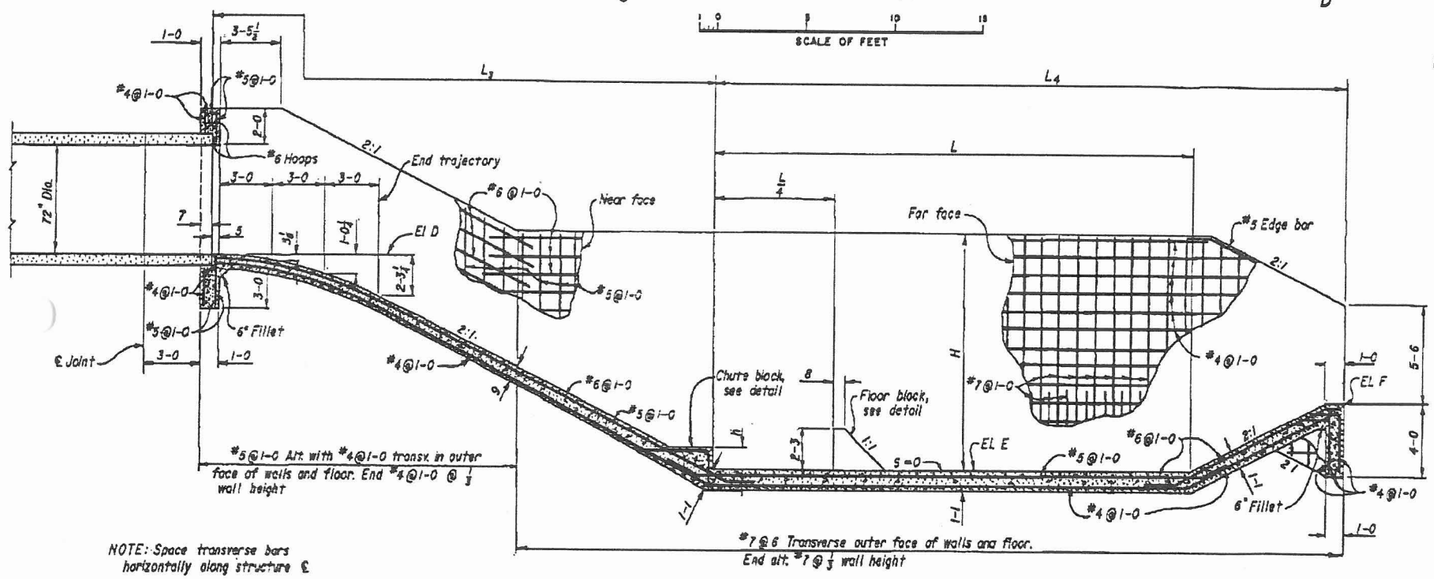
GRANITE REEF AQUEDUCT
REACH 9
72" DIA. SINGLE BARREL PIPE OVERCHUTES
PLAN AND SECTION

DESIGNED O. E. Nelson | SUBMITTED Robert L. Vance
DRAWN Charles Taylor | RECOMMENDED Forest Rickey
CHECKED Dave Smith | APPROVED R. E. Mullin
CHIEF, WATER CONVEYANCE BRANCH

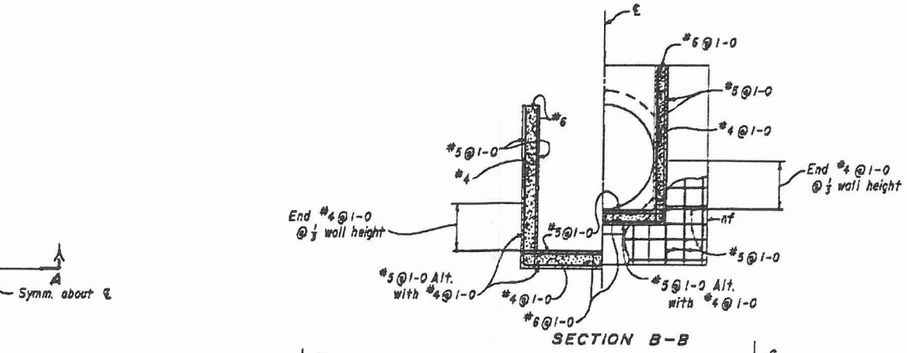
DENVER, COLORADO FEBRUARY 20, 1970 | 344-D-579

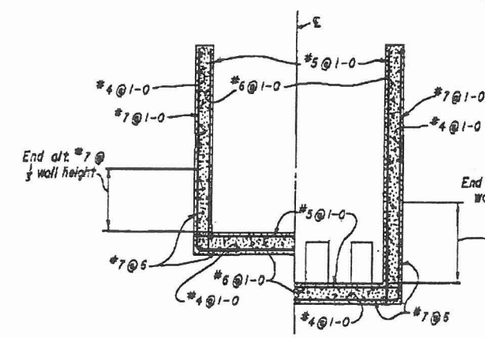
A-37

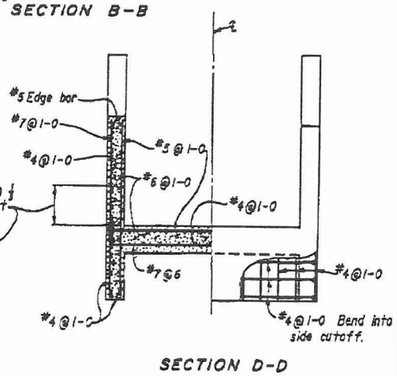




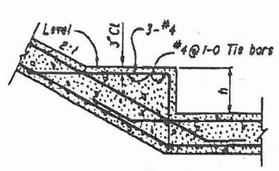
NOTE: Space transverse bars horizontally along structure ℄

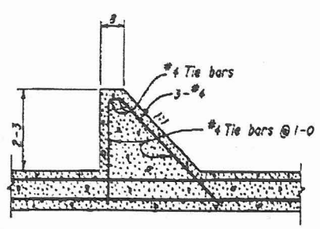






NOTE
For general notes, see 344-D-578.





STATION	ELEVATIONS			DIMENSIONS				
	D	E	F	L	L_3	L_4	H	h
52+80	1539.89	1528.20	1532.00	26-10½	28-3	35-6	13-0	1-3
85+70	1539.62	1532.85	1536.00	24-2½	18-5	31-6	12-0	1-6
119+70	1539.35	1532.85	1536.00	24-2½	17-10½	31-6	12-0	1-6
159+50	1539.03	1532.85	1536.00	24-2½	17-2½	31-6	12-0	1-6
190+60	1539.19	1532.85	1536.00	24-2½	17-6½	31-6	12-0	1-6
216+60	1538.97	1529.55	1533.00	26-1½	25-3½	34-0	12-9	1-6
240+00	1539.29	1531.75	1535.00	25-0	19-11½	32-6	12-6	1-6
253+00	1539.19	1532.85	1536.00	24-2½	17-6½	31-6	12-0	1-6
279+00	1537.98	1525.00	1529.00	28-0	30-10	37-0	13-0	1-3
298+70.	1537.83	1525.00	1529.00	28-0	30-6½	37-0	13-0	1-3

6-2-80 / 0-80 AS BUILT BY 33.2. LTR 4-28-80

ALWAYS THINK SAFETY

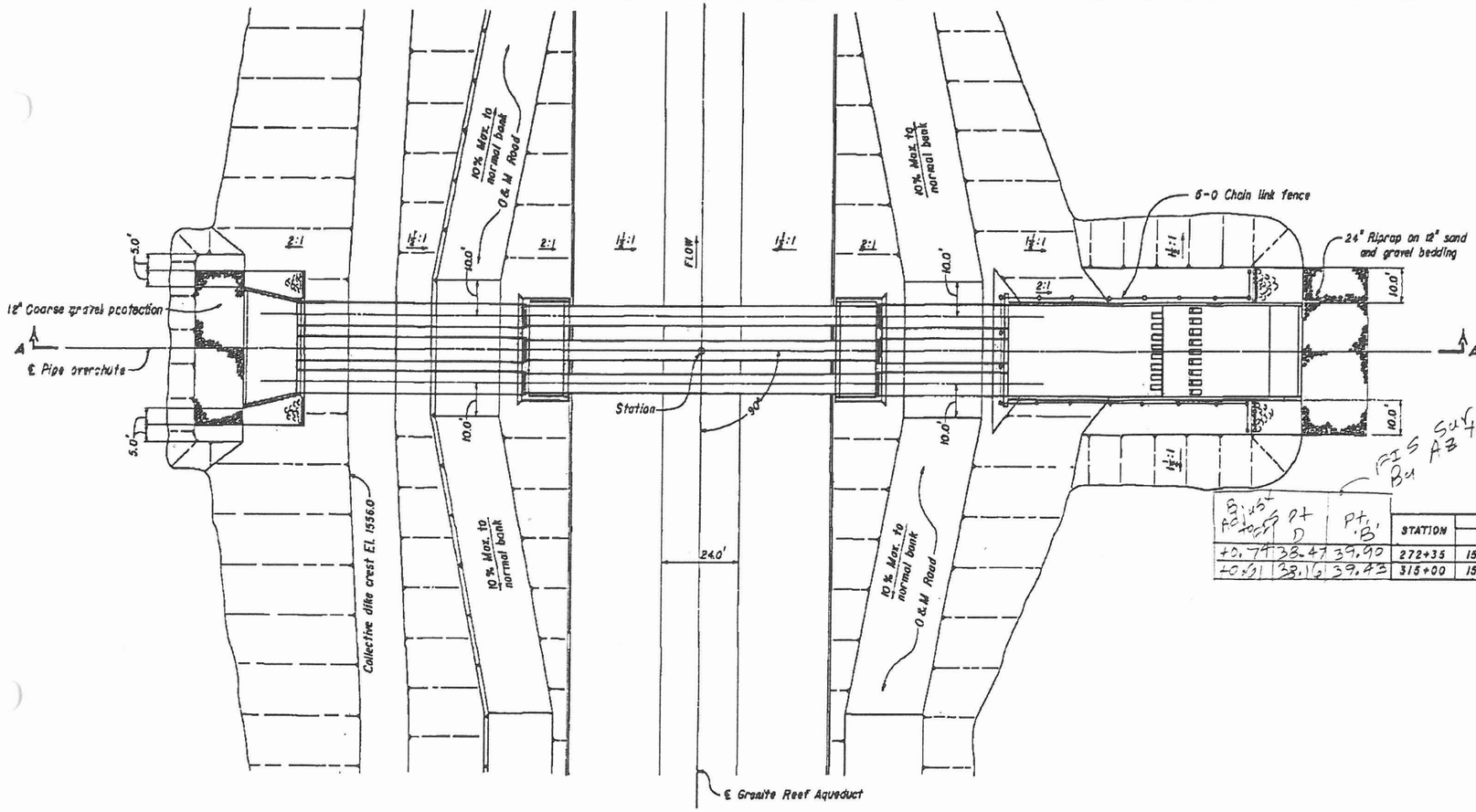
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION-ARIZONA

GRANITE REEF AQUEDUCT
REACH 9
72" DIA. SINGLE BARREL PIPE OVERCHUTES
STILLING BASIN

DESIGNED A. J. Nelson SUBMITTED Robert L. Tassell
DRAWN R. Miller RECOMMENDED Forest Pickett
LAYOUT Dave Smith APPROVED R. E. Wolfe
CHIEF, WATER CONVEYANCE BRANCH

DENVER, COLORADO MARCH 3, 1978 344-D-580

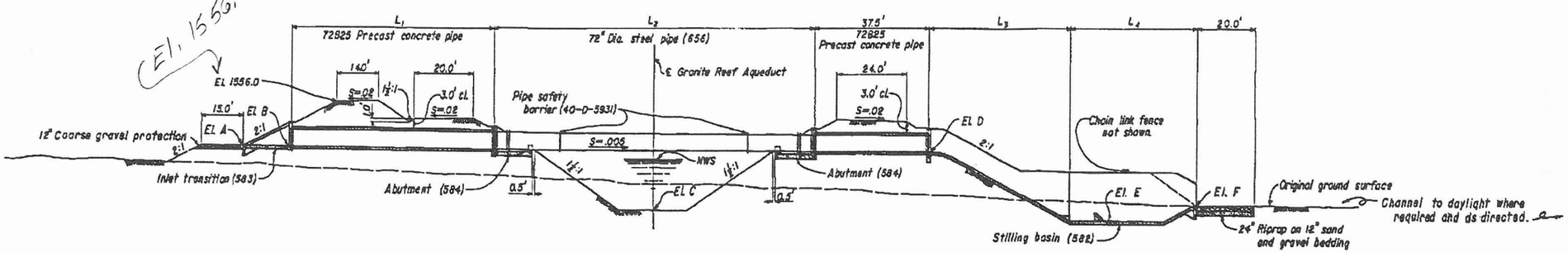
A-38



TYPICAL PLAN

SCALE OF FEET

El. 1556.6 FIS Datum



SECTION A-A

FIS Survey AZ tec Engr 2/00

Ft. S Ft. D	Ft. B'	STATION	ELEVATIONS A	B	C	D	E	F	DIMENSIONS L_1	L_2	L_3	L_4
+0.74	38.47	39.90	272+35	1539.16	1539.16	1519.13	1538.04	1527.25	1531.00	76.0	108.8	25.46	36-6
+0.21	38.16	39.43	315+00	1538.82	1538.82	1518.79	1537.70	1515.90	1521.00	77.0	108.8	48.48	43-6

NOTES

For general notes, see 344-D-578.
For chain link fencing details, see 40-D-6268, EXCEPT barbed wire supporting arms shall be oriented vertically.

8-17-80 D-80	AS BUILT BY 330, L.T.R. 4-17-80

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION-ARIZONA

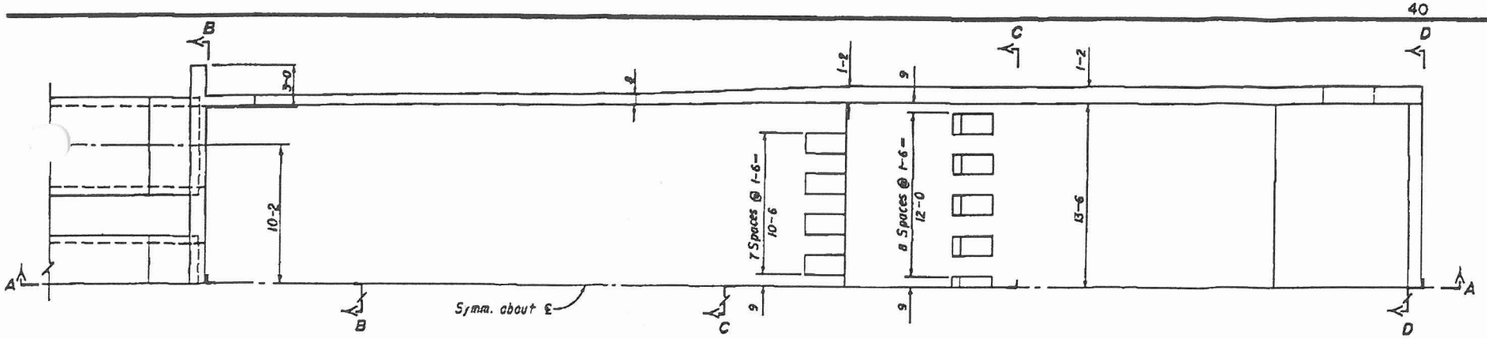
GRANITE REEF AQUEDUCT
REACH-B

72" DIA. THREE BARREL PIPE OVERCHUTES
PLAN AND SECTION

DESIGNED A.R. Silva SUBMITTED Robert L. Davis
DRAWN J.J. Kesl RECOMMENDED Donald Ridley
CHECKED D.C.S. J.W. APPROVED R.C. Mick
CHIEF, WATER & CONVEYANCE BRANCH

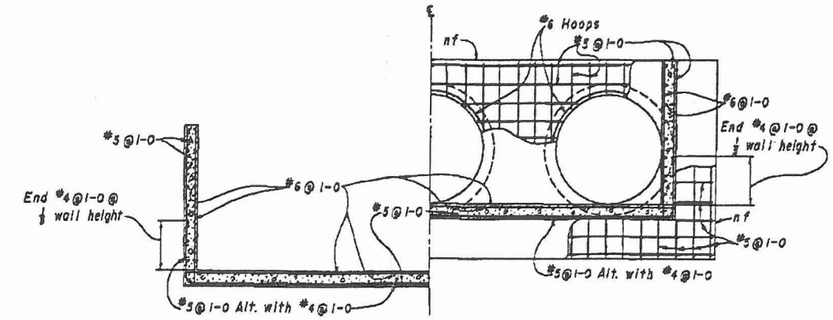
DENVER, COLORADO MARCH 10, 1978 | 344-D-581

A-39

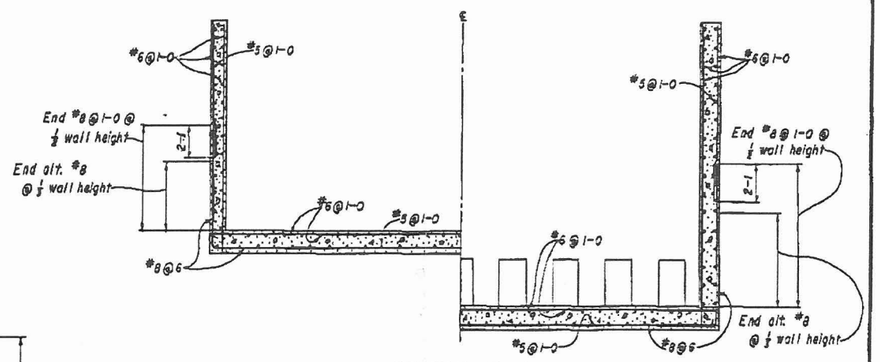


TYPICAL HALF PLAN

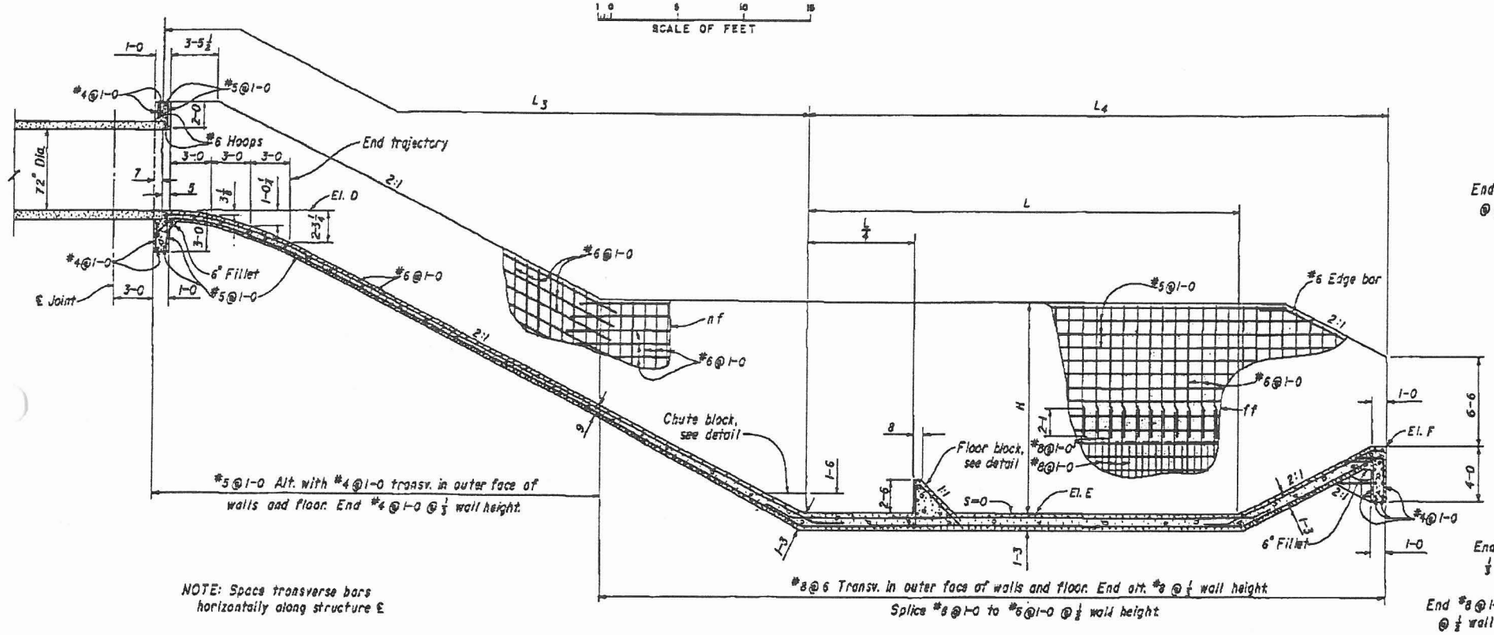
SCALE OF FEET



SECTION B-B

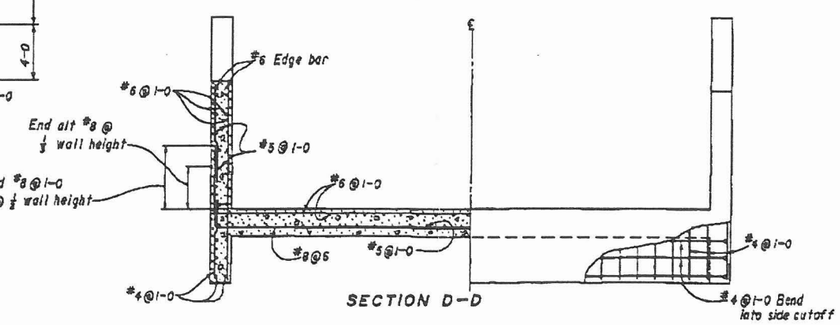


SECTION C-C

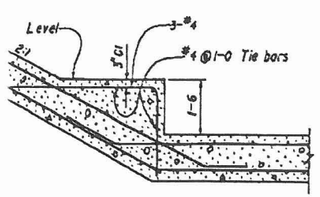


NOTE: Space transverse bars horizontally along structure ℄

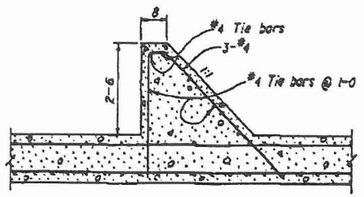
SECTION A-A



SECTION D-D



CHUTE BLOCK



FLOOR BLOCK

STATION	ELEVATIONS			DIMENSIONS			
	D	E	F	L	L_3	L_4	H
272+35	1538.04	1527.25	1531.00	28-0	26-5½	36-6	14-0
315+00	1537.70	1515.90	1521.00	32-3½	48-5½	43-6	15-6

NOTE
For general notes, see 344-D-578

6-17-80 AS BUILT BY JJO, LTR. 4-16-80

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION—ARIZONA

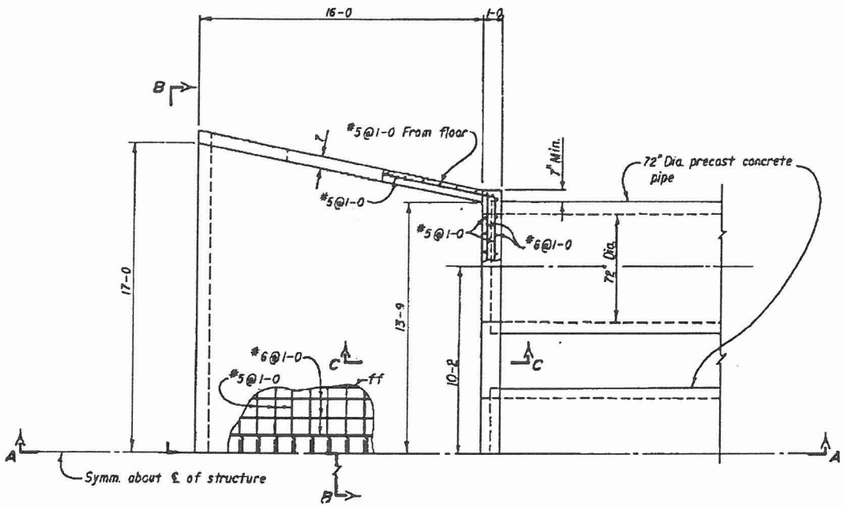
GRANITE REEF AQUEDUCT
REACH 9
72" DIA. THREE BARREL PIPE OVERCHUTES
STILLING BASIN

DESIGNED C. E. Nelson SUBMITTED Robert L. Jansen
DRAWN J. M. Wrobel RECOMMENDED Frank Rathye
CHECKED Dale Smith APPROVED R. R. Marsh
CHIEF, WATER CONVEYANCE BRANCH

DENVER, COLORADO, MARCH 4, 1979 | 344-D-582

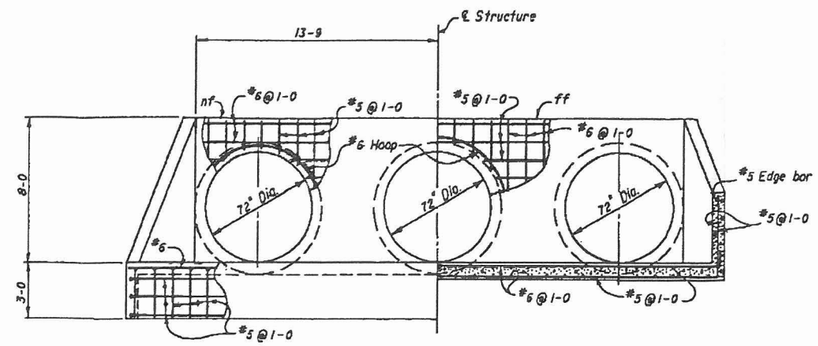
A-40

7-1239A (7-72)
Bureau of Reclamation

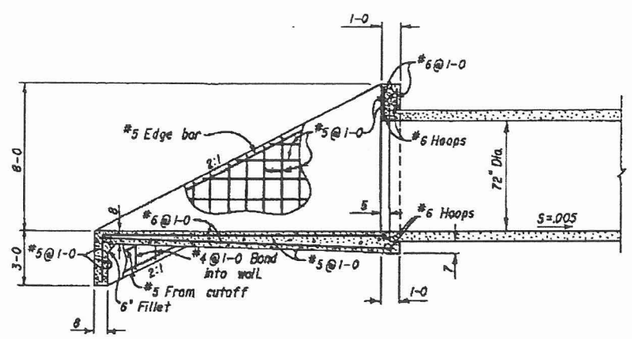


HALF PLAN

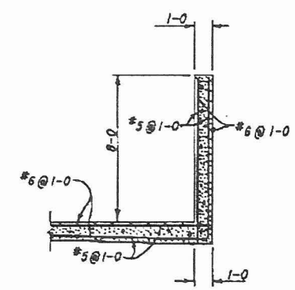
SCALE OF FEET



SECTION B-B



SECTION A-A



SECTION C-C

NOTE

For general notes, see 344-D-578.

6-17-80	AS BUILT BY 330, LTR. 4-15-80

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION-ARIZONA

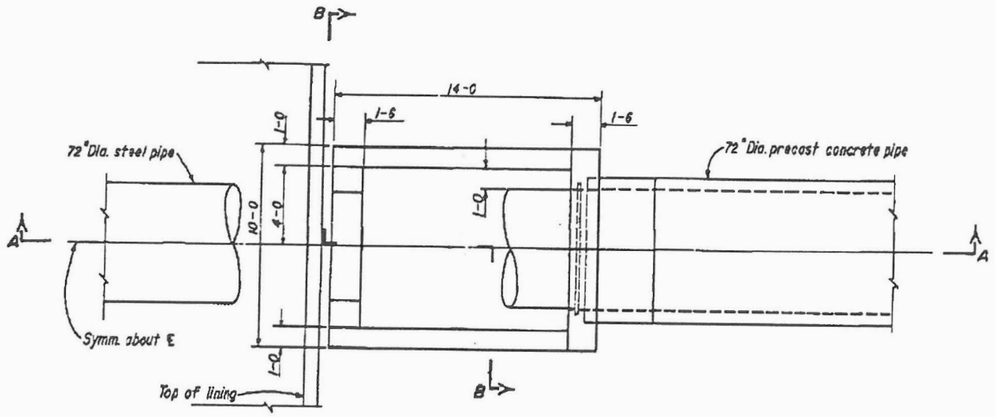
GRANITE REEF AQUEDUCT
REACH 9
72" DIA. THREE BARREL PIPE OVERCHUTES INLET TRANSITION

DESIGNED Q.J.Jones SUBMITTED Robert L. Vance
DRAWN R. Miller RECOMMENDED Frank Ritchey
CHECKED Dave Smith APPROVED R.C. Mellen
CHIEF, DESIGN CONSTRUCTION BRANCH

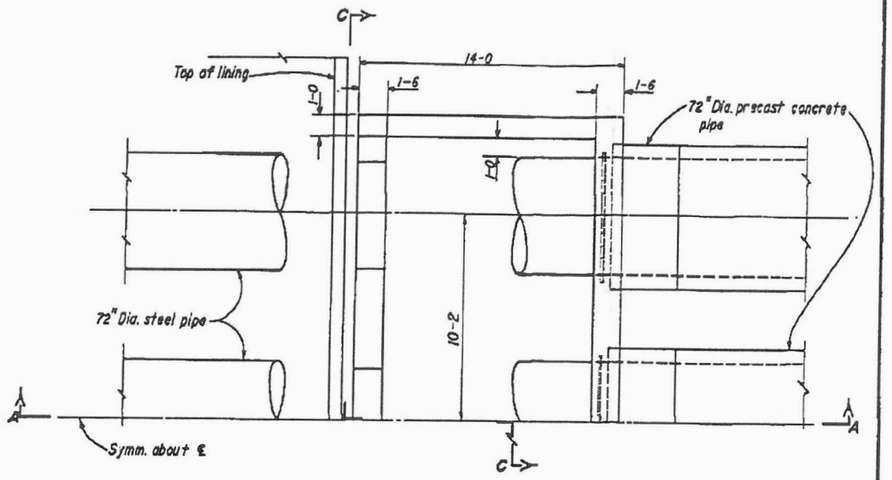
DENVER, COLORADO APRIL 1, 1970 | 344-D-583

A-41

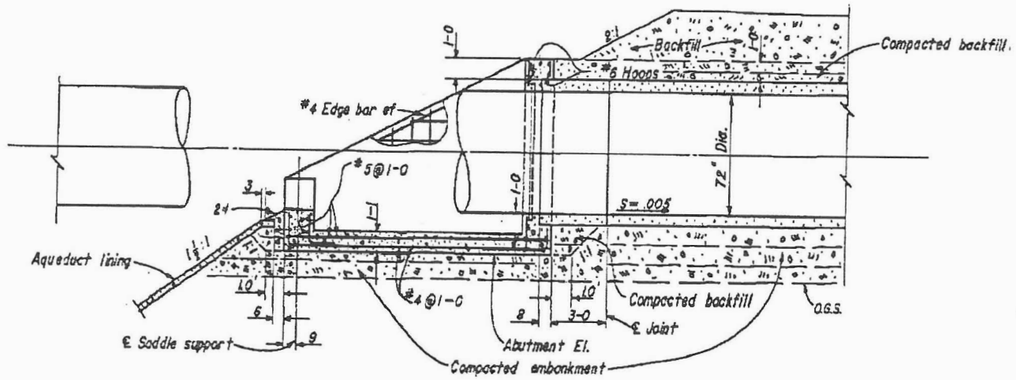
21" x 29"



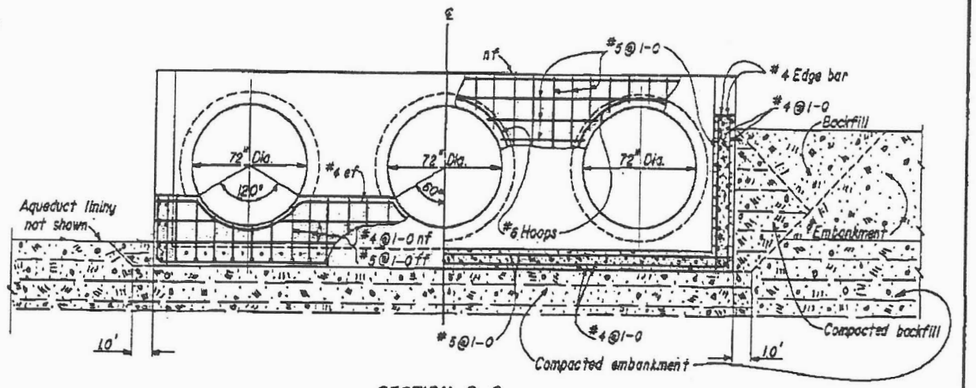
TYPICAL PLAN - SINGLE BARREL OVERCHUTE
OUTLET SHOWN - INLET SIMILAR



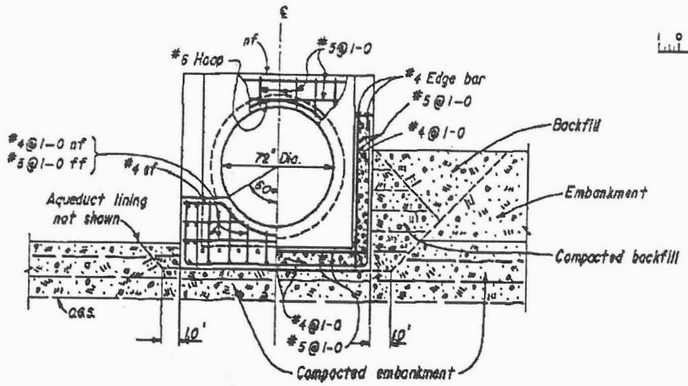
TYPICAL HALF PLAN - THREE BARREL OVERCHUTE
OUTLET SHOWN - INLET SIMILAR



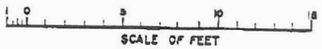
SECTION A-A



SECTION C-C



SECTION B-B



STATION	ABUTMENT EL.	
	INLET	OUTLET
36+12	1538.67	1538.13
52+80	1538.54	1538.00
85+70	1538.27	1537.73
119+70	1538.00	1537.46
159+50	1537.68	1537.14
180+50	1537.52	1536.98
190+60	1537.85	1537.30
216+80	1537.63	1537.08
240+00	1537.96	1537.40
253+00	1537.86	1537.30
272+35	1536.69	1536.15
279+00	1536.63	1536.09
298+70	1536.48	1535.94
315+00	1536.35	1535.81

NOTES

For general notes, see 344-D-578.
For steel pipe details, see 344-D-656.

6-17-80	AS BUILT BY 230, LTR. 6-16-80

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION - ARIZONA

GRANITE REEF AQUEDUCT
REACH 9
72" DIA. PIPE OVERCHUTES
ABUTMENTS

DESIGNED Q. L. Nelson SUBMITTED Robert A. Vance
DRAWN RECOMMENDED Forest Ritchey
CHECKED D. A. Smith APPROVED
CHIEF, WATER CONVEYANCE BRANCH

DENVER, COLORADO, MARCH 8, 1978 | 344-D-584

A-42

AVERY

JOB No

STORAGE POND

ANW #7158-07
FCD #99-12
Date 8/19/00

Podelford Wash FIS study

LOCATION: upstream of CAP Canal Dike and west of 163RD Ave. To Drainage Divide 2200'± To west

*Lowest Overchute Inlet El. **Calcs From 200 Scale Mapping

ELEVATION	PLANIMETER READING	SQ.IN.	AREA ACRES	AVE. AREA.	DEPTH FT.	VOLUME Ac.Ft.	ACCUM. VOL. Ac.ft
1541.09*			0				0
1542	0	0	0	0	0.91	0	0
1544	0.11	0.11	0.10	0.05	2	0.1	0.1
1546	1.63	1.63	1.50	0.8	2	1.6	1.7
1548	8.35	8.35	7.67	4.59	2	9.17	10.87
1549			12.18	9.93	1	9.93	20.80
1550	18.16	18.16	16.68	14.43	1	14.43	35.22
1552	29.42	29.42	27.02	21.85	2	43.7	78.92
1553			32.67	29.85	1	29.85	108.77
1554	41.73	41.73	38.32	35.50	1	35.50	144.27

JOB No

ANW# 7158-07

STORAGE POND

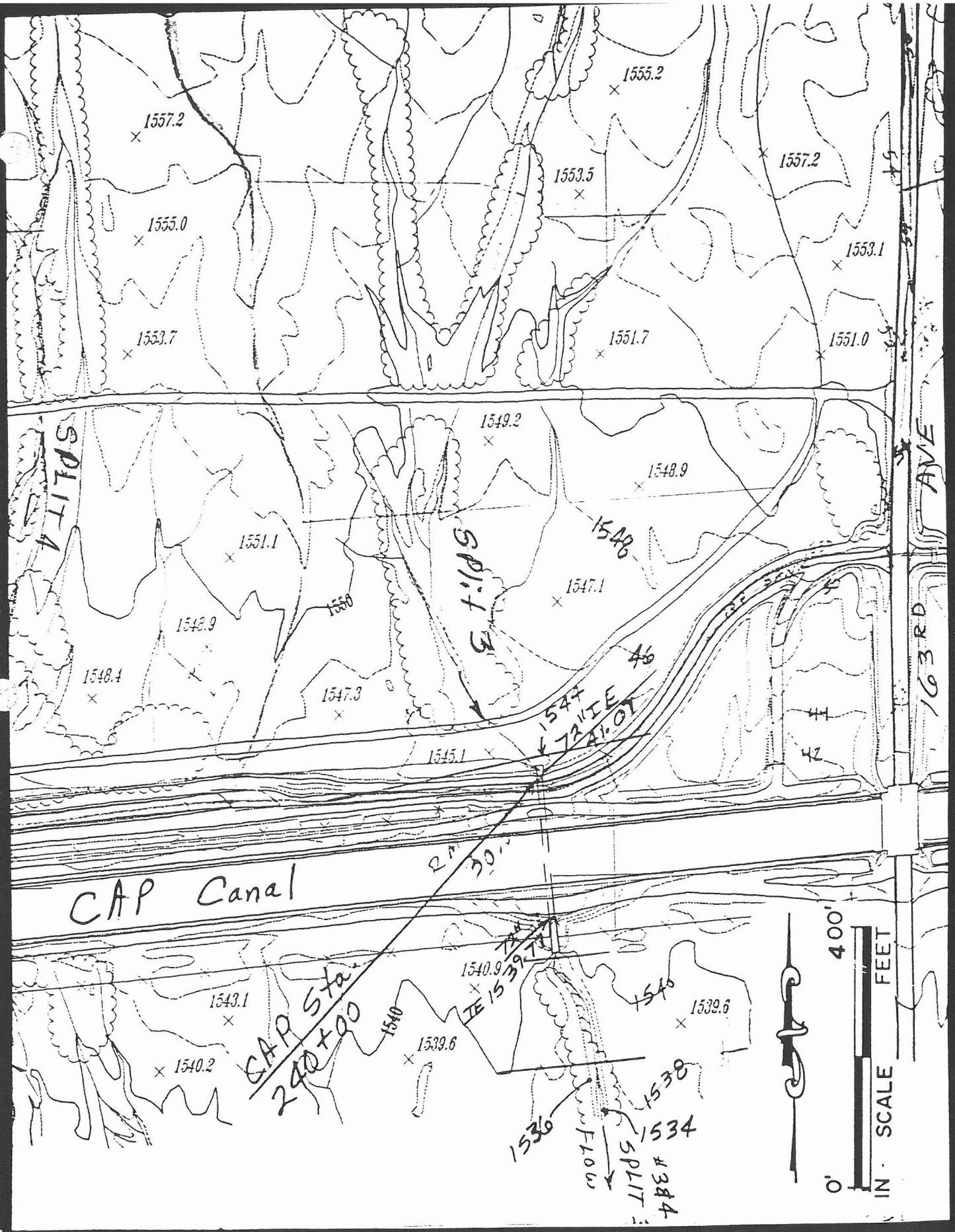
Padelford wash FIS study FCD# 99-12

Date: 8/19/00

LOCATION: Upstream of CAP Canal Dike and East of 163RD Ave

*Lowest Overchute Inlet I.E. **Calcs. From 200 Scale mapping

ELEVATION	PLANIMETER READING	SQ.IN.	AREA. ACRES	AVE. AREA.	DEPTH FT.	VOLUME Ac Ft.	ACCUM. VOL. Ac Ft
*1539.43			4.10				0
1540.0	6.526	6.526	5.99	5.05	0.57	2.88	2.88
1542.0	28.12	28.12	25.82	15.91	2	31.82	34.7
1544.0	60.01	60.01	55.11	40.47	2	80.94	115.64
1546.0	95.37	95.37	87.58	71.35	2	142.70	258.34
1548.0	120.96	120.96	111.07	99.33	2	198.66	457.0
1550.0	156.04	156.04	143.28	127.18	2	254.36	711.36
1552.0	187.31	187.31	172.00	157.64	2	315.28	1026.64
1553.0			185.87	178.93	1	178.93	1205.57
1554.0	217.51	217.51	199.73	192.8	1	192.80	1398.37
1556.0	250.78	250.78	230.28	215.01	2	430.01	1828.38



A-N WEST NO.7158-07
FCD.NO.99-12

EXPLANATION

SB36 SUBAREA BOUNDARY

PADELFORD WASH FIS

DRAINAGE CAP CANAL OVERCHUTE DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

A-N WEST INC.
Consulting Engineers

B-3

FIGURE CAP 24000

Culvert Designer/Analyzer Report
CAP24000

Analysis Component			
Storm Event	Design	Discharge	500.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	500.00 cfs	Check Discharge	500.00 cfs

Tailwater properties: Rectangular Channel			
Slope	0.500000 ft/ft	Mannings Coefficient	0.012
Depth	0.76 ft	Bottom Width	10.00 ft

Tailwater conditions for Design Storm.			
Discharge	500.00 cfs	Bottom Elevation	1,539.77 ft
Depth	0.76 ft	Velocity	66.15 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-72 inch Circular	500.00 cfs	1,557.52 ft	18.07 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
CAP24000

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,557.52 ft	Discharge	500.00 cfs
Inlet Control HW Elev	1,557.52 ft	Tailwater Elevation	1,540.53 ft
Outlet Control HW Elev	1,555.50 ft	Control Type	Inlet Control
Headwater Depth/ Height	2.74		

Grades			
Upstream Invert	1,541.07 ft	Downstream Invert	1,539.77 ft
Length	217.00 ft	Constructed Slope	0.005991 ft/ft

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	5.67 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	5.67 ft
Velocity Downstream	18.07 ft/s	Critical Slope	0.010273 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Concrete	Span	6.00 ft
Section Size	72 inch	Rise	6.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,555.50 ft	Upstream Velocity Head	4.86 ft
Ke	0.50	Entrance Loss	2.43 ft

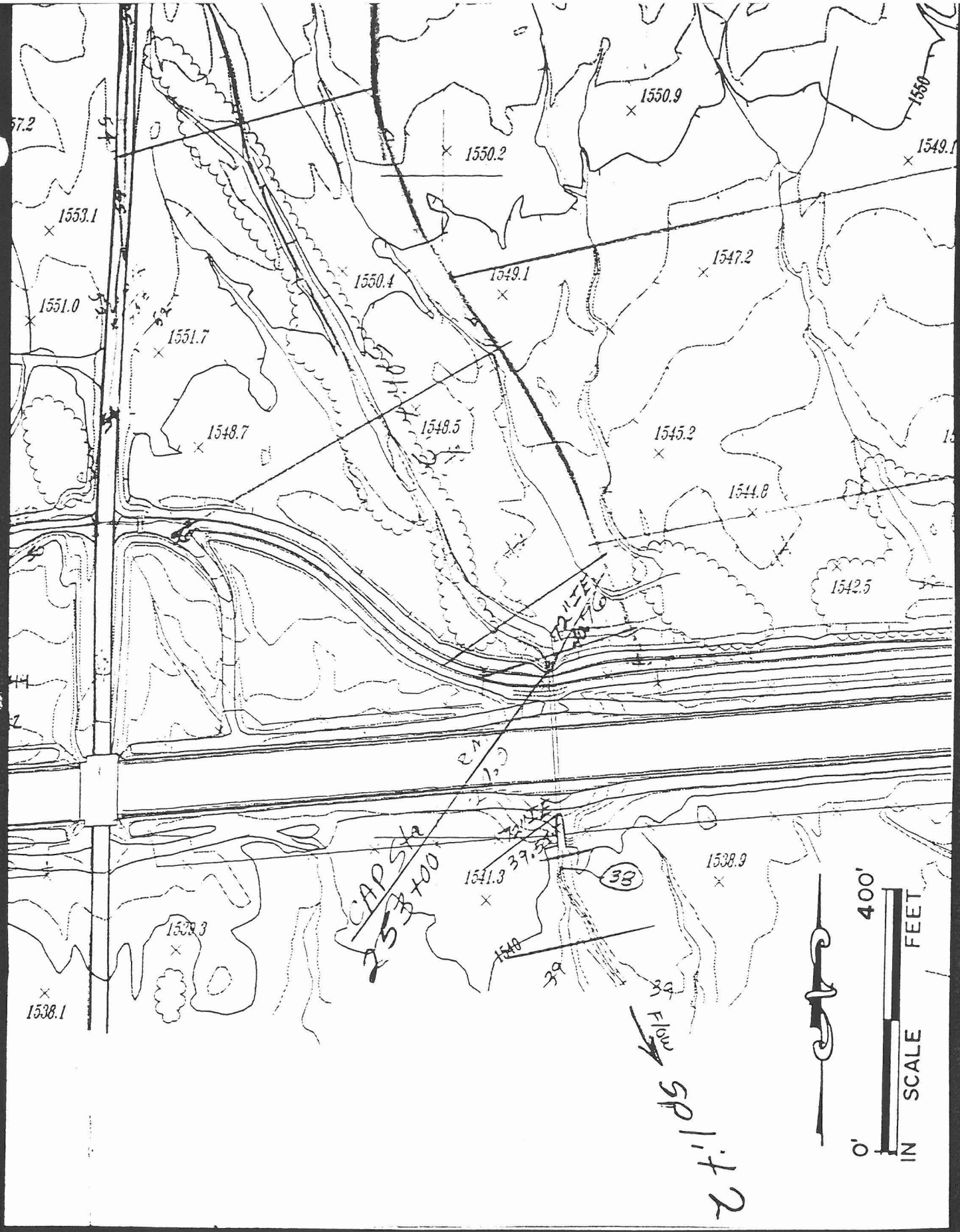
Inlet Control Properties			
Inlet Control HW Elev	1,557.52 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	28.3 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Rating Table Report
CAP24000

Range Data:

	Minimum	Maximum	Increment	
Discharge	0.00	500.00	25.00	cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo	(D) Dn V
0.00	1,539.77	1,539.77	1,539.77	0.00
25.00	1,543.08	1,542.84	1,543.08	7.24
50.00	1,543.97	1,543.64	1,543.97	8.87
75.00	1,544.68	1,544.30	1,544.68	9.86
100.00	1,545.31	1,544.90	1,545.31	10.60
125.00	1,545.88	1,545.46	1,545.88	11.22
150.00	1,546.42	1,546.00	1,546.42	11.74
175.00	1,546.94	1,546.54	1,546.94	12.19
200.00	1,547.45	1,547.06	1,547.45	12.60
225.00	1,547.95	1,547.63	1,547.95	12.98
250.00	1,548.45	1,548.21	1,548.45	13.32
275.00	1,548.96	1,548.84	1,548.96	13.63
300.00	1,549.55	1,549.55	1,549.47	13.90
325.00	1,550.33	1,550.33	1,549.99	14.14
350.00	1,551.17	1,551.17	1,550.54	14.30
375.00	1,552.07	1,552.07	1,551.06	14.38
400.00	1,553.04	1,553.04	1,551.64	15.06
425.00	1,554.06	1,554.06	1,552.59	15.77
450.00	1,555.15	1,555.15	1,553.54	16.51
475.00	1,556.30	1,556.30	1,554.50	17.28
500.00	1,557.52	1,557.52	1,555.50	18.07



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FCD.NO.99-12

A-N WEST INC.
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EXPLANATION

SB36 SUBAREA BOUNDARY

PADELFORD WASH FIS

DRAINAGE CAP CANAL OVERCHUTE DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

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FIGURE CAP25300

Culvert Designer/Analyzer Report
CAP25300

Analysis Component			
Storm Event	Design	Discharge	550.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	550.00 cfs	Check Discharge	500.00 cfs

Tailwater properties: Rectangular Channel			
Slope	0.500000 ft/ft	Mannings Coefficient	0.012
Depth	0.80 ft	Bottom Width	10.00 ft

Tailwater conditions for Design Storm.			
Discharge	550.00 cfs	Bottom Elevation	1,539.54 ft
Depth	0.80 ft	Velocity	68.49 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-72 inch Circular	550.00 cfs	1,559.82 ft	19.70 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
CAP25300

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,559.82 ft	Discharge	550.00 cfs
Inlet Control HW Elev	1,559.82 ft	Tailwater Elevation	1,540.34 ft
Outlet Control HW Elev	1,557.45 ft	Control Type	Inlet Control
Headwater Depth/ Height	3.18		

Grades			
Upstream Invert	1,540.76 ft	Downstream Invert	1,539.54 ft
Length	221.00 ft	Constructed Slope	0.005520 ft/ft

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	5.77 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	5.77 ft
Velocity Downstream	19.70 ft/s	Critical Slope	0.012535 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Concrete	Span	6.00 ft
Section Size	72 inch	Rise	6.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,557.45 ft	Upstream Velocity Head	5.88 ft
Ke	0.50	Entrance Loss	2.94 ft

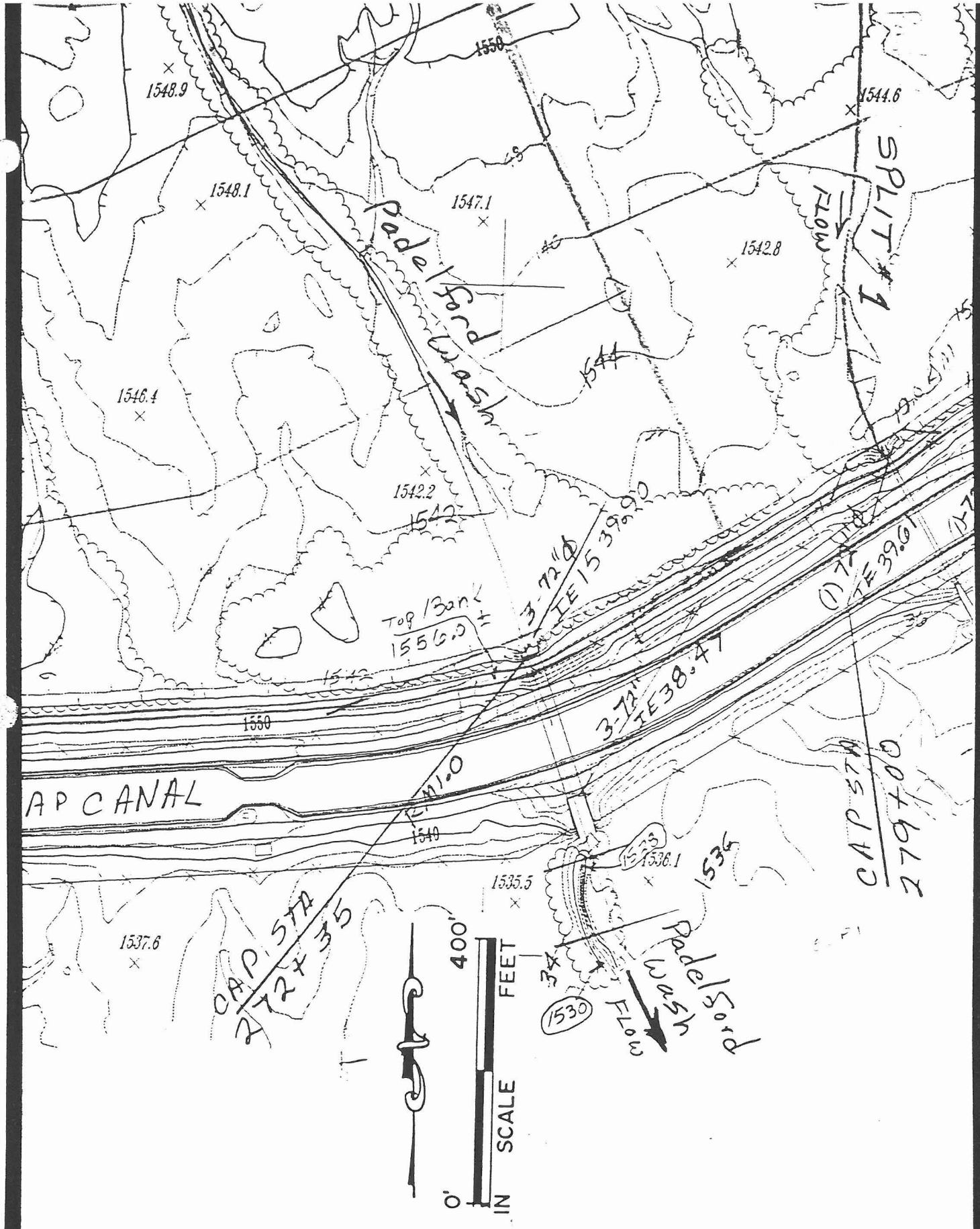
Inlet Control Properties			
Inlet Control HW Elev	1,559.82 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	28.3 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Rating Table Report
CAP25300

Range Data:

	Minimum	Maximum	Increment	
Discharge	0.00	550.00	50.00	cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo	(D) Dn V
0.00	1,539.54	1,539.54	1,539.54	0.00
50.00	1,543.66	1,543.33	1,543.66	8.52
100.00	1,545.00	1,544.59	1,545.00	10.34
150.00	1,546.11	1,545.70	1,546.11	11.46
200.00	1,547.14	1,546.78	1,547.14	12.31
250.00	1,548.14	1,547.90	1,548.14	12.99
300.00	1,549.24	1,549.24	1,549.16	13.53
350.00	1,550.86	1,550.86	1,550.22	13.74
400.00	1,552.73	1,552.73	1,551.48	15.06
450.00	1,554.84	1,554.84	1,553.36	16.51
500.00	1,557.21	1,557.21	1,555.32	18.07
550.00	1,559.82	1,559.82	1,557.45	19.70



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EXPLANATION

SB36 SUBAREA BOUNDARY

PADELFORD WASH FIS

DRAINAGE CAP CANAL OVERCHUTE DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

FIGURE CAP 272 35

Culvert Designer/Analyzer Report
CAP27235

Analysis Component			
Storm Event	Design	Discharge	1,550.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,550.00 cfs	Check Discharge	1,250.00 cfs

Tailwater properties: Rectangular Channel			
Slope	0.500000 ft/ft	Mannings Coefficient	0.012
Depth	0.79 ft	Bottom Width	27.00 ft

Tailwater conditions for Design Storm.			
Discharge	1,550.00 cfs	Bottom Elevation	1,538.47 ft
Depth	0.79 ft	Velocity	72.28 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-72 inch Circular	1,550.00 cfs	1,557.19 ft	18.61 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
CAP27235

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,557.19 ft	Discharge	1,550.00 cfs
Inlet Control HW Elev	1,557.19 ft	Tailwater Elevation	1,539.26 ft
Outlet Control HW Elev	1,554.95 ft	Control Type	Inlet Control
Headwater Depth/ Height	2.88		

Grades			
Upstream Invert	1,539.90 ft	Downstream Invert	1,538.47 ft
Length	222.30 ft	Constructed Slope	0.006433 ft/ft

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	5.71 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	5.71 ft
Velocity Downstream	18.61 ft/s	Critical Slope	0.010991 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Concrete	Span	6.00 ft
Section Size	72 inch	Rise	6.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev	1,554.95 ft	Upstream Velocity Head	5.19 ft
Ke	0.50	Entrance Loss	2.59 ft

Inlet Control Properties			
Inlet Control HW Elev	1,557.19 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	84.8 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

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Rating Table Report
CAP27235

Range Data:

	Minimum	Maximum	Increment	
Discharge	0.00	1,550.00	50.00	cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo	(D) Dn V
0.00	1,538.47	1,538.47	1,538.47	0.00
50.00	1,541.53	1,541.32	1,541.53	6.59
100.00	1,542.23	1,541.96	1,542.23	8.08
150.00	1,542.80	1,542.47	1,542.80	9.09
200.00	1,543.28	1,542.92	1,543.28	9.80
250.00	1,543.73	1,543.33	1,543.73	10.37
300.00	1,544.14	1,543.72	1,544.14	10.85
350.00	1,544.52	1,544.10	1,544.52	11.28
400.00	1,544.89	1,544.47	1,544.89	11.66
450.00	1,545.25	1,544.83	1,545.25	12.01
500.00	1,545.60	1,545.19	1,545.60	12.32
550.00	1,545.94	1,545.55	1,545.94	12.61
600.00	1,546.28	1,545.91	1,546.28	12.89
650.00	1,546.61	1,546.28	1,546.61	13.14
700.00	1,546.95	1,546.64	1,546.95	13.39
750.00	1,547.28	1,547.04	1,547.28	13.61
800.00	1,547.62	1,547.46	1,547.62	13.83
850.00	1,547.96	1,547.80	1,547.96	14.04
900.00	1,548.38	1,548.38	1,548.30	14.23
950.00	1,548.89	1,548.89	1,548.85	14.41
1,000.00	1,549.43	1,549.43	1,549.00	14.57
1,050.00	1,550.00	1,550.00	1,549.37	14.70
1,100.00	1,550.59	1,550.59	1,549.74	14.80
1,150.00	1,551.22	1,551.22	1,550.13	14.77
1,200.00	1,551.87	1,551.87	1,550.44	15.06
1,250.00	1,552.54	1,552.54	1,550.94	15.53
1,300.00	1,553.25	1,553.25	1,551.63	16.01
1,350.00	1,553.98	1,553.98	1,552.28	16.51
1,400.00	1,554.74	1,554.74	1,552.93	17.02
1,450.00	1,555.53	1,555.53	1,553.59	17.54
1,500.00	1,556.35	1,556.35	1,554.26	18.07
1,550.00	1,557.19	1,557.19	1,554.95	18.61

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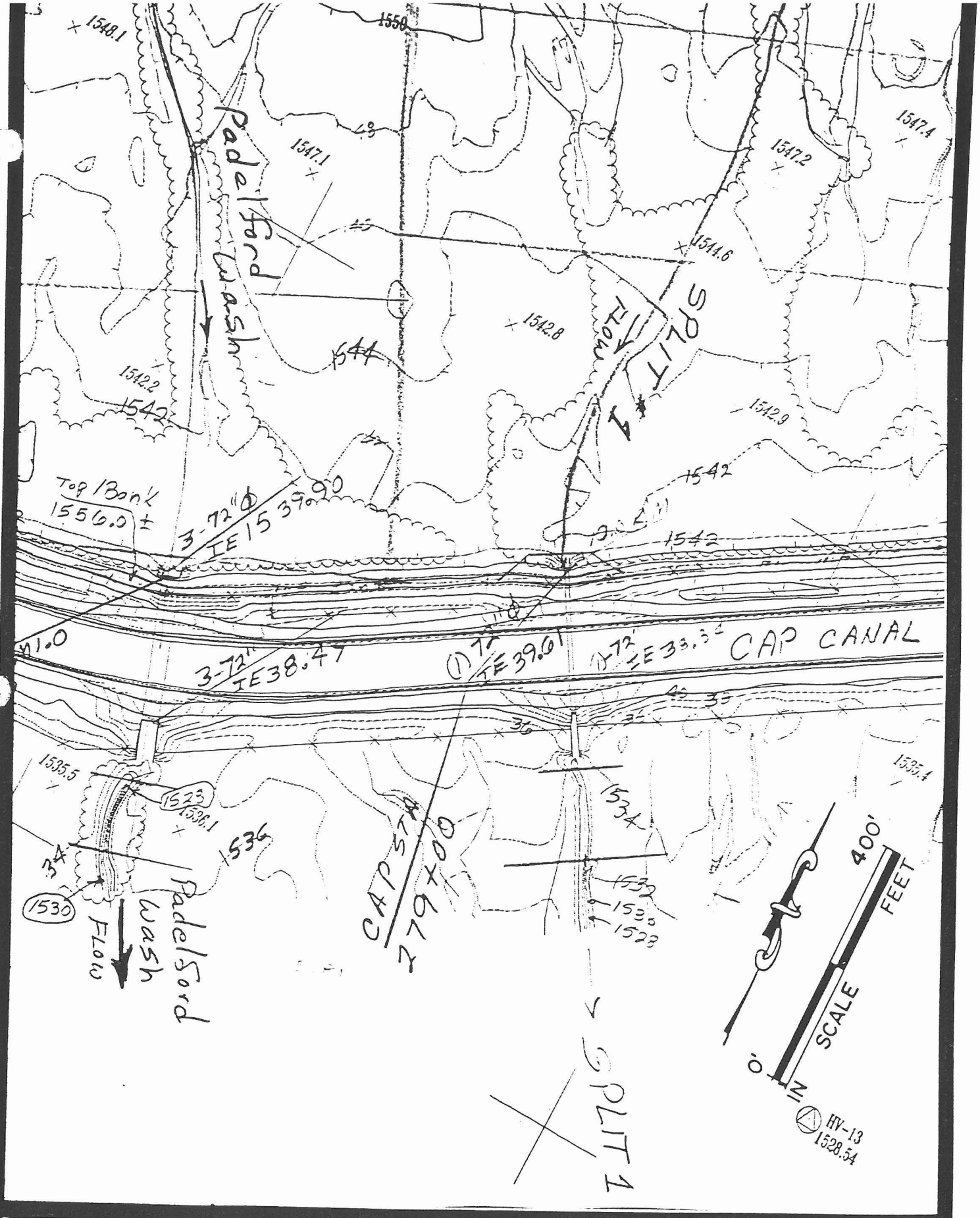

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A-N WEST INC.
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EXPLANATION

SB36 SUBAREA BOUNDARY

PADELFORD WASH FIS

DRAINAGE CAP CANAL OVERCHUTE DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

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FIGURE CAP 27900

Culvert Designer/Analyzer Report

~~CAP27000~~
CAP 279+00

Analysis Component			
Storm Event	Design	Discharge	550.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	550.00 cfs	Check Discharge	500.00 cfs

Tailwater properties: Rectangular Channel			
Slope	0.500000 ft/ft	Mannings Coefficient	0.012
Depth	0.80 ft	Bottom Width	10.00 ft

Tailwater conditions for Design Storm.			
Discharge	550.00 cfs	Bottom Elevation	1,538.34 ft
Depth	0.80 ft	Velocity	68.49 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-72 inch Circular	550.00 cfs	1,558.67 ft	19.70 ft/s
Weir	Not Considered	N/A	N/A	N/A

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Culvert Designer/Analyzer Report

~~CAP27000~~

CAP 279+00

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,558.67 ft	Discharge	550.00 cfs
Inlet Control HW Elev	1,558.67 ft	Tailwater Elevation	1,539.14 ft
Outlet Control HW Elev	1,556.27 ft	Control Type	Inlet Control
Headwater Depth/ Height	3.18		

Grades			
Upstream Invert	1,539.61 ft	Downstream Invert	1,538.34 ft
Length	222.30 ft	Constructed Slope	0.005713 ft/ft

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	5.77 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	5.77 ft
Velocity Downstream	19.70 ft/s	Critical Slope	0.012535 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Concrete	Span	6.00 ft
Section Size	72 inch	Rise	6.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,556.27 ft	Upstream Velocity Head	5.88 ft
Ke	0.50	Entrance Loss	2.94 ft

Inlet Control Properties			
Inlet Control HW Elev	1,558.67 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	28.3 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

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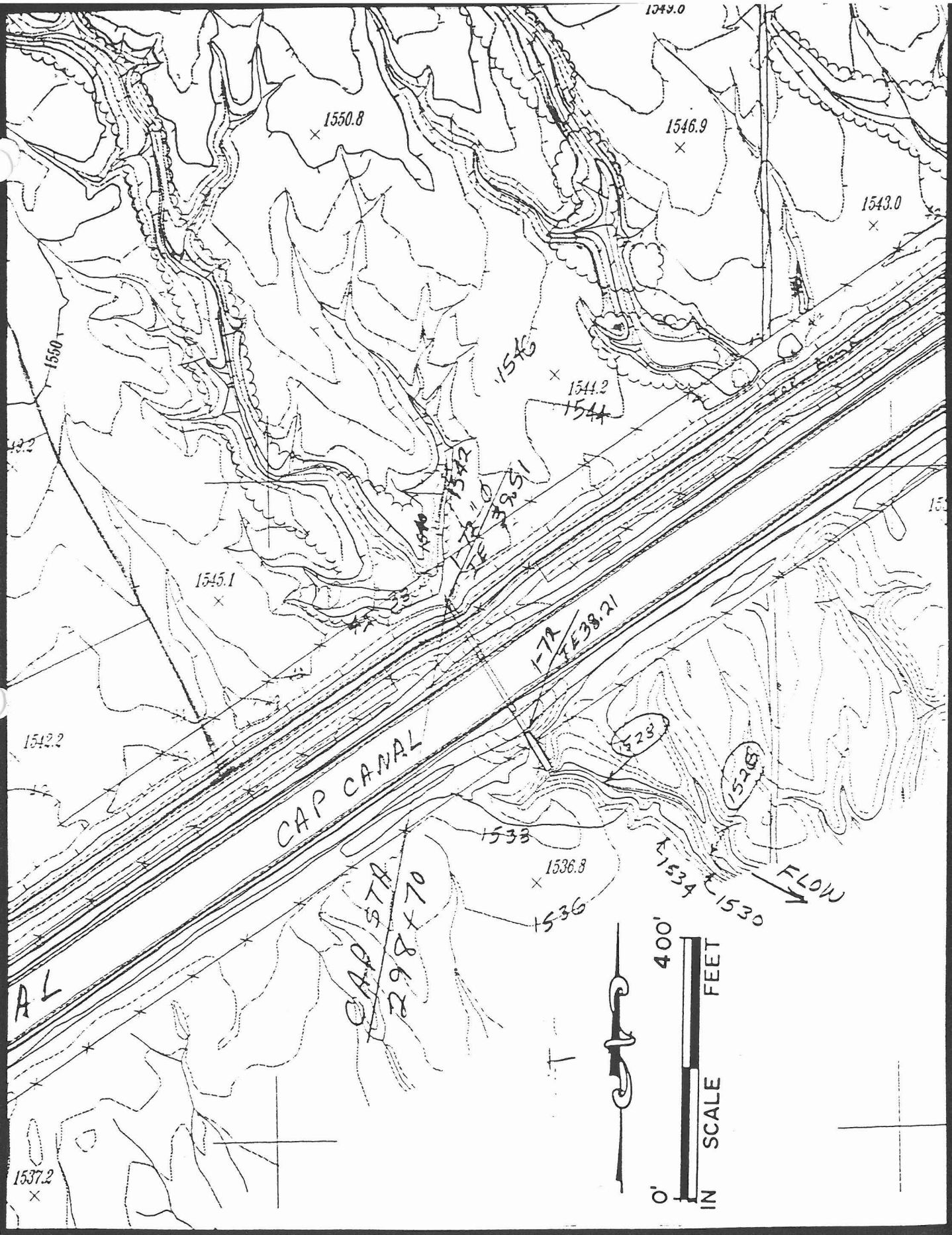
Rating Table Report

~~CAP27000~~
CAP 279+00

Range Data:

	Minimum	Maximum	Increment
Discharge	0.00	550.00	50.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo	(D) Dn V
0.00	1,538.34	1,538.34	1,538.34	0.00
50.00	1,542.51	1,542.18	1,542.51	8.72
100.00	1,543.85	1,543.44	1,543.85	10.46
150.00	1,544.96	1,544.55	1,544.96	11.58
200.00	1,545.99	1,545.62	1,545.99	12.44
250.00	1,546.99	1,546.75	1,546.99	13.14
300.00	1,548.09	1,548.09	1,548.01	13.69
350.00	1,549.71	1,549.71	1,549.08	13.99
400.00	1,551.58	1,551.58	1,550.25	15.06
450.00	1,553.69	1,553.69	1,552.16	16.51
500.00	1,556.06	1,556.06	1,554.13	18.07
550.00	1,558.67	1,558.67	1,556.27	19.70



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EXPLANATION

SB36 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

DRAINAGE CAP CANAL OVERCHUTE DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

A-N WEST INC.
Consulting Engineers

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FIGURE CAP 28970

Culvert Designer/Analyzer Report
CAP29870

Analysis Component			
Storm Event	Design	Discharge	550.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	550.00 cfs	Check Discharge	400.00 cfs

Tailwater properties: Rectangular Channel			
Slope	0.500000 ft/ft	Mannings Coefficient	0.012
Depth	0.80 ft	Bottom Width	10.00 ft

Tailwater conditions for Design Storm.			
Discharge	550.00 cfs	Bottom Elevation	1,538.21 ft
Depth	0.80 ft	Velocity	68.49 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-72 inch Circular	550.00 cfs	1,559.57 ft	19.70 ft/s
Weir	Not Considered	N/A	N/A	N/A

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Culvert Designer/Analyzer Report
CAP29870

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,558.57 ft	Discharge	550.00 cfs
Inlet Control HW Elev	1,558.57 ft	Tailwater Elevation	1,539.01 ft
Outlet Control HW Elev	1,556.15 ft	Control Type	Inlet Control
Headwater Depth/ Height	3.18		

Grades			
Upstream Invert	1,539.51 ft	Downstream Invert	1,538.21 ft
Length	223.30 ft	Constructed Slope	0.005822 ft/ft

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	5.77 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	5.77 ft
Velocity Downstream	19.70 ft/s	Critical Slope	0.012535 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	Concrete	Span	6.00 ft
Section Size	72 inch	Rise	6.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,556.15 ft	Upstream Velocity Head	5.88 ft
Ke	0.50	Entrance Loss	2.94 ft

Inlet Control Properties			
Inlet Control HW Elev	1,558.57 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	28.3 ft^2
K	0.00930	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

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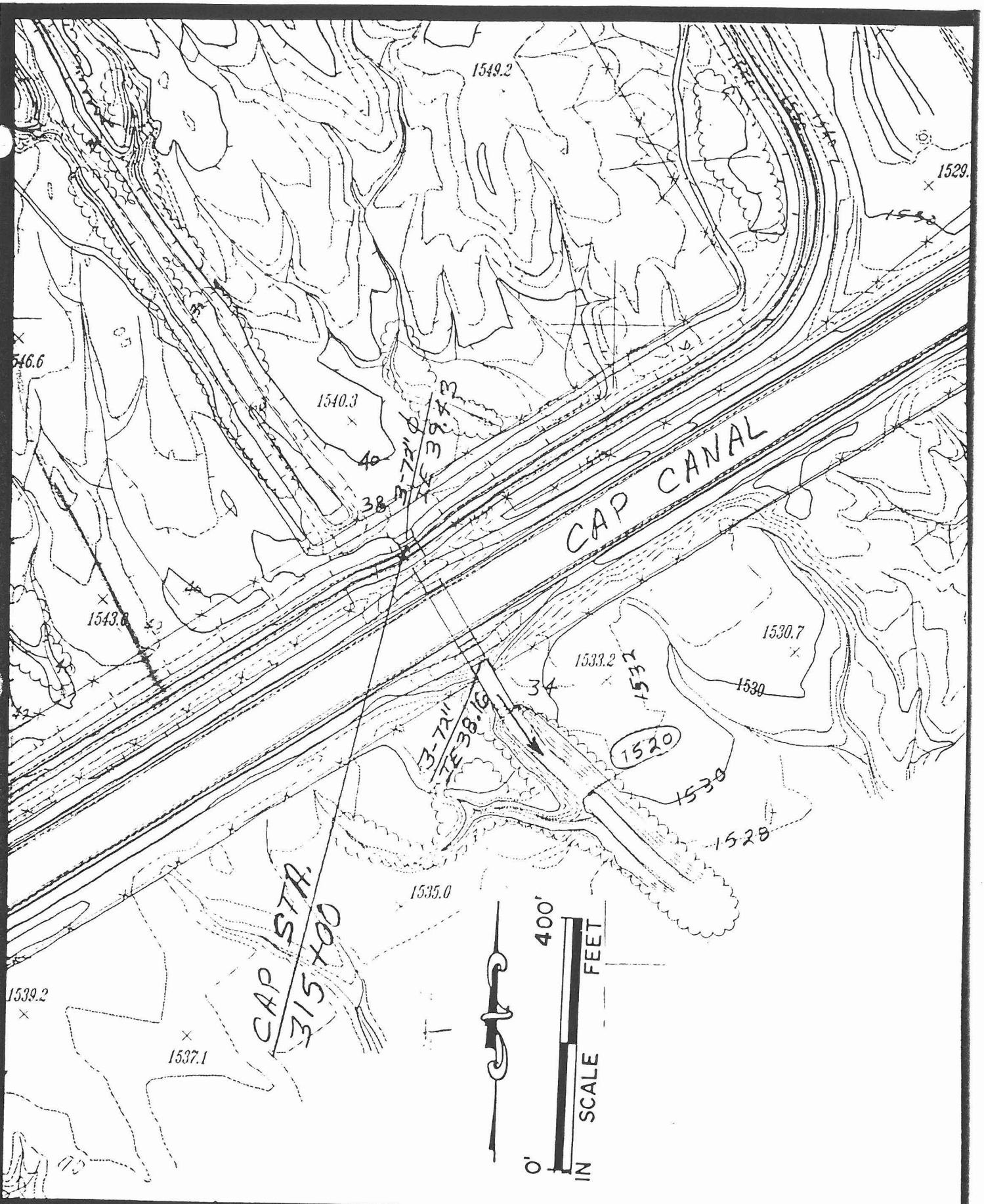
Rating Table Report
CAP29870

Range Data:

	Minimum	Maximum	Increment
Discharge	0.00	550.00	50.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo	(D) Dn V
0.00	1,538.21	1,538.21	1,538.21	0.00
50.00	1,542.41	1,542.08	1,542.41	8.78
100.00	1,543.75	1,543.34	1,543.75	10.52
150.00	1,544.86	1,544.45	1,544.86	11.65
200.00	1,545.89	1,545.52	1,545.89	12.51
250.00	1,546.89	1,546.65	1,546.89	13.21
300.00	1,547.99	1,547.99	1,547.91	13.78
350.00	1,549.61	1,549.61	1,548.98	14.11
400.00	1,551.48	1,551.48	1,550.12	15.06
450.00	1,553.59	1,553.59	1,552.04	16.51
500.00	1,555.96	1,555.96	1,554.02	18.07
550.00	1,558.57	1,558.57	1,556.15	19.70



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EXPLANATION

SB 31 — DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

DRAINAGE CAP CANAL OVERCHUTE DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

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FIGURE CAP31500

Culvert Designer/Analyzer Report
CAP31500

Analysis Component			
Storm Event	Design	Discharge	1,550.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,550.00 cfs	Check Discharge	1,250.00 cfs

Tailwater properties: Rectangular Channel			
Slope	0.500000 ft/ft	Mannings Coefficient	0.012
Depth	0.79 ft	Bottom Width	27.00 ft

Tailwater conditions for Design Storm.			
Discharge	1,550.00 cfs	Bottom Elevation	1,538.16 ft
Depth	0.79 ft	Velocity	72.28 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-72 inch Circular	1,550.00 cfs	1,556.72 ft	18.61 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
CAP31500

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	1,558.72	ft	Discharge	1,550.00	cfs
Inlet Control HW Elev	1,558.72	ft	Tailwater Elevation	1,538.95	ft
Outlet Control HW Elev	1,554.66	ft	Control Type	Inlet Control	
Headwater Depth/ Height	2.88				

Grades					
Upstream Invert	1,539.43	ft	Downstream Invert	1,538.16	ft
Length	223.30	ft	Constructed Slope	0.005687	ft/ft

Hydraulic Profile					
Profile	CompositeM2Pressure		Depth, Downstream	5.71	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	5.71	ft
Velocity Downstream	18.61	ft/s	Critical Slope	0.010991	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Concrete		Span	6.00	ft
Section Size	72 inch		Rise	6.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev	1,554.66	ft	Upstream Velocity Head	5.19	ft
Ke	0.50		Entrance Loss	2.59	ft

Inlet Control Properties					
Inlet Control HW Elev	1,558.72	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	84.8	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

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Rating Table Report
CAP31500

Range Data:

	Minimum	Maximum	Increment
Discharge	0.00	1,550.00	50.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo	(D) Dn V
0.00	1,538.16	1,538.16	1,538.16	0.00
50.00	1,541.06	1,540.86	1,541.06	6.31
100.00	1,541.76	1,541.49	1,541.76	7.74
150.00	1,542.33	1,542.00	1,542.33	8.71
200.00	1,542.81	1,542.45	1,542.81	9.41
250.00	1,543.26	1,542.86	1,543.26	9.97
300.00	1,543.67	1,543.26	1,543.67	10.44
350.00	1,544.05	1,543.63	1,544.05	10.86
400.00	1,544.42	1,544.00	1,544.42	11.23
450.00	1,544.78	1,544.37	1,544.78	11.57
500.00	1,545.13	1,544.73	1,545.13	11.87
550.00	1,545.47	1,545.08	1,545.47	12.16
600.00	1,545.81	1,545.45	1,545.81	12.42
650.00	1,546.14	1,545.81	1,546.14	12.67
700.00	1,546.48	1,546.17	1,546.48	12.90
750.00	1,546.81	1,546.57	1,546.81	13.12
800.00	1,547.15	1,546.99	1,547.15	13.32
850.00	1,547.49	1,547.43	1,547.49	13.51
900.00	1,547.91	1,547.91	1,547.83	13.67
950.00	1,548.43	1,548.43	1,548.18	13.82
1,000.00	1,548.96	1,548.96	1,548.53	13.93
1,050.00	1,549.53	1,549.53	1,548.90	13.94
1,100.00	1,550.13	1,550.13	1,549.21	14.16
1,150.00	1,550.75	1,550.75	1,549.58	14.60
1,200.00	1,551.40	1,551.40	1,550.08	15.06
1,250.00	1,552.08	1,552.08	1,550.74	15.53
1,300.00	1,552.78	1,552.78	1,551.36	16.01
1,350.00	1,553.51	1,553.51	1,551.99	16.51
1,400.00	1,554.27	1,554.27	1,552.64	17.02
1,450.00	1,555.06	1,555.06	1,553.29	17.54
1,500.00	1,555.88	1,555.88	1,553.97	18.07
1,550.00	1,556.72	1,556.72	1,554.66	18.61

HWEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project 1128-01 Sht. ___ of ___
Padelford Wash FIS
Calc. By GAS Date 9/8/00
FCD No 99-12
Chkd. ___ Date ___

Retention / Detention Basin Data

LOCATION: From 2200'± West of 163RD Ave, To 163RD Ave. & North of CAP Canal
CAP Sta 240+00

INFLOW I.D. NO.: CO 400

OUTFLOW I.D. NO: DR 400

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS) CAP 240+00	SPILLWAY DISCHGE (CFS)	TOTAL DISCHARGE CFS
1541.09	0	0	0	Weir Flow To	0
~~1542~~	~~0~~	~~0~~	~~8.2~~	East By	
1544	0.10	0.10	51.1	Attached Normal	51.1
1546	1.50	1.7	130.6	Depth Calcs	130.6
1548	7.67	10.87	227.5	By Flowmaster	227.5
(1) 1549	12.18	20.80	276.7		276.7
1550	16.68	35.22	314.4		314.4
1552	27.02	78.92	373.1		373.1
(2) 1553	32.67	108.77	399.0		399.0
1554	38.32	144.27	423.5	200	623.5
1556	40.81	223.40	468.5	2150	2618.5
1556.5	41.4	244.0	479.1	3050	3529.1
1557			491	4050	4541

Notes: 1.) Breakout To West Along CAP Begins at El. 1549±
2.) Breakout To East over 163RD Ave Begins at El. 1553±

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir Storage									
SV 0.0	0.10	1.7	10.87	20.82	35.22	78.92	108.77	144.27	223.4
SQ Record - Discharge									244.0
SQ 0	51.1	130.6	227.5	276.7	314.4	373.1	399.0	623.5	2618.5
SE Record - Elevation									3529.1
SE 1541.1	1544.0	1546.0	1548.0	1549.0	1550.0	1552.0	1553.0	1554.0	1556.0
SS Record - Spillway Characteristics									1556.5
SS			N/A						
ST Record - Top of Dam Overflow									
ST			N/A						

Worksheet
Worksheet for Irregular Channel

Project Description	
Project File	c:\fmw\padel1.fm2
Worksheet	WEIR FLOW OVER 163RD AVE.WEST TO EAST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.020000 ft/ft

Elevation range: 1553.00 ft to 1556.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1556.00	0.00	701.00	0.015
300.00	1554.00			
400.00	1553.00			
540.00	1554.00			
700.00	1555.50			
701.00	1556.00			

Discharge 200.00 ft^3/s ← Q = 200

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	1553.54	ft
Flow Area	34.38	ft^2
Wetted Perimeter	128.46	ft
Top Width	128.46	ft
Depth	0.54	ft
Critical Water Elev.	1553.70	ft
Critical Slope	0.004644	ft/ft
Velocity	5.82	ft/s
Velocity Head	0.53	ft
Specific Energy	1554.06	ft
Froude Number	1.98	
Full Flow Capacity	20814.59	ft^3/s

Flow is supercritical.

Energy Grade = Ponded water El. at CAP Corresponding to 200 CFS weiring over 163RD Ave at Q = 200 cfs

Worksheet
Worksheet for Irregular Channel

Project Description	
Project File	c:\fmw\padel1.fm2
Worksheet	WEIR FLOW OVER 163RD AVE.WEST TO EAST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.020000 ft/ft

Elevation range: 1553.00 ft to 1556.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1556.00	0.00	701.00	0.015
300.00	1554.00			
400.00	1553.00			
540.00	1554.00			
700.00	1555.50			
701.00	1556.00			

Discharge 2150.00 ft^3/s

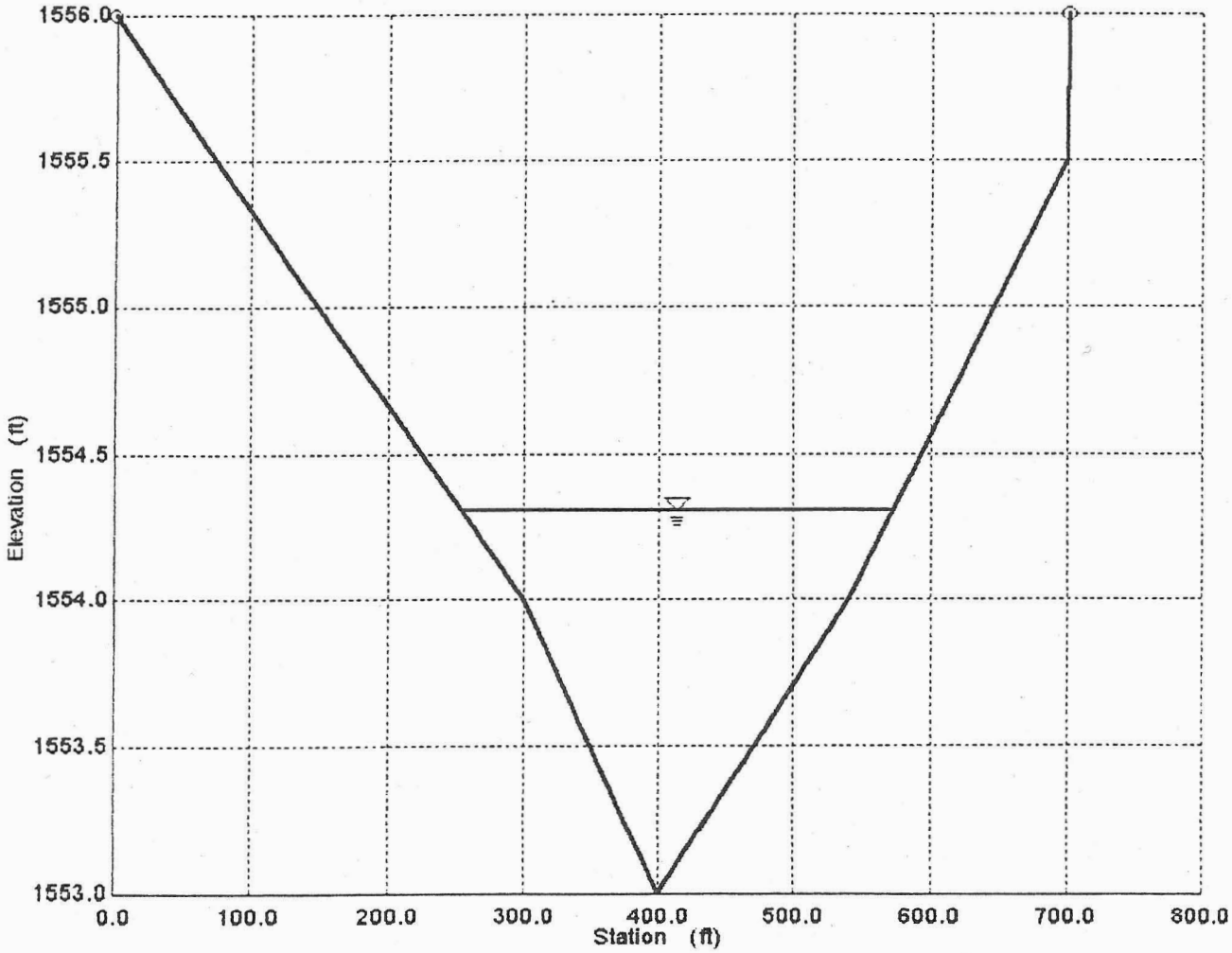
Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	1554.31	ft
Flow Area	205.55	ft^2
Wetted Perimeter	318.63	ft
Top Width	318.62	ft
Depth	1.31	ft
Critical Water Elev.	1554.82	ft
Critical Slope	0.003405	ft/ft
Velocity	10.46	ft/s
Velocity Head	1.70	ft
Specific Energy	1556.01	ft
Froude Number	2.30	
Full Flow Capacity	20814.59	ft^3/s
Flow is supercritical.		

Energy Grade = 1556.0 or Ponded WSEL at Q = 2150 cfs over 163RD Ave

Cross Section
Cross Section for Irregular Channel

Project Description	
Project File	c:\fmw\padel1.fm2
Worksheet	WEIR FLOW OVER 163RD AVE.WEST TO EAST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.015	
Channel Slope	0.020000	ft/ft
Water Surface Elevation	1554.31	ft
Discharge	2150.00	ft^3/s



Worksheet
Worksheet for Irregular Channel

Project Description	
Project File	c:\fmw\padel1.fm2
Worksheet	WEIR FLOW OVER 163RD AVE.WEST TO EAST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.020000 ft/ft

Elevation range: 1553.00 ft to 1556.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1556.00	0.00	701.00	0.015
300.00	1554.00			
400.00	1553.00			
540.00	1554.00			
700.00	1555.50			
701.00	1556.00			

Discharge 3050.00 ft^3/s — Q= 3050 CFS

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	1554.49	ft
Flow Area	267.80	ft^2
Wetted Perimeter	365.35	ft
Top Width	365.34	ft
Depth	1.49	ft
Critical Water Elev.	1555.08	ft
Critical Slope	0.003252	ft/ft
Velocity	11.39	ft/s
Velocity Head	2.02	ft
Specific Energy	1556.50	ft
Froude Number	2.35	
Full Flow Capacity	20814.59	ft^3/s

Flow is supercritical.

Ponded or Energy Grade at Canal for 3050 CFS weiring over 163RD Ave

Worksheet
Worksheet for Irregular Channel

Project Description	
Project File	c:\fmw\padel1.fm2
Worksheet	WEIR FLOW OVER 163RD AVE.WEST TO EAST
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.020000 ft/ft

Elevation range: 1553.00 ft to 1556.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1556.00	0.00	701.00	0.015
300.00	1554.00			
400.00	1553.00			
540.00	1554.00			
700.00	1555.50			
701.00	1556.00			
Discharge	4050.00 ft³/s			

Q = 4050 cfs

Results		
Wtd. Mannings Coefficient	0.015	
Water Surface Elevation	1554.65	ft
Flow Area	331.74	ft²
Wetted Perimeter	407.81	ft
Top Width	407.79	ft
Depth	1.65	ft
Critical Water Elev.	1555.33	ft
Critical Slope	0.003133	ft/ft
Velocity	12.21	ft/s
Velocity Head	2.32	ft
Specific Energy	1556.97	ft
Froude Number	2.39	
Full Flow Capacity	20814.59	ft³/s
Flow is supercritical.		

Ponded or E.G.L at Canal For 4050 cfs Weiring Over 163RD Ave.

HWEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project 11 3 8 - 01 Sht. ___ of ___
Pedelford Wash FIS Calc. By SGAS Date 9/8/00
FCD No 99-12 Chkd. ___ Date ___

Retention / Detention Basin Data

LOCATION: East of 163RD Ave & N. of CAP CANAL

INFLOW I.D. NO.: CO 501

OUTFLOW I.D. NO: DR 500

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS) 253+00	272+35	279+00	298+70	315+00	TOTAL DISCHARGE CFS
1539.43	4.11		0	0	0	0	0	0
1540	5.99	2.88	5.6	25.0	31.9	23.1	31.7	117.3
1542	25.82	34.7	29.9	83.6	43.9	49.0	121.1	327.5
1544	55.11	115.64	62.7	282.9	106.8	111.3	343.4	907.1
1546	87.58	258.34	145.0	558.8	200.5	205.5	628.8	1738.6
1548	111.07	457.0	243.0	850.8	302.8	300.3	908.7	2605.6
1550	143.28	711.36	322.8	1050.0	357.8	360.4	1089.2	3180.2
1552	172.00	1026.64	380.3	1209.7	410.0	412.3	1244.1	3656.4
(1) 1553	185.87	1205.57	406.4	1282.4	433.6	436.0	1315.1	3873.5
(2) 1554	199.73	1398.37	430.1	1351.3	456.5	458.6	1382.2	4078.7
1556	230.23	1828.38	474.5	1478.7	498.7	500.8	1507.1	4459.8

Notes: 1.) Breakout To West over 163RD Ave Begins at El. 53.0±
2.) Breakout To East over Berm Begins at El. 54.

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir Storage									
SV 0	2.88	34.7	115.64	258.34	457.0	711.36	1026.64	1205.57	1398.37
SQ Record - Discharge									
SQ 0	117.3	327.5	907.1	1738.6	2605.6	3180.2	3656.4	3873.5	4078.7
SE Record - Elevation									
SE 1539.43	1540	1542	1544	1546	1548	1550	1552	1553	1554
SS Record - Spillway Characteristics									
SS			N/A						
ST Record - Top of Dam Overflow									
ST			N/A						

Splitflow Relationships To Each CAP structure, East of 163rd Ave

	CAP Canal Over Chute Structure Sta.							
	253+00		272+35		279+00		298+70	315+00
ELEV.	DV 2 (cfs)	DV 2-6 (cfs)	DV 3 (cfs)	DV 3-6 (cfs)	DV 4 (cfs)	DV 4-6 (cfs)	DV 5 (cfs)	DV 5-6 (cfs)
1539.43	0	0	0	0	0	0	0	0
1540	5.6	117.3	25.0	111.7	31.9	86.7	23.1	54.8
1542	29.9	327.5	83.6	297.6	43.9	214.0	49.0	170.1
1544	62.7	907.1	282.6	844.4	106.8	561.8	111.3	455.0
1546	145.0	1738.6	558.8	1593.6	206.5	1034.8	205.5	834.3
1548	243.0	2605.6	850.8	2362.6	302.8	1511.8	300.3	1207.0
1550	322.8	3180.2	1050.0	2857.4	357.8	1807.4	360.4	1449.6
1552	380.3	3656.4	1209.7	3276.1	410.0	2066.4	412.3	1656.4
1553	406.4	3873.5	1282.4	3467.1	433.6	2184.7	436.0	1751.1
1554	430.1	4078.7	1351.3	3648.6	456.5	2297.3	458.6	1840.8
1556	474.5	4459.8	1478.7	3985.3	498.7	2506.6	500.6	2007.9

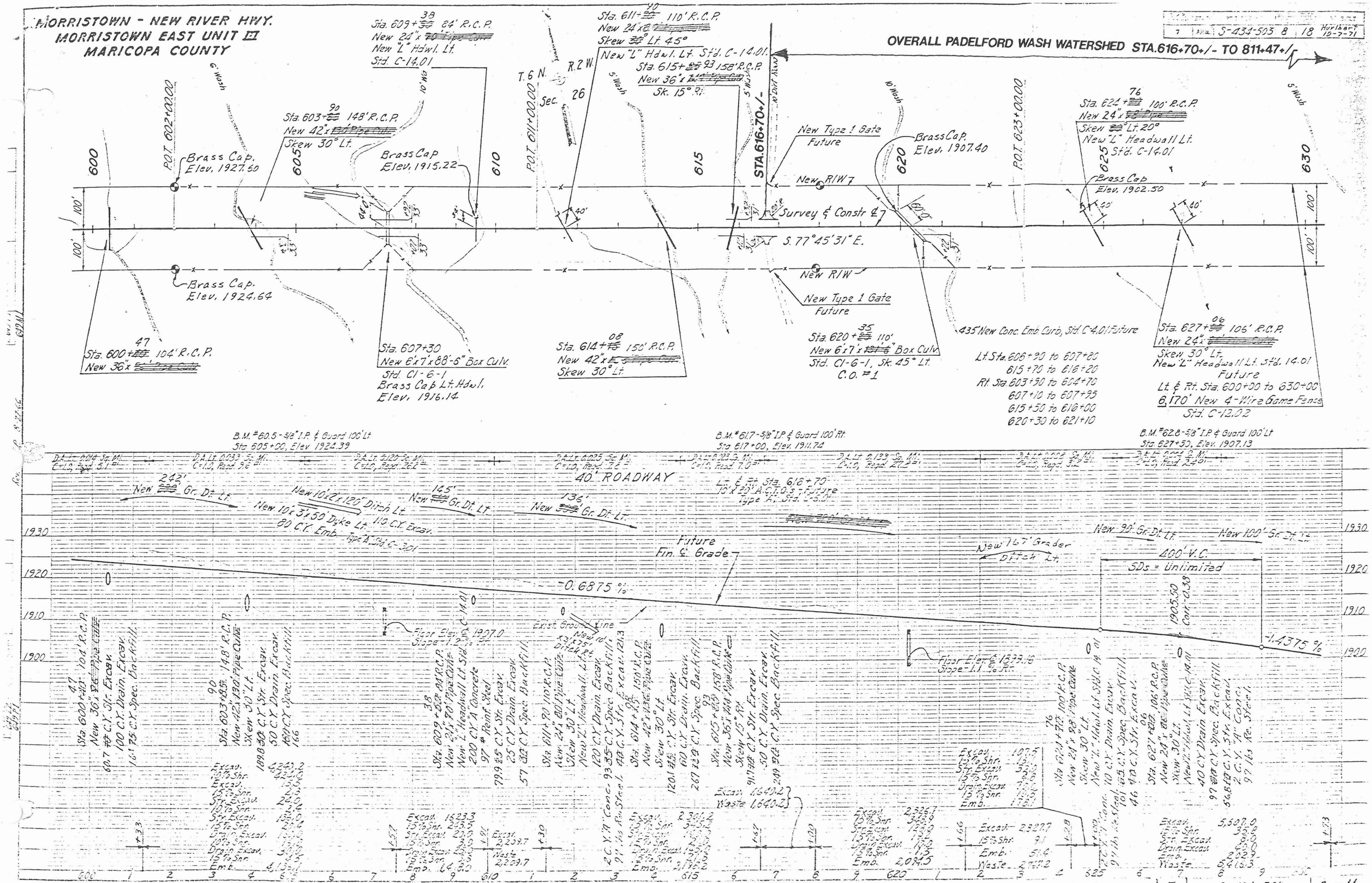
B-34

AMWEST INC. Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project Pedersen Wash FIS FCD No 99-12
Calc. By GAS
Chkd.
Date 11/7/01
Sht. ___ of ___
Date

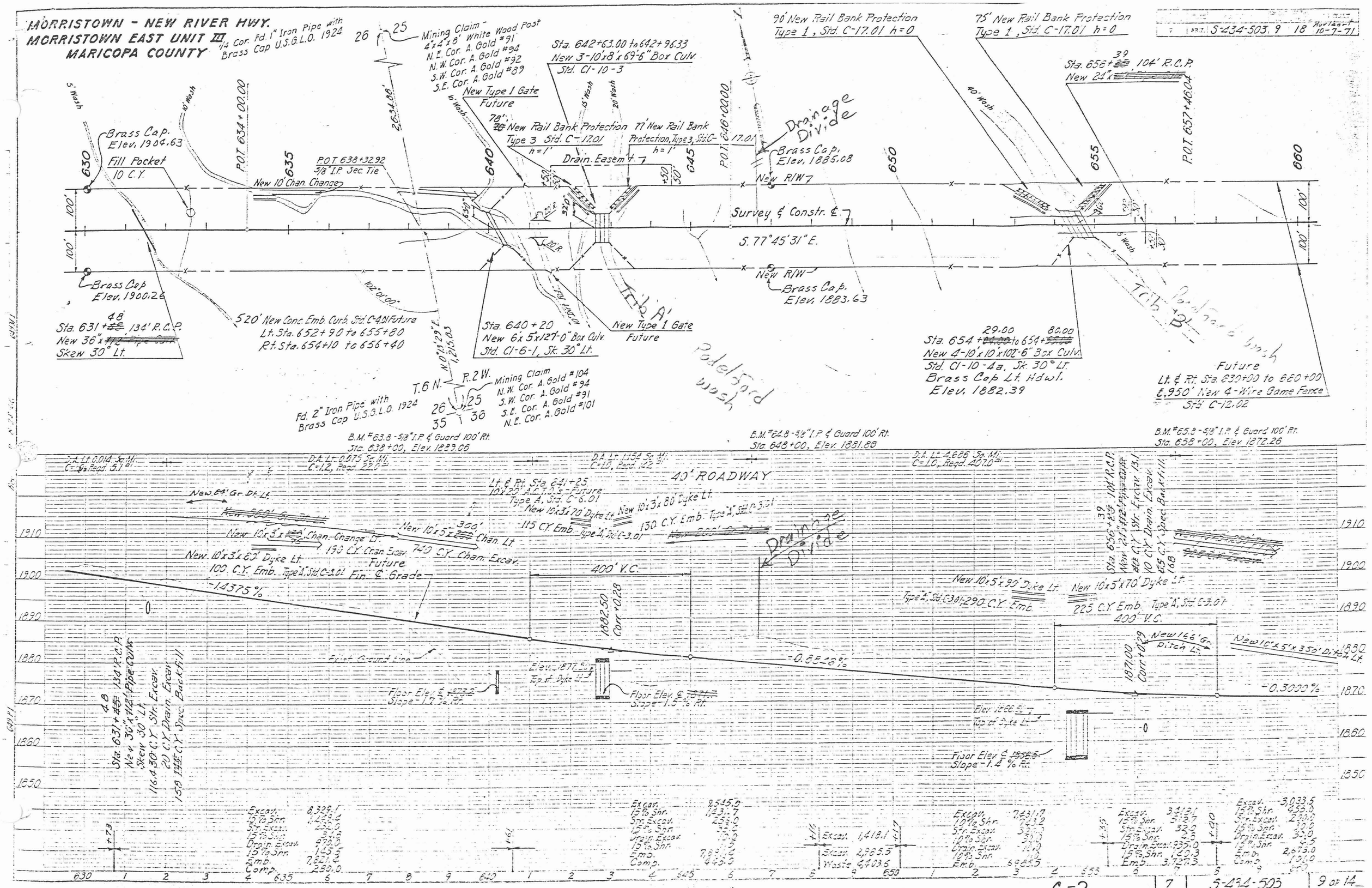
MORRISTOWN - NEW RIVER HWY.
MORRISTOWN EAST UNIT II
MARICOPA COUNTY

OVERALL PADELFORD WASH WATERSHED STA.616+70+/- TO 811+47+/-

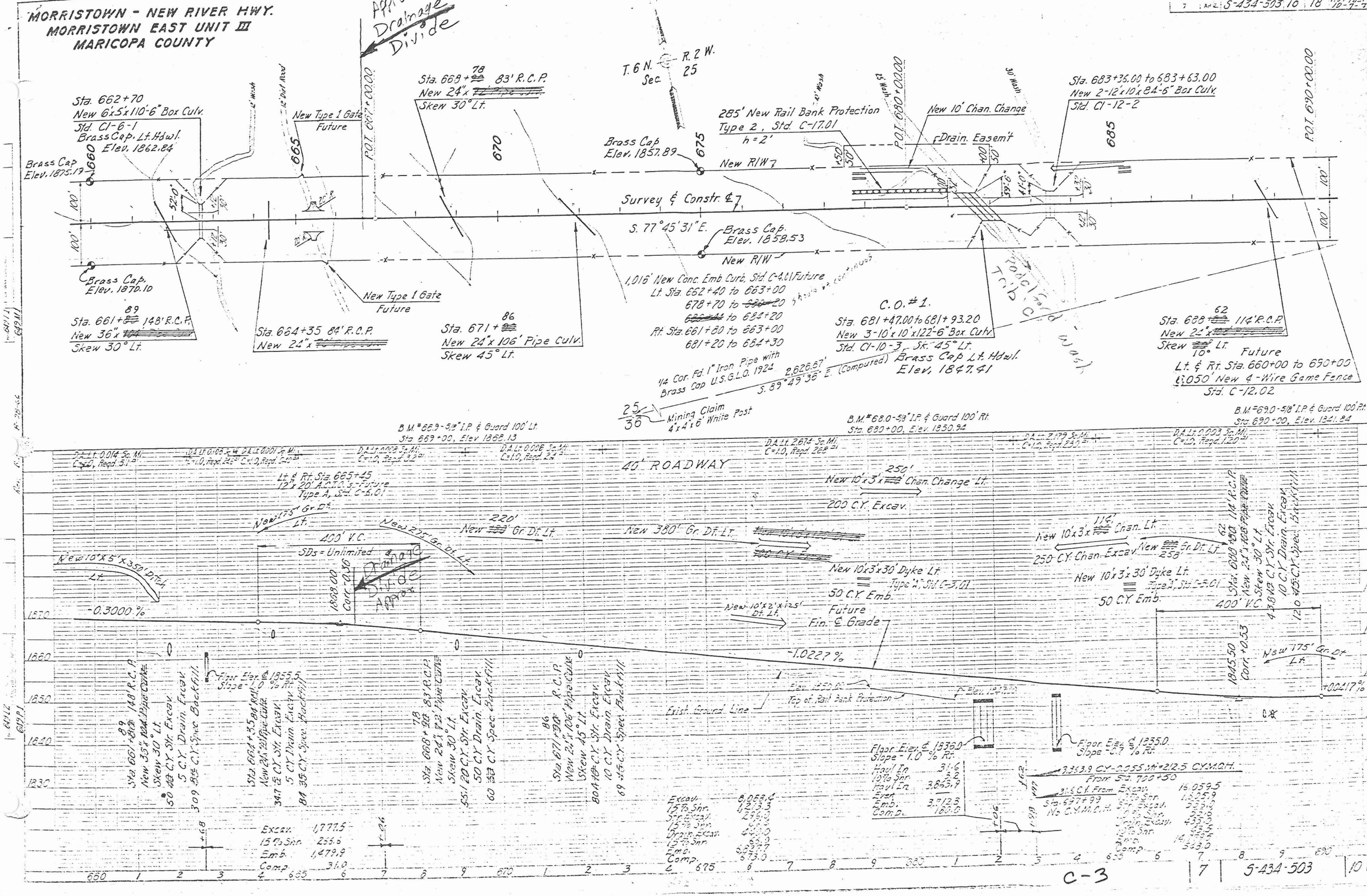


C-1 | 7 | S-434-503 | 8 of 14

MORRISTOWN - NEW RIVER HWY.
MORRISTOWN EAST UNIT III
MARICOPA COUNTY



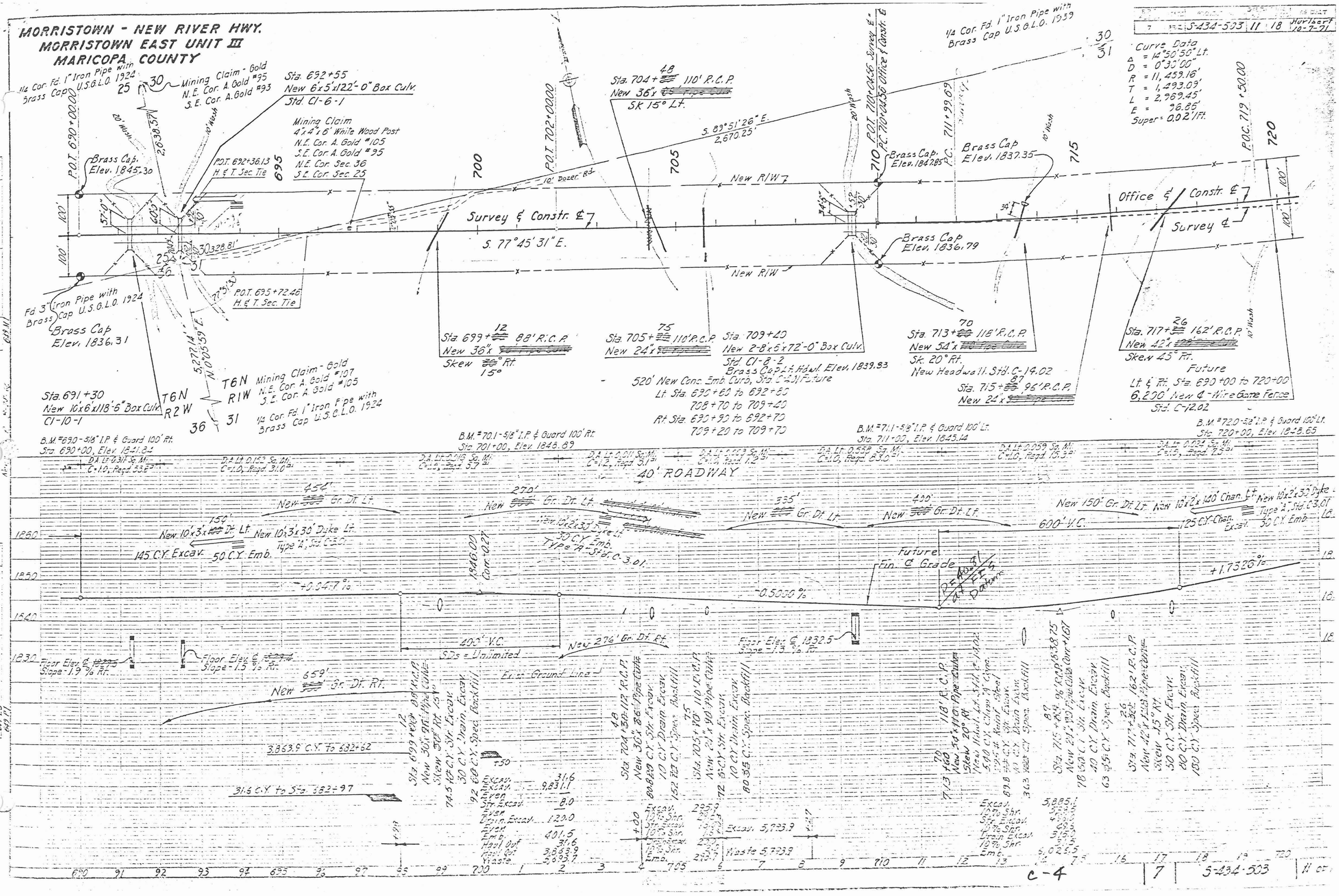
MORRISTOWN - NEW RIVER HWY.
MORRISTOWN EAST UNIT III
MARICOPA COUNTY



C-3

7	S-434-503	11	18	Hurlburt 10-7-71	

MORRISTOWN - NEW RIVER HWY.
MORRISTOWN EAST UNIT III
MARICOPA COUNTY



MORRISTOWN - NEW RIVER HWY.
MORRISTOWN EAST UNIT III
MARICOPA COUNTY

Office & Survey & Curve Data
Δ = 14°50'50" Lt.
D = 0°30'00"
R = 11,459.16'
T = 1,493.09'
L = 2,969.45'
E = 96.86'
Super = 0.02'/Ft.

Fd. 2" Iron Pipe with Brass Cap U.S.G.L.O. 1924

Mining Claim 4"x4"x6' White Post S.W. Cor. - R. Gold N.W. Cor. - R. Gold

T. 6 N. R. 1 W.

S-434-503 12 18 Hurlbert 10-7-71

70' New Rail Bank Protection Type 3 Std. C-17.01 h=2'

Sta. 726+78 133 R.C.P. New 24" Skew 45° Rt.

Sta. 736+24 190' R.C.P. New 24" Skew 30° Rt.

Sta. 739+65 158' R.C.P. New 42" Skew 45° Rt. New Headwall Lt. Std. C-14.02 Brass Cap Elev. 1872.38

Sta. 742+30 158' R.C.P. New 24" Skew 45° Rt. New "L" Headwall Lt. Std. C-14.01

Sta. 748+74 94' R.C.P. New 24" New "L" Hdwl. Lt. Std. C-14.01

P.O.C. 719+50.00

Brass Cap Elev. 1848.16

New 10' Chan. Change

M.P. 726+84.42

New R/W

Office & Constr. ℄

Survey ℄

Brass Cap Elev. 1853.15

P.I. 726+92.78

P.O.C. 733+50.00

40' Wash

P.T. 739+74.01

Brass Cap Elev. 1874.32

EQUATION: P.O.T. 741+62.62 Bk. = 50' Lt. P.T. 741+69.14 Ahd.

Brass Cap Elev. 1880.01

P.O.T. 746+76.41

Brass Cap Elev. 1897.50

N. 87°23'39" E.

New Chan.

Rt. Sta. 737+50 to 742+00 450' New Guard Rail. - Future.

Mining Claim 3"x6"x4' White Post "L" for "G" No. 3 in Mound of Stones Brass Cap Elev. 1881.43

1291' New Conc. Emb. Curb, Std. C Lt. Sta. 720+90 to 724+00, 733+50 to 73[illegible], 73[illegible]+52 to 742+70; Rt. Sta. 740+60 to 741+45 — Future

P.O.T. 746+11.39 H. & T. Sec. Tie

Future: Lt. & Rt. Sta. 720+00 to 750+00 6,090' New 4-Wire Game Fence Std. C-12.02

Sta. 720+55 New 8'x5'x146'-6" Box Culv. Std. C1-8-1, Sk. 45° Rt. Brass Cap Lt. Hdwl. Elev. 1845.77

Sta. 731+66 139 R.C.P. New 24" Skew 30° Rt.

Sta. 734+07.00 to 734+33.00 New 2-10'x8'x14'-9" Box Culv. Std. C1-10-2, Sk. 30° Lt. Brass Cap, Lt. Hdwl. Elev. 1860.14

1/4 Cor. Fd. 1" Iron Pipe with Brass Cap in Mound of Stones U.S.G.L.O. 1939

B.M. #72.0 - 5/8" I.P. & Guard 100' Lt. Sta. 720+00, Elev. 1848.65

B.M. #73.0 - 5/8" I.P. & Guard 100' Lt. Sta. 730+00, Elev. 1867.74

B.M. #74.1 - 5/8" I.P. & Guard 100' Lt. Sta. 740+55, Elev. 1875.57

D.A. Lt. 0.067 Sq. Mi. C=1.0, Reqd. 33.6 cfs

D.A. Lt. 0.014 Sq. Mi. C=1.2, Reqd. 3.1 cfs

D.A. Lt. 1.061 Sq. Mi. C=1.0, Reqd. 133.6 cfs

D.A. Lt. 0.003 Sq. Mi. C=1.0, Reqd. 1.2 cfs

D.A. Lt. 0.022 Sq. Mi. C=1.0, Reqd. 7.2 cfs

D.A. Lt. 0.002 Sq. Mi. C=1.0, Reqd. 0.8 cfs

40' ROADWAY

New 10'x3'x250' Chan. Change Lt. 430 C.Y. Chan. Excav.

New 10'x3'x50' Dyke Lt. 80 C.Y. Emb. Type "A", Std. C-39.01

New 263' Gr. Dt. Lt.

New 190' Gr. Dt. Lt.

New 234' Gr. Dt.

Sta. 731+66 139 R.C.P. New 24" Skew 30° Rt. 35.6 C.Y. Str. Excav. 40 C.Y. Drain. Excav. 180 C.Y. Spec. Backfill

Sta. 739+65 158 R.C.P. New 42" Skew 45° Rt. New Hdwl. Lt. Std. C-14.02 100 C.Y. Drain. Excav. 29 C.Y. Spec. Backfill 139 C.Y. Str. Excav. 8.0 C.Y. Str. Excav. 4.95 C.Y. Conc. 205 lbs. Re. Steel

EQUATION Short Sta. 8.57 Sta. 741 to 742 = 93.48

+1.4404%

3:1 Cut Slope Lt.

New 16'x4"x315' Chan. Rt.

New 32' Crown Dt. Rt.

Future Fin. ℄ Grade

600' V.C.

SD = Unlimited

Chan. Flow Line

Use Std. C-2.03 Fill Slopes Rt.

+1.7326%

Exist. Ground Line

Floor Elev. ℄ 1838.0 Slope -1.6% Rt.

Floor Elev. ℄ 1832.6 Slope -1.1% Rt.

Haul In 10% Swell 1,207.7 120.8 Emb. 1,310.5 Comp. 18.0

1,207.7 C.Y. To Sta. 733+68

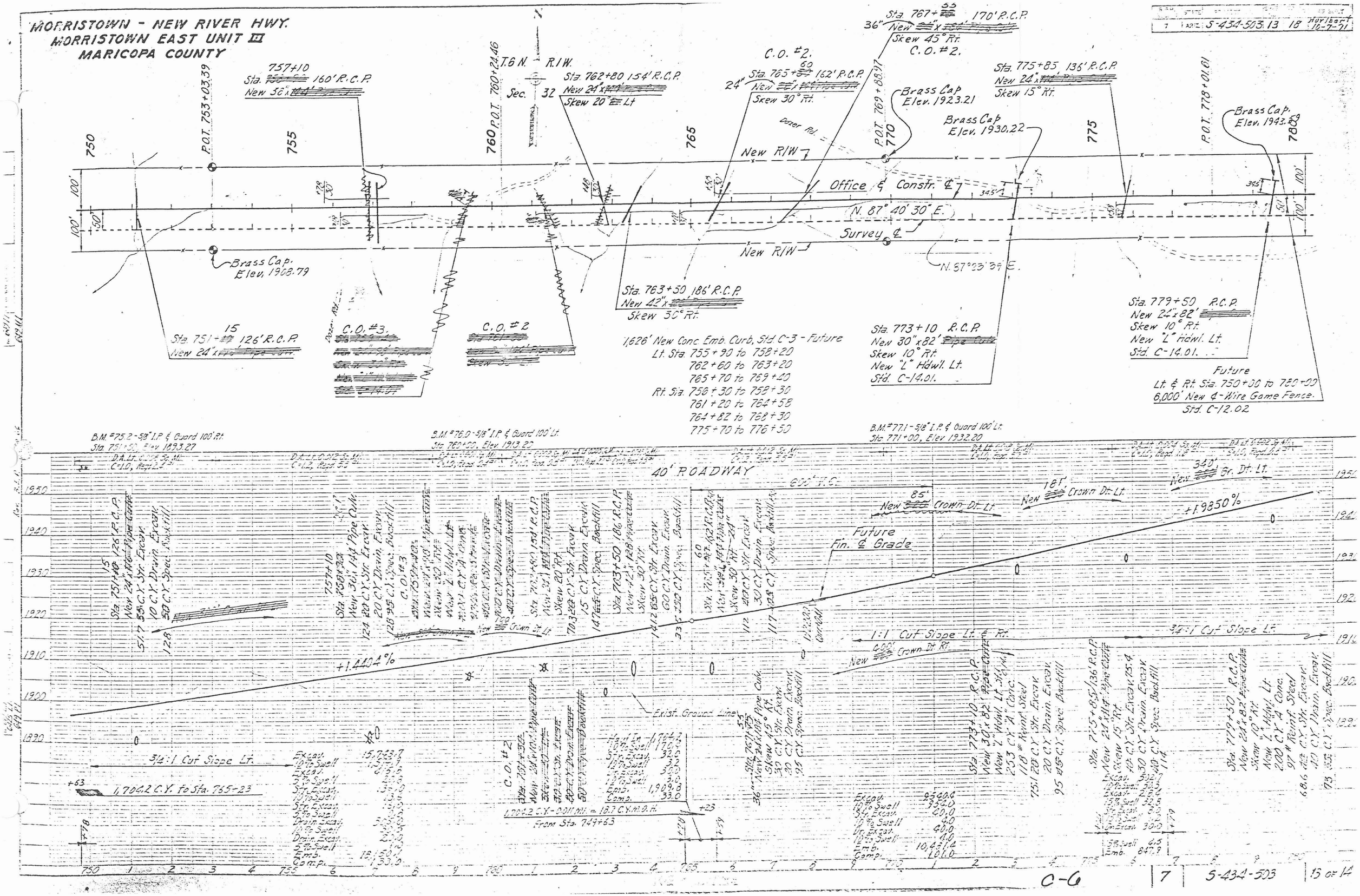
Sta. 742+30 158 R.C.P. New 24" Skew 45° Rt. New "L" Hdwl. Lt. Std. C-14.01 40 C.Y. Drain. Excav. 168 C.Y. Spec. Backfill 291.6 C.Y. Str. Excav. 97 lbs. Re. Steel

Sta. 748+74 94 R.C.P. New 24" 80' Pipe Culvert New "L" Hdwl. Lt. 200 C.Y. "A" Conc. 97 lbs. Reinf. Steel 82.5 C.Y. Str. Excav. 98.3 50 C.Y. Drain. Excav. 74.5 C.Y. Spec. Backfill

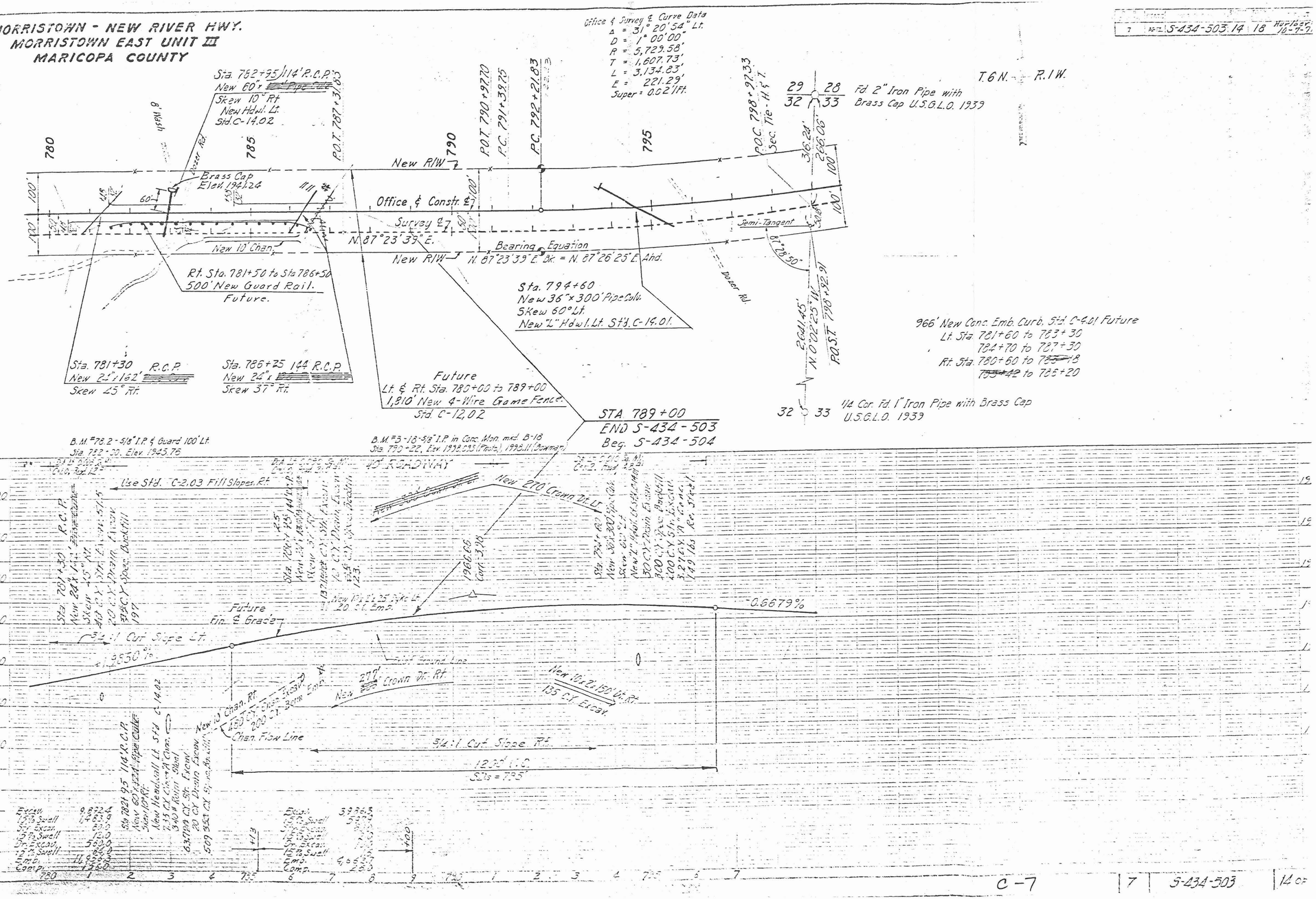
Excav. 6,207.7 Haul Cor. 1,207.7

C-5 | 7 | S-434-503 | 12 of

MORRISTOWN - NEW RIVER HWY.
MORRISTOWN EAST UNIT III
MARICOPA COUNTY



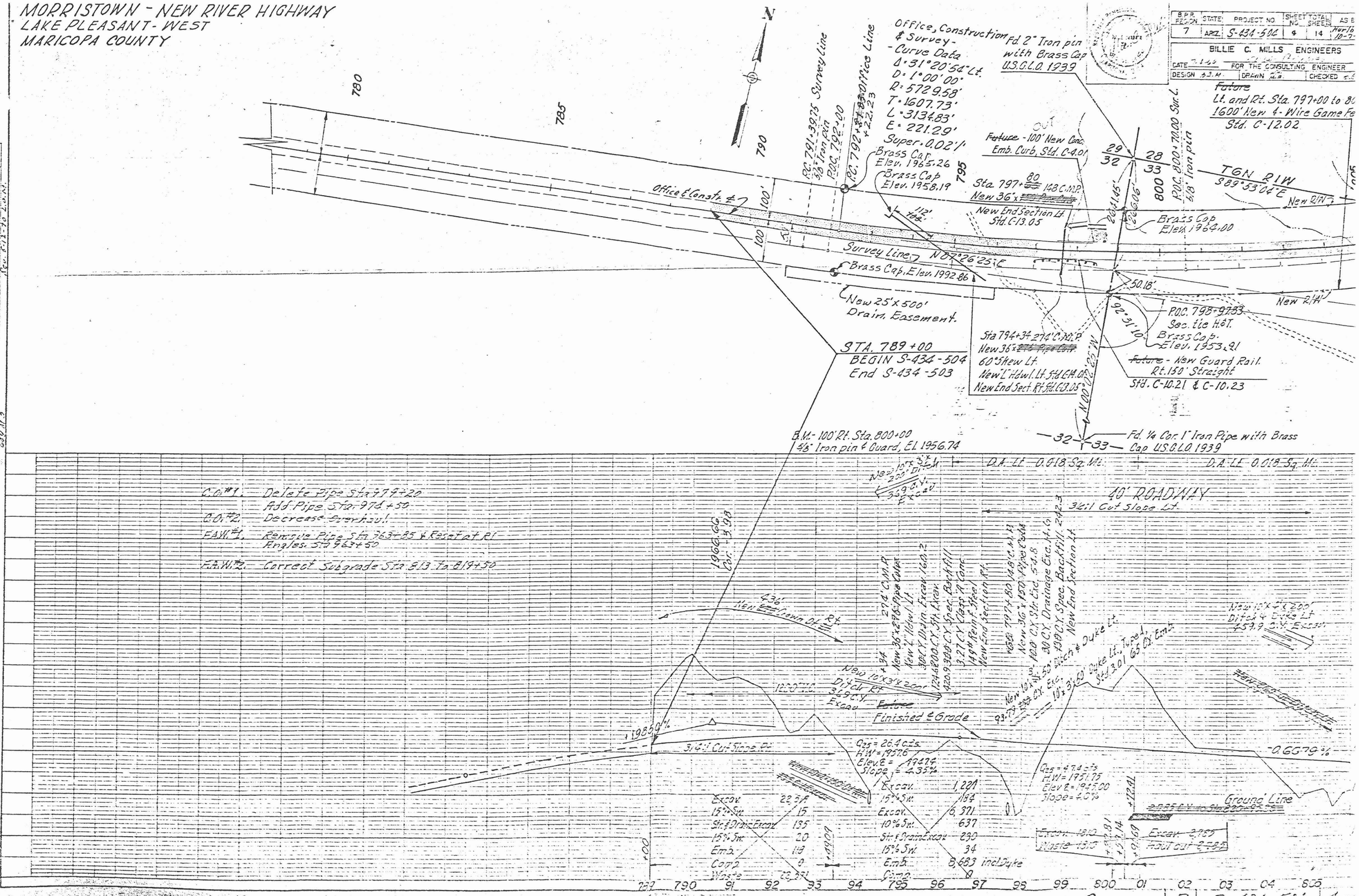
MORRISTOWN - NEW RIVER HWY.
MORRISTOWN EAST UNIT III
MARICOPA COUNTY



MORRISTOWN - NEW RIVER HIGHWAY
LAKE PLEASANT - WEST
MARICOPA COUNTY

B.P.R. REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	AS B
7	ARIZ.	S-434-504	4	14	Herlo 10-2-

BILLIE C. MILLS ENGINEERS
DATE 7-1-63 FOR THE CONSULTING ENGINEER
DESIGN B.B.M. DRAWN C.B. CHECKED



B.P.R. DESIGN	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZ.	S-434-504	5	14	Hurlocker 10-8-71

BILLIE C. MILLS ENGINEERS

DATE 7-8-66 FOR THE CONSULTING ENGINEER

DESIGN 6-61 DRAWN CHECKED

MORRISTOWN—NEW RIVER HIGHWAY
LAKE PLEASANT - WEST
MARICOPA COUNTY

Office, Constr. & Survey - Curve Data
Δ = 31° 20'54" Lt.
D = 1° 00' 00"
R = 5729.58
T = 1607.73'
L = 3134.83'
E = 221.29'
Super = 0.02'/Ft.

~~Future~~ New Guard Rail. Lt. 150' Straight. Rt. 275' Straight. Std. C-10.21 & C-10.23.

Future. 150' New Conc. Emb. Curb. Std. C-4.01

Brass Cap Elev. 1953.77

972.98 805 100' 100' P.O.C. Mid pt. 807+07.17 5/8" Iron pin Survey Line

P.O.C. 809+06.86 Geo. Tie Not Set Survey Line

810 P.O.C. 811+00.00 5/8" Iron pin Survey Line

Super = 0.02'/Ft.

815 P.O.C. 818+50.00 5/8" Iron pin Survey Line

820 New 50'x250' Drainage Easement

P.T. 822+74.58 5/8" Iron pin

EQUATION 6+55.56 Office Line Bk. = Survey Line Ahd. 6+82.23

P.T. 823+56.66 P.O.T. 823+70.69 Brass Cap. Elev. 1934.65

Future Lt. & Rt. Sta. 805+00 to Sta. 835+00 5,972' New 4-Wire Game Fence. Std. C-12.02

Future 300' New Conc. Emb. Curb Std. C-4.01.

825 P.O.T. 827+69.73 5/8" Iron pin

830 Future 600' New Conc. Emb. Curb Std. C-4.01

831+15 Sta. ~~830+85~~ 166' C.M.P. New 36" x ~~14' Pipe Culv.~~

835

Office & Constr. ℄

Survey ℄ Brass Cap. Elev. 1957.62

34°01'25"

Sta. 806+00 180' C.M.P. New 36" x ~~14' Pipe Culv.~~ Skew 30° Lt.

New End Sections Lt. & Rt. Std. C-13.05

Sta. 808+~~25~~ 23 134' C.M.P. New 24" x ~~33' Pipe Culv.~~ Skew 15° Lt.

New End Sections Lt. & Rt. Std. C-13.05

TGN R1W 1669.41'

S 89°53'04" E

New R/W

Survey & Construction ℄

N 56°05'31" E. Brass Cap. Elev. 1917.46

New R/W

Sta. 816+~~35~~ +36 170' C.M.P. New 42" x ~~Pipe Culv.~~ Skew ~~15°~~ Lt. 25°

Sta. 823+~~35~~ 38 160' C.M.P. New 30" x ~~Pipe Culv.~~ New End Section Lt. Std. C-13.05

~~Future~~ New Guard Rail. Rt. 200' Straight. Std. C-10.21 & C-10.23

Future New Guard Rail. Lt. 175' Straight. Rt. 175' Straight. Std. C-10.21 & C-10.23.

832+90 Sta. ~~833+00~~ 140' C.M.P. New 24" x ~~Pipe Culv.~~ New End Sections Lt. & Rt. Std. C-13.05

OVERALL PADELFORD WASH WATERSHED;

STA. 616+70+/- TO 811+47+/-

Fd. 1/4 Cor. 1" Iron Pipe with Brass Cap U.S.G.L.O-1939

B.M. - 100' Rt. Sta. 821+50.00 5/8" Iron pin & Guard. El. = 1938.75

B.M. - 100' Lt. Sta. 832+00.00 5/8" Iron pin & Guard El. = 1914.36

~~B.M. - 100' Rt. Sta. 810+00.00 5/8" Iron pin & Guard. El. = 1956.52~~

D.A. Lt. 0.008 Sq. Mi. D.A. Lt. 0.053 Sq. Mi. D.A. Lt. 0.010 Sq. Mi. D.A. Lt. 0.024 Sq. Mi.

New 260' Grader Ditch Lt.

~~Dike Lt. 210' of Excav.~~

~~40' x 2' x 50' Dike Lt. Type A Std. C-3.01~~

~~New 1,000' x 1.5' x 1.5' Dike Lt. 210' of Excav.~~

~~Type A Std. C-3.01~~

~~Emb.~~

40' ROADWAY

New 195' Crown Ditch Lt. 31.3 C.Y. Excav.

New 50' Crown Ditch Lt.

New 10' x 2' x ~~150'~~ 8' x 220' Ditch & Dike Lt. ~~220'~~ 163.6 C.Y. Excav.

EQUATION Short Sta. = 14.03 Lt. Sta. 823+56.66 to Sta. 823+70.69

New 10' x 2' x 50' Dike Lt. Type A Std. C-3.01 120 C.Y. Emb.

~~Future~~ Finished ℄ Grade

New 150' Crown Ditch Lt.

= 0.6679 %

Ground Line

1960 1950 1940 1930 1920 1910 1900

Qss = 47.4 cfs HW = 1951.75

Elev. ℄ = ~~1945.4~~ Slope = 2.7 %

1945.79

Qss = 21.1 cfs HW = 1951.0 Elev. ℄ = 1946.3 Slope = 5.07 %

1/2 Cut Slope Lt.

120' C.M.P. New 30" x ~~15' Pipe Culv.~~ 115.7 ~~60~~ C.Y. Str. Excav. 12 ~~45~~ C.Y. Drain. Excav. 277.6 ~~139~~ C.Y. Spec. Backfill. New End Sections Lt. & Rt.

134' C.M.P. New 24" x ~~38' Pipe Culv.~~ 131.2 ~~66~~ C.Y. Str. Excav. 21.7 ~~35~~ C.Y. Drain. Excav. 186.7 ~~93~~ C.Y. Spec. Backfill. New End Sections Lt. & Rt.

Qss = 24.1 cfs HW = 1930.35 Elev. ℄ = ~~1925.5~~ 1925.15 Slope = 2.0 %

120' C.M.P. New 42" x 166' Pipe Culv. Sk. 15° Lt. 29 C.Y. Str. Excav. 232.8 10 C.Y. Drain. Excav. 22.5 49.4 C.Y. Spec. Backfill 360.6

~~Sta. 816+36~~

2,785 C.Y. x 0.00990 Mi. = 27.572 C.Y.M.O.H. from Sta. 800+72.41

Qss = 25.8 cfs HW = 1922.9 Elev. ℄ = ~~1920.5~~ 1922.72 Slope = 9.0 %

3.5:1 Cut Slope Lt. & Rt.

800' H.C.

3.4237 %

Qss = 57 cfs HW = 1910.5

Elev. ℄ = ~~1903.5~~ 1902.50 Slope = 1.85 %

Qss = 3.7 cfs HW = 1903.9 Elev. ℄ = 1904.3 Slope = 6.6 %

~~823+56 ±05~~ 16.02 C.Y. ~~New 30" x 64' Pipe Culv.~~ 149.6 ~~65~~ C.Y. Str. Excav. 16.4 ~~7.3~~ C.Y. Drain. Excav. 219.5 ~~110~~ C.Y. Spec. Backfill. New End Sec. Lt.

Excav.	6,591	Excav.	15,255
10% Str.	660	15% Str.	2,288
Excav.	39	Excav.	1,213
15% Str.	5	5% Str.	60
Str. & Drain Excav.	195	Str. & Drain Excav.	35
15% Str.	29	5% Str.	2
Emb.	7,402 incl. Dykes	Emb.	16,362
Comp.	123	Comp.	367

Excav.	9
5% Str.	—
Emb.	3,973 incl. Dyke
Comp.	—
Haul in	2,785
10% Str.	279

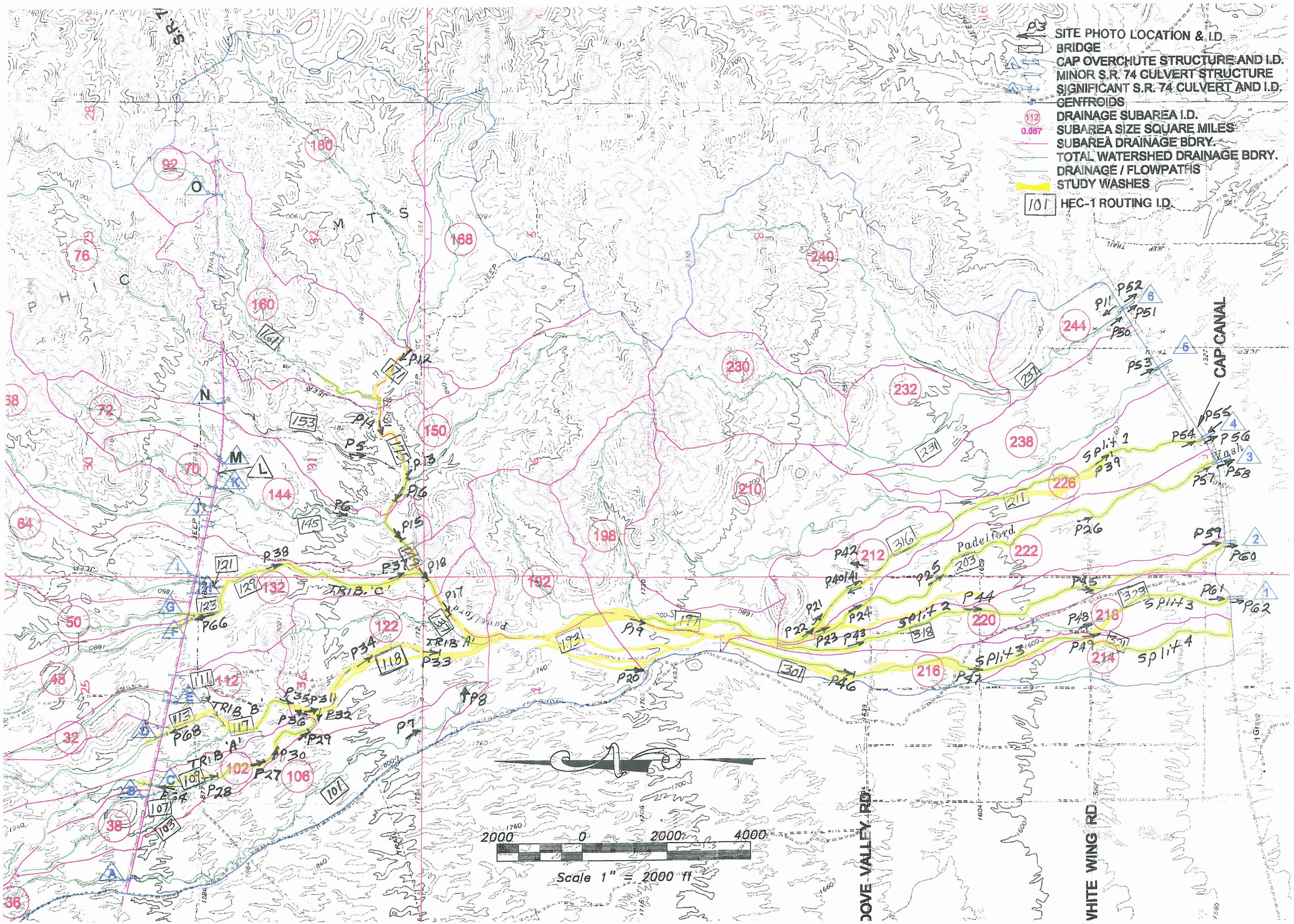
Excav.	23,143
20% Str.	6,629
Str. & Drain Excav.	120
5% Str.	6
Str. & Drain Excav.	215
10% Str.	22
Emb.	27,885
Comp.	228

+22.36 +95.26 +50.16 +50.04

805 06 07 08 09 810 11 12 13 14 815 16 17 18 19 820 21 22 23 24 825 26 27 28 29 830 31 32 33 34 835

C-9

AVERY



1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

NO.	DATE	DESCRIPTION	BY

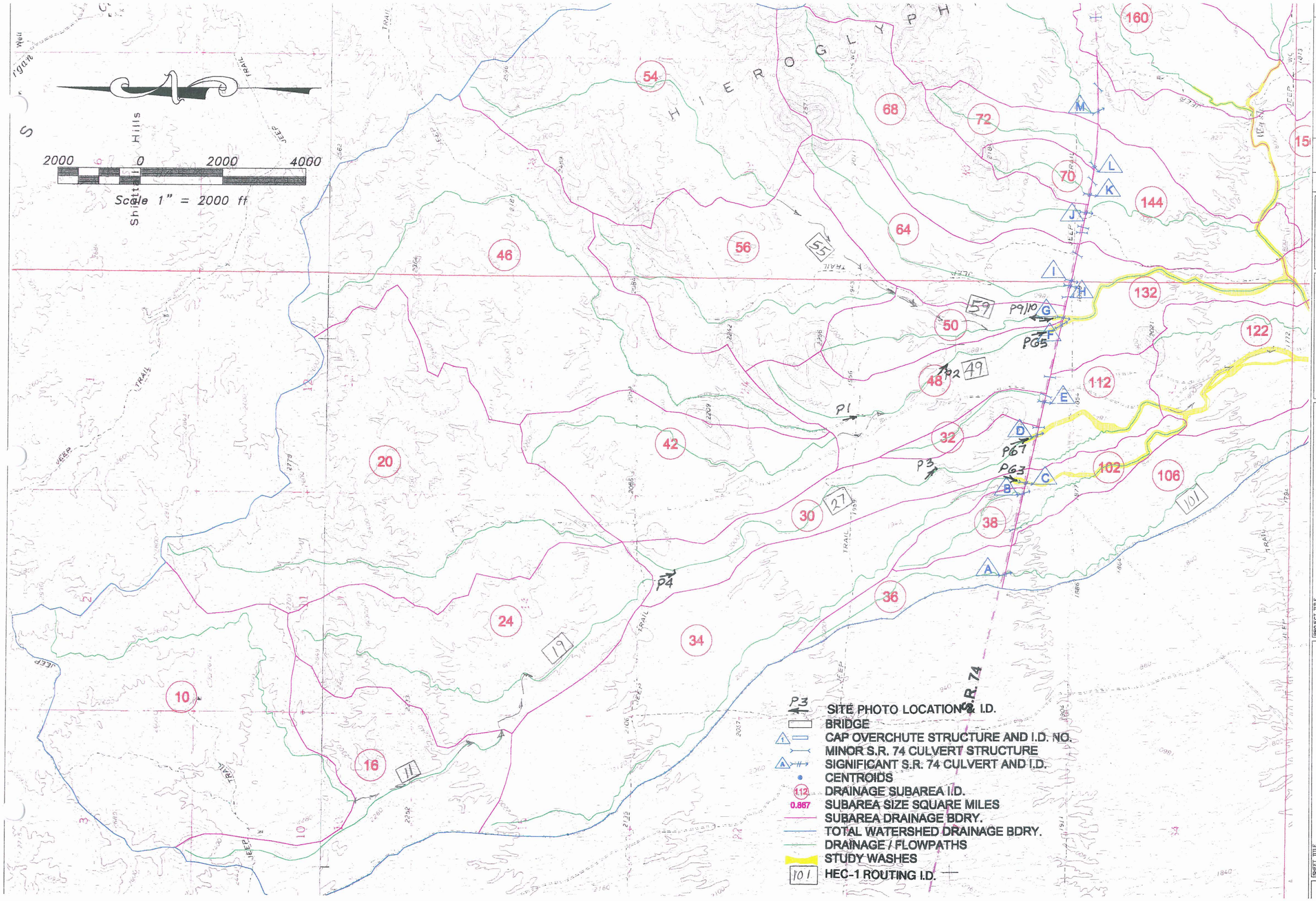
Registered Professional Engineer (Civil) 15280 GREGORY A. SCHUELKE Date Signed ARIZONA, U.S.A.

A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
phoenix@anwest.com

PROJECT TITLE
PADELFORD WASH FLOOD PLAIN DELINEATION STUDY
F.C.D. NO. 99-12

SHEET TITLE
EXHIBIT D1 - PHOTO & ROUTING I.D. LOCATIONS

NO.	7158-07	DESIGN	GAS	SCALE	
JOB. ID.	7158d07XHR3	DRAWN	CMB	HORZ.	1"=2000'
DATE	9/14/00	CHECK	XXX	VERT.	N/A



A-N WEST INC.
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020

PROJECT TITLE
PADELFORD WASH FLOOD PLAIN DELINEATION STUDY
F.C.D. NO. 99-12

SHEET TITLE
EXHIBIT D2 - PHOTO & ROUTING I.D. LOCATIONS

SHEET 2 OF 2

A common method of selecting the roughness coefficient, *n*, is to first select a base value of *n* for the bed material (table 1). The base values of *n* are for a straight uniform channel of a given bed material. Cross-section irregularities, channel alignment, obstructions, vegetation, and other factors that increase roughness are accounted for by adding increments of roughness to the base value of *n*. Ranges of adjustments for the factors that may add to channel roughness are shown in table 2.

Many alluvial channels in Maricopa County have bed material that moves during floodflow. In addition to the changing channel geometry of these channels, the roughness coefficient may change during floodflow because of the changing form of the channel bed in parts of the channel cross section (Davidian, 1984). Bedforms, such as dunes, antidunes, and plane bed have been observed during large floods. Within a few minutes, dunes can appear, disappear, and reappear at different locations across a large stream channel. The Manning roughness coefficient can double or triple when the bedform changes from plane to dunes. A method of defining reliable values of Manning's *n* for unstable alluvial channels is not available. A plane bedform is common during large floods, and for this report, plane-bed conditions are assumed where the roughness coefficient is related to the size of the channel material and not the form of the channel bed. Plane-bed conditions were assumed for nearly all indirect measurements of peak discharge where the slope-area method was used.

Table 1.--*Base values of Manning's n for stable channels*

[Modified from Aldridge and Garrett, 1973, table 1]

Channel material	Size of bed material		Base *n* values	
	Millimeters	Inches	Benson and Dalrymple (1967)[1]	Chow (1959)[2]
Concrete.....	-------	--------	0.012-0.018	0.011
Rock cut.....	-------	--------	----------	.025
Firm soil.....	-------	--------	.025- .032	.020
Coarse sand.....	1-2	--------	.026- .035	-----
Fine gravel.....	-------	--------	----------	.024
Gravel.....	2-64	0.08-2.5	.028- .035	-----
Coarse gravel.....	-------	--------	----------	.028
Cobble.....	64-256	2.5-10.0	.030- .050	-----
Boulder.....	>256	>10.0	.040- .070	-----

[1]Straight uniform channel.
[2]Smoothest channel attainable in indicated material.

n_b

SOURCE:ESTIMATED MANNING'S ROUGHNESS COEFFICIENTS_BY B.W.THOMPSEN AND H.W.HJALMARSON,APRIL,1991

Table 2.--*Adjustment factors for the determination of overall Manning's n values*

[Modified from Chow, 1959]

Channel conditions	Manning's n adjustment[1]	Example
Degree of irregularity:		
Smooth	0.000	Smoothest channel attainable in given bed material.
Minor	.001- .005	Channels with slightly eroded or scoured side slopes.
n_1 Moderate	.006- .010	Channels with moderately sloughed or eroded side slopes.
Severe	.011- .020	Channels with badly sloughed banks; unshaped, jagged, and irregular surfaces of channels in rock.
Effects of obstruction[2]:		
Negligible	.000- .004	A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, that occupy less than 5 percent of the cross-sectional area.
Minor	.005- .015	Obstructions occupy 5 to 15 percent of the cross-sectional area and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction. Smaller adjustments are used for curved smooth-surfaced objects than are used for sharp-edged angular objects.
n_2 Appreciable	.020- .030	Obstructions occupy from 15 to 50 percent of the cross-sectional area or the space between obstructions is small enough to cause the effects of several obstructions to be additive, thereby blocking an equivalent part of a cross section.
Severe	.040- .060	Obstructions occupy more than 50 percent of the cross-sectional area or the space between obstructions is small enough to cause turbulence across most of the cross section.
Vegetation:		
Small	.002- .010	Dense growths of flexible turf grass, such as Bermuda, or weeds where the average depth of flow is at least two times the height of the vegetation; supple tree seedlings such as willow, cottonwood, arrow weed, or saltcedar where the average depth of flow is at least three times the height of the vegetation.
n_3 Medium	.010- .025	Grass or weeds where the average depth of flow is from one to two times the height of the vegetation; moderately dense stemmy grass, weeds, or tree seedlings where the average depth of flow is from two to three times the height of the vegetation; moderately dense brush, similar to 1- to 2-year-old saltcedar in the dormant season, along the banks and no significant vegetation along the channel bottoms where the hydraulic radius exceeds 2 feet.
Large	.025- .050	Turf grass or weeds where the average depth to flow is about equal to the height of vegetation; small trees intergrown with some weeds and brush where the hydraulic radius exceeds 2 feet.

See footnotes at end of table.

P1

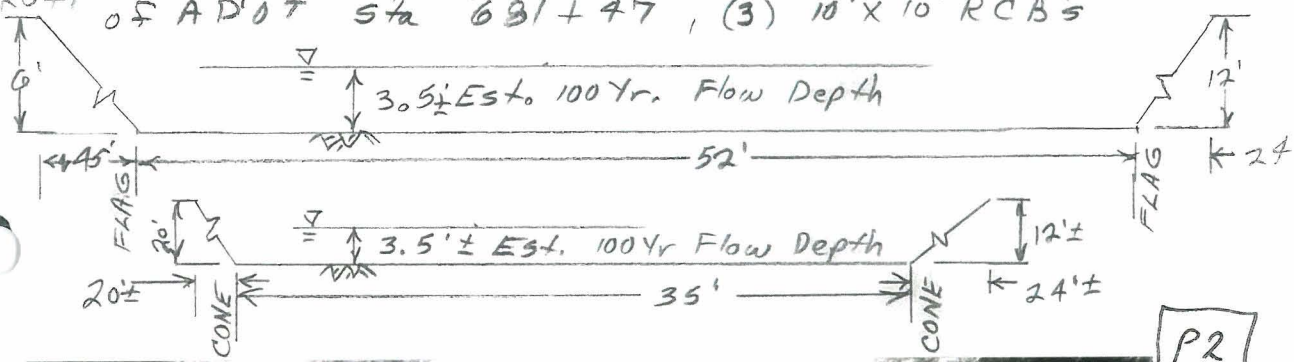
Channel (n)

$n_b = 0.025$
$n_1 = 0.005$
$n_2 = 0.005$
$n_3 = 0.006$
$n_{total} = 0.041$

(If Applicable) Overbank (n)

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$n_{total} = 0.065$

HEC-1 #R049 Looking D/S, Approx. 6000 ft. Upstream of ADOT Sta 681+47, (3) 10'x10' RCB's



P2

Channel (n)

$n_b = 0.025$
$n_1 = 0.005$
$n_2 = 0.005$
$n_3 = 0.006$
$n_{tot} = 0.041$

(If Applicable) Overbank (n)

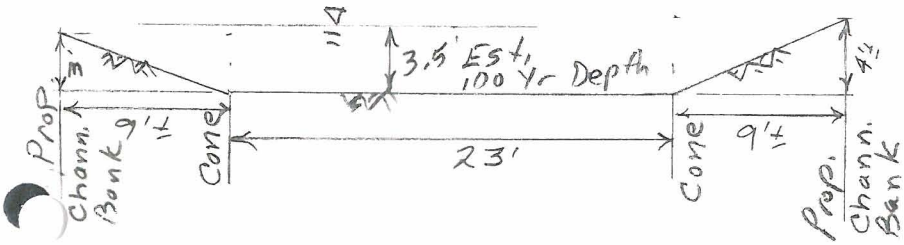
$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$n_{total} = 0.065$

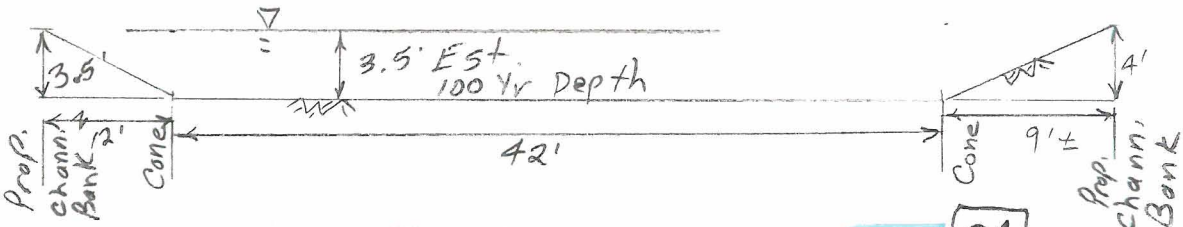
Looking D/S, Approx. 3000 ft Upstream of ADOT Sta. 681+47, (3) 10'x10' RCB's HEC-1 # R049

P3

Channel (n)	(If applicable) Overbank (n)
$n_b = 0.025$	$n_b = 0.025$
$n_1 = 0.002$	$n_1 = 0.01$
$n_2 = 0.002$	$n_2 = 0.01$
$n_3 = 0.008$	$n_3 = 0.02$
$n_{Tot} = 0.037$	$n_{tot} = 0.065$

HEC-1 #R027 Looking D/S at 0.5 Mile upstream of 4-10'X10' RCB's (ADOT Sta. 654+29)





P4

Channel (n)	(If applicable) Overbank (n)
$n_b = 0.025$	$n_b = 0.025$
$n_1 = 0.002$	$n_1 = 0.01$
$n_2 = 0.002$	$n_2 = 0.01$
$n_3 = 0.008$	$n_3 = 0.02$
$n_{Tot} = 0.037$	$n_{tot} = 0.065$

HEC # R027 Looking D/S at 2.0 Miles upstream of 4-10'X10' RCB's (ADOT Sta. 654+29)

P5

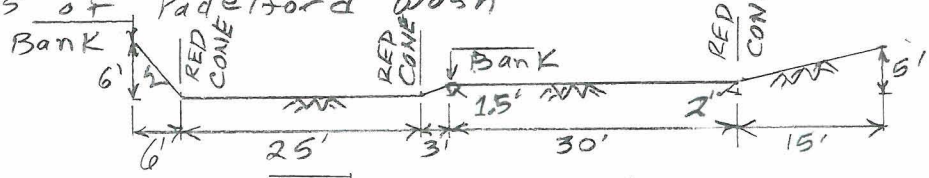
channel 'n'

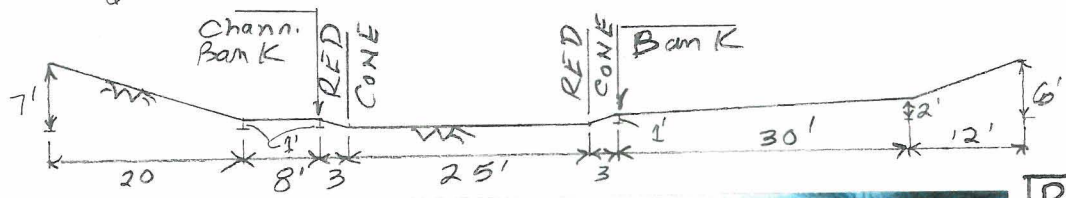
$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma = 0.037$

Overbank (n)

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma = 0.065$

HEC-1 Routing I.D. R153, Looking D/S, 0.3± MI. U/S of Padelford wash





P6

channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma = 0.065$

HEC-1 Routing I.D. R145, Looking D/S, 0.2 MI. U/S of Padelford wash

P7

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.01$

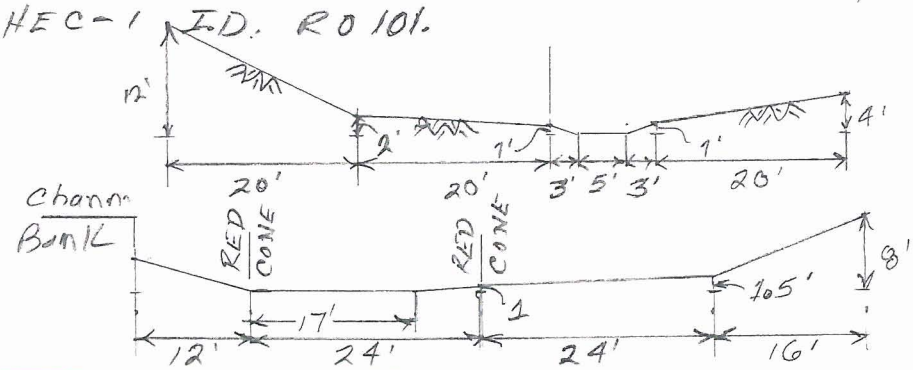
$\Sigma n = 0.042$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$

$\Sigma n = 0.065$

Looking D/S, Approx. 1.6 Miles D/S of ADOT Sta. 620+35, 6'X7' RCB at 52.74. Near South Sec. Line Sec. 36 T6N, R2W HEC-1 I.D. R0101.



P8

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.01$

$\Sigma n = 0.042$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$

$\Sigma n = 0.065$

Looking D/S, Approx. 100' U/S of waterline Crossing and approx. 1800 FT U/S of Confluence with Pedeford on HEC-I I.D. 101 on wash From ADOT Sta 620+35.

P9

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$

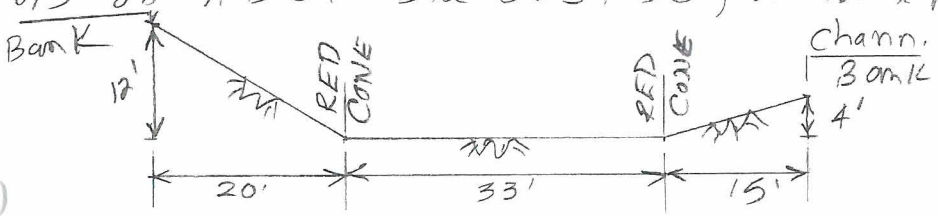
$\Sigma n = 0.037$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$

$\Sigma n = 0.065$

HEC-1 I.D. R059, Looking D/S Approx. 300 FT U/S of ADOT Sta 683+36, 2-12'x10' RCB's on S.R. 74



P10

HEC-1 I.D. R059, Looking U/S At Same Location as Above

P11

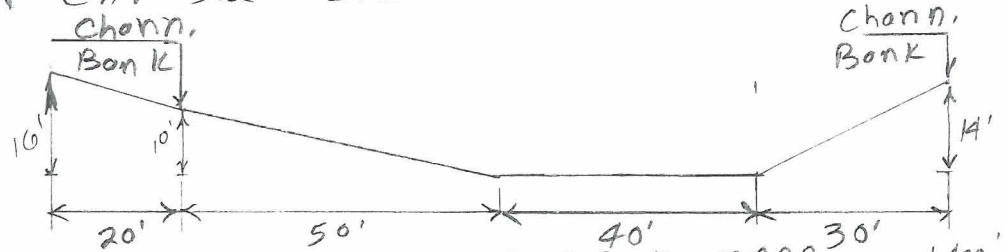
channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.04$

Overbank n

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

HEC-1 Routing I.D. R237, Looking U/S
From CAP Sta 315+00



SECTION FROM MAPPING, 1400' U/S OF CAP
Looking D/S

|P12|

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$

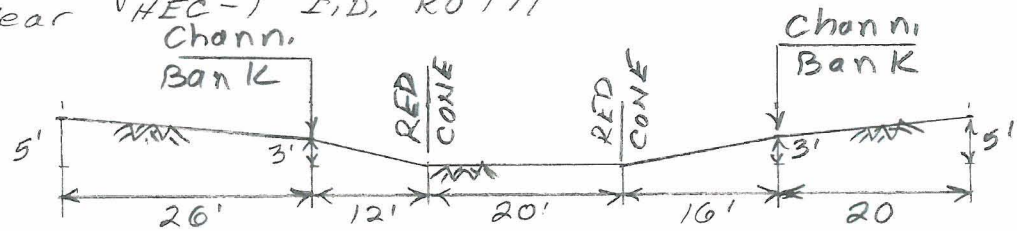
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$

$\Sigma n = 0.065$

Looking D/S on Padelford wash, 1.8 MI U/S of Trib 'A' Confluence
Near HEC-1 I.D. R017



P13

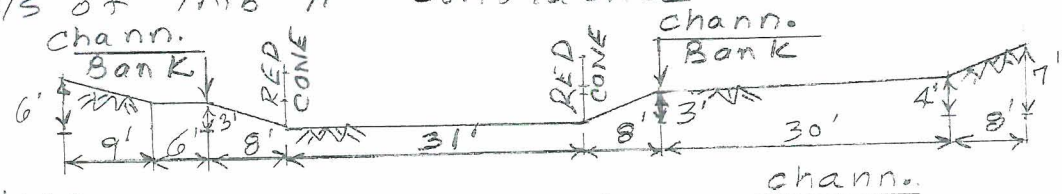
Channel 'n'

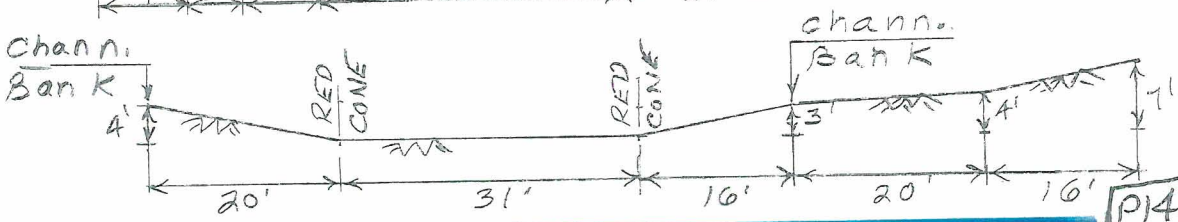
$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Padelford Wash, 1.0 MI. U/S of Trib 'A' Confluence





P14

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Padelford Wash, 1.3 MI U/S of Trib 'A' Confluence
Near UFCI TR. RA 171

D-12

P15

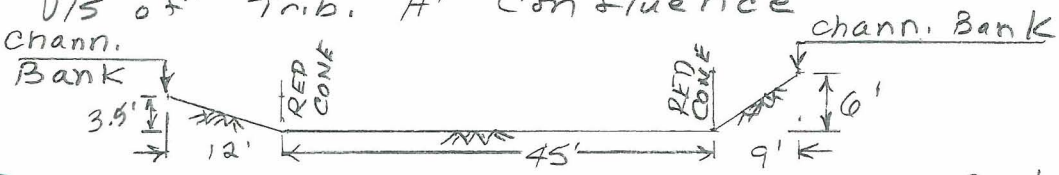
Channel "n"

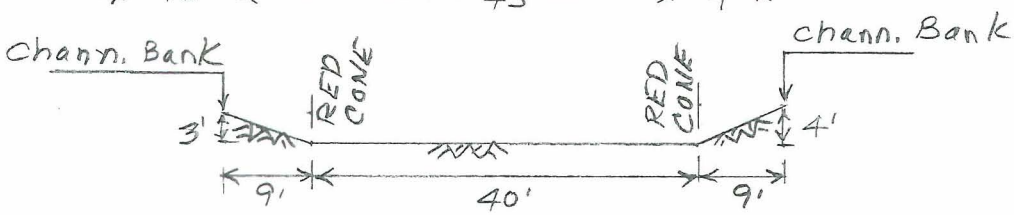
$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Channel Overbank

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Padelford Wash, 0.6 Mi. U/S of Trib. 'A' Confluence





P16

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

chann. overbank

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Padelford wash, 0.8 Mi. U/S of Trib. 'A' Confluence

P17

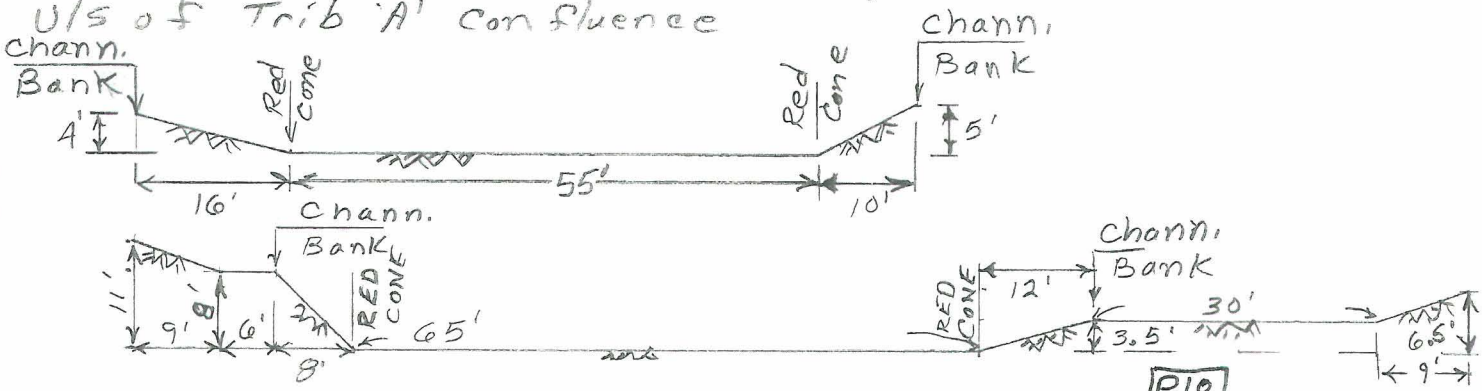
Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Channel overbank

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Padelford Wash, 0.2 Mi. U/S of Trib 'A' Confluence



P18

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Channel overbank

$n_b = 0.025$
$n_1 = .01$
$n_2 = .01$
$n_3 = .02$
$\Sigma n = 0.065$

Looking D/S on Padelford Wash, 0.4 Mi U/S of Trib. 'A' Confluence

P19

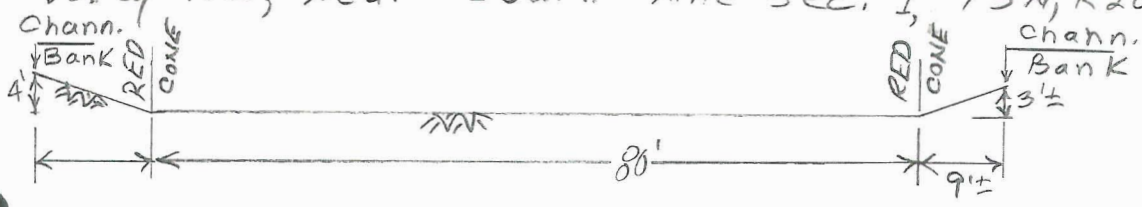
channel 'n'

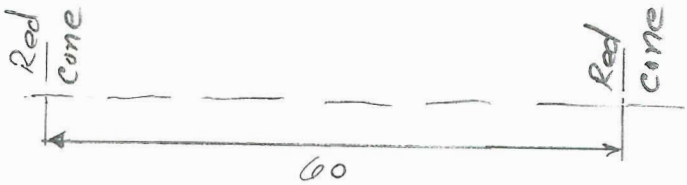
$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma = 0.065$

Looking D/S at Main Chann. of Padelford wash, (1) Mi U/s of Dove Valley Rd, Near South Line Sec. 1, T5N, R2W





P20

Vegetative Cover Along 60' Length of Tape Between Cones ≈ 39'

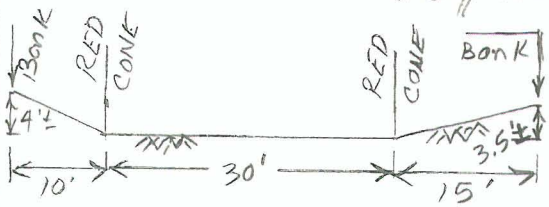
Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Typical Overbank 'n' Value and Vegetative Cover To W. of Main Channel of Padelford Near S. Sec. Line Sec. 1, T5N, R2W.

P21

Split #1
Looking D/S, Just D/S of Split 1, 1500'± N. of Dove Valley Rd

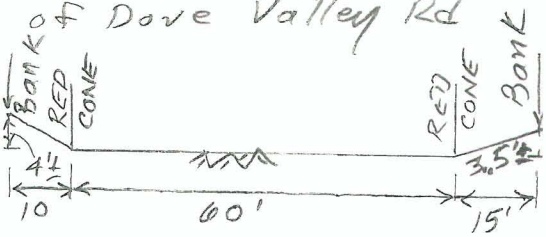


Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

P22

Padelford W. Looking D/S From 1500'± N. of Dove Valley Rd

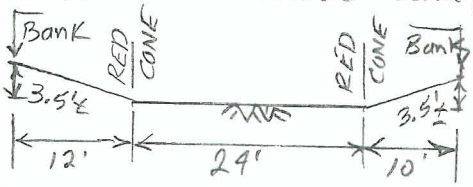


Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

P23

Padelford W. Looking D/S Just D/S of Split 1 From Padelford W. & 1500'± N. Dove Valley Rd.



Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

P24

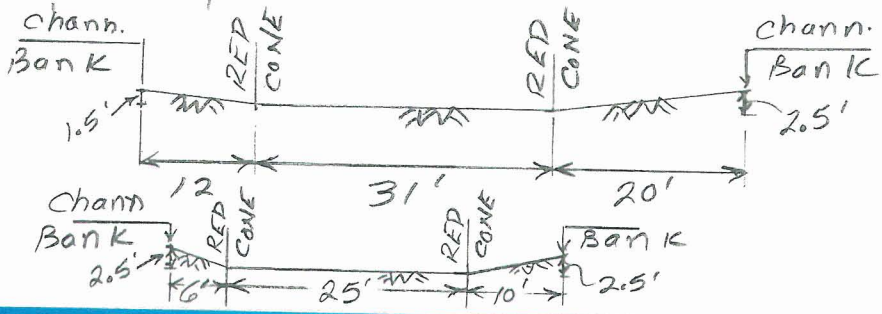
Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Padelford wash, Looking D/S, 200' U/S Dove Valley Rd, 600' W. of 163RD Ave



P25

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Padelford wash - Looking D/S at 163RD Ave 3690' N. of White Wing Rd.

(D-17)

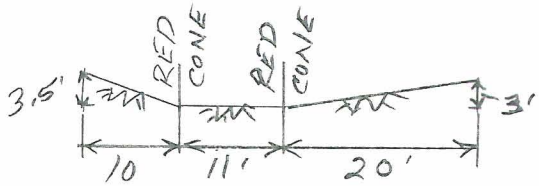
channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.040$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Padelford Wash – Looking D/S, 0.2 MI (1050'±) E. of 163RD Ave & 50' N. of White wing Rd



P27

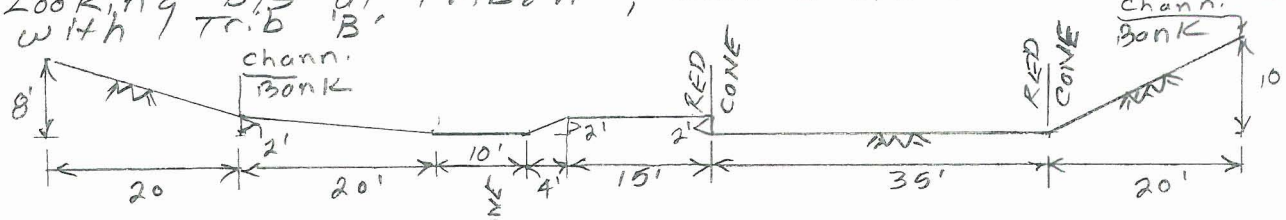
Channel 'n'

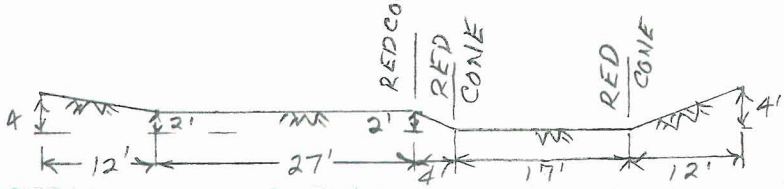
$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.040$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S at Trib. 'A', 2000'± U/S of Confluence with Trib. 'B'





P28

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.040$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S at Trib 'A', 3300'± U/S of Confluence with Trib. 'B'

P29

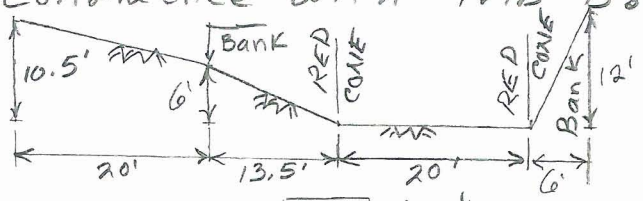
channel 'n'

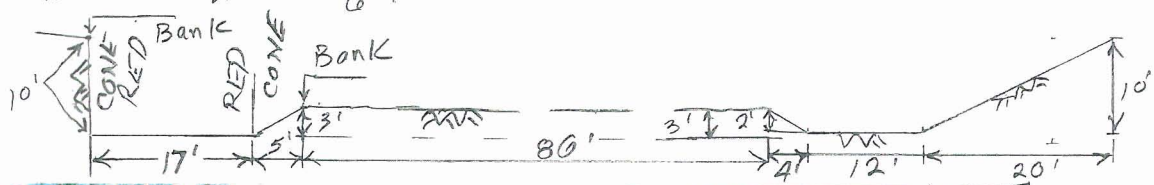
$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.040$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S at Trib. 'A', 600'± U/S of Confluence with Trib 'B'.





P30

channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.040$

overbank n

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S at Trib 'A', 1500'± U/S of Confluence with Trib 'B'.

P31

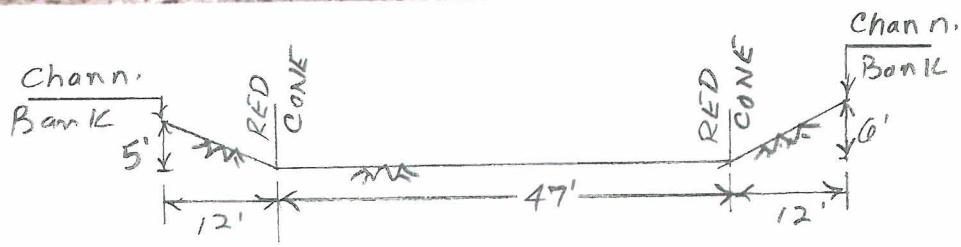
Looking D/S at Trib 'A' From Confluence with Trib. 'B', Approx. 3000 FT. N. S. Line of Sec. 36 and 4500 FT± U/S Confluence with Padelford wash.

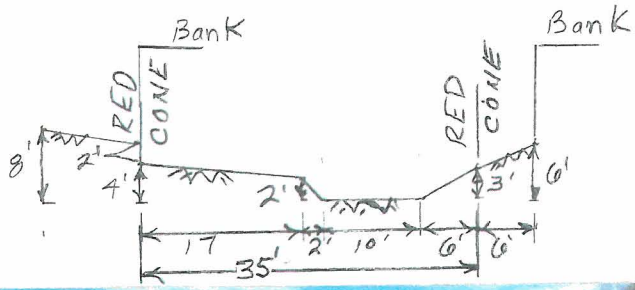
Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$





P32

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.040$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking Upstream (U/S) on Trib 'A' From Confluence with Trib 'B'

P33

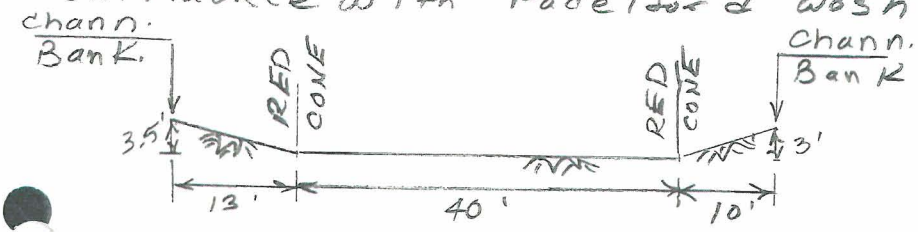
Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/s at Trib 'A' near South Line Sec. 36, T6N, R2W, 1500'± U/s Confluence with Padelford wash.



P34

Channel 'n'

$n_b = 0.025$
$n_1 = 0.008$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Looking D/s at Trib 'A', Approx. 1800'± U/s of S. Line of Sec. 36, and 3300'± U/s Confluence with Padelford wash

P35

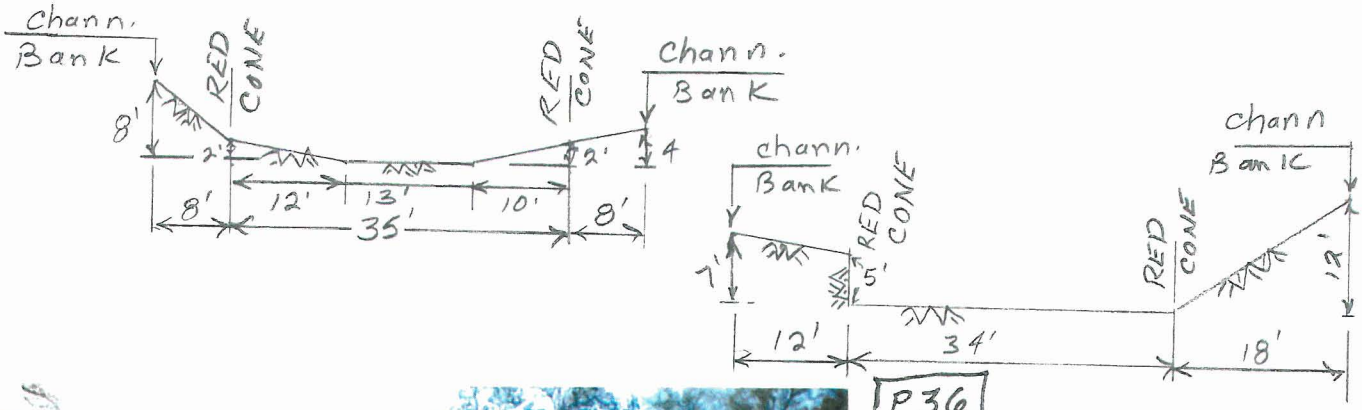
Channel 'n'

$n_b = 0.025$
$n_1 = 0.005$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.040$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking Upstream (U/S) on Trib 'B' at Confluence with Trib 'A', Approx 3000' N. of S. Line of Sec. 36 T6N, R2W, and 4500' U/S of Confluence with Padel Ford Wash.



P36

Channel 'n'

$n_b = 0.025$
$n_1 = 0.005$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.040$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Trib 'B' at 500' ± U/S of Confluence with Trib. 'A' (D-23)

P37

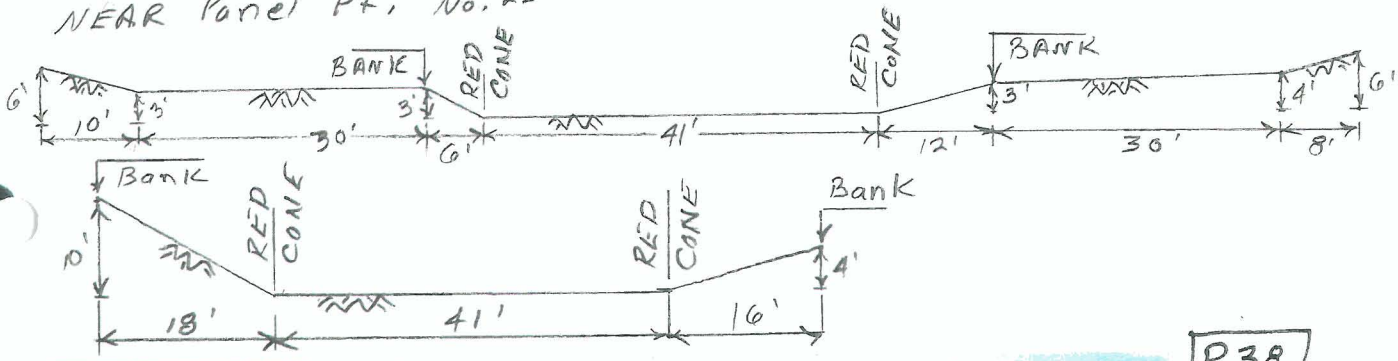
channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Trib. 'C', 0.1 MI± U/S of Padelford w. Confl. NEAR Panel Pt. No. 22



P38

channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.005$
$n_3 = 0.008$
$\Sigma n = 0.040$

overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Looking D/S on Trib 'C' Approx 0.7 Mi. U/S of Confluence with Padelford Wash.

P39

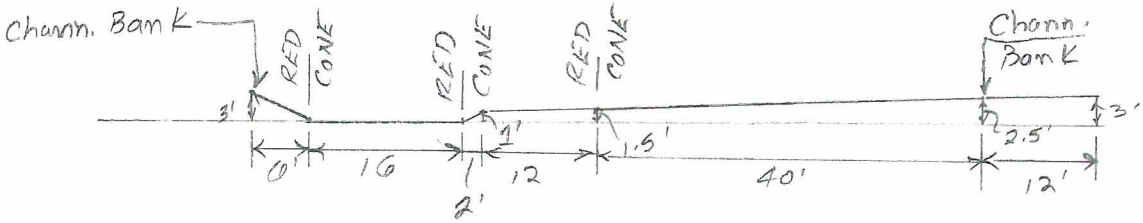
Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.006$
$\Sigma n = 0.037$

Overbank 'n'

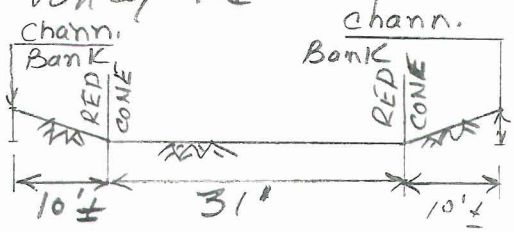
$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Split 1 – Looking D/S, 0.5± mi EAST of 163 RD Ave & 500'± S. of White wing Rd



P40

Looking U/S in Split #1 wash 200'± N. Dove Valley Rd



P41

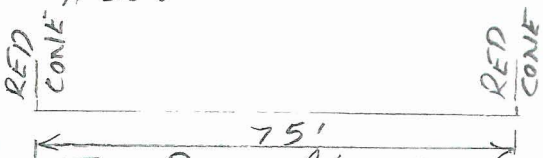
Looking D/S in Split #1 wash From same Location as Above

Channel 'n'

n_b = 0.025
n_1 = 0.002
n_2 = 0.002
n_3 = 0.008
Σn = 0.037

P42

Typical Vegetative Cover and overbank 'n' value Photo 200'± to East of Above wash Location



Veg. Cover Along tape = 40'±

Overbank 'n'

n_b = 0.025
n_1 = 0.01
n_2 = 0.01
n_3 = 0.02
Σ = 0.065

P43

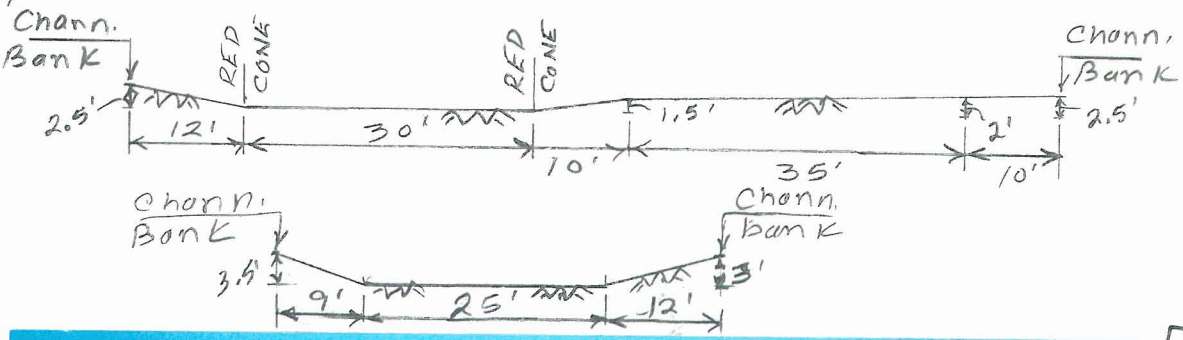
Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Split 2 - Looking D/S, 200' N. of Dove Valley Rd & 1400' west of 163RD Ave



P44

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Split 2 - Looking D/S, 850' W. of 163RD Ave & 20' N. of Quail Run Rd. (P-27)

P45

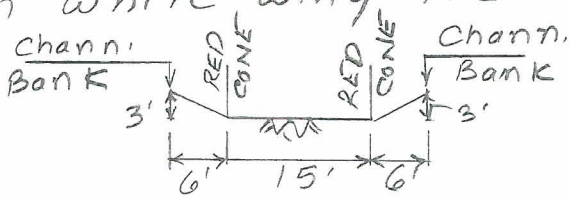
channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Split 2 - Looking D/S, 350' w. of 163RD Ave on white wing rd



P46

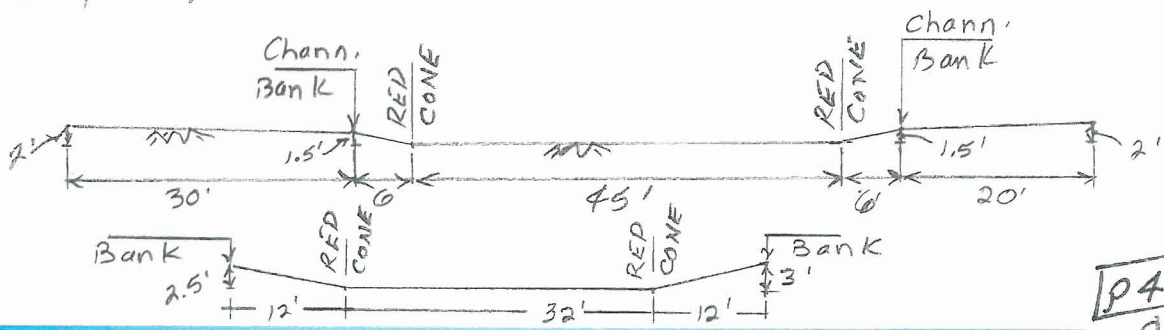
Split 3, Looking D/S, 200 FT. N. of Dove Valley Rd, 2250 FT. west of 163RD Ave.

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma = 0.065$



P47

Split 3 Looking D/S, 20' No of Quail Run Rd. & 2250' W. of 163RD Ave.

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

P48

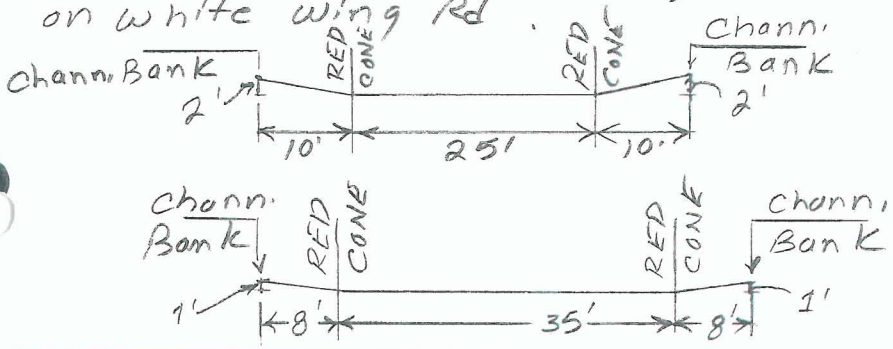
Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Split 3 - Looking D/S, 1430' ± west of 163RD Ave on White Wing Rd.



P49

Channel 'n'

$n_b = 0.025$
$n_1 = 0.002$
$n_2 = 0.002$
$n_3 = 0.008$
$\Sigma n = 0.037$

Overbank 'n'

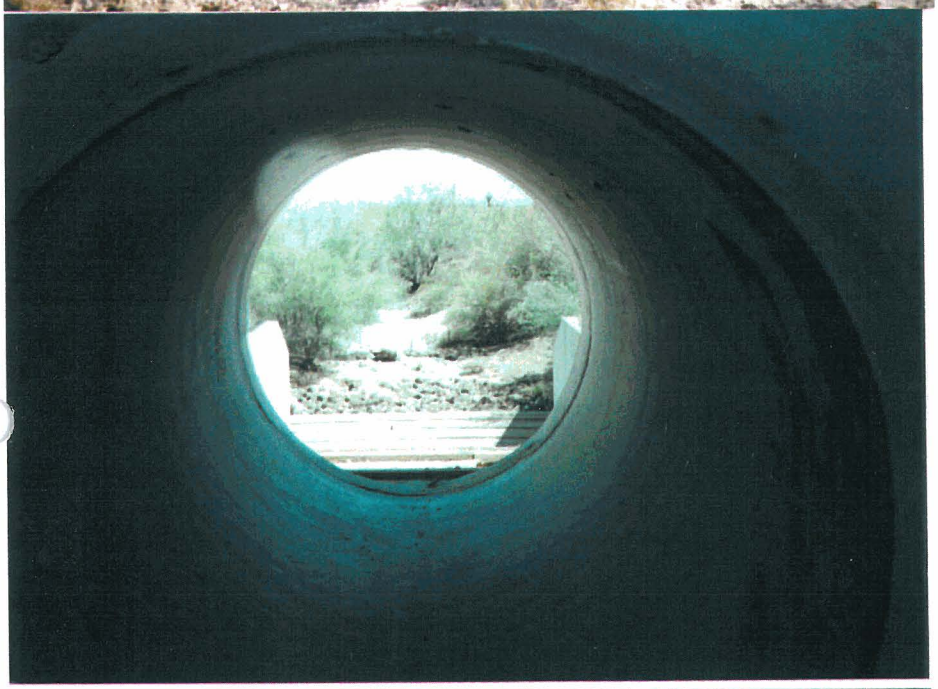
$n_b = 0.025$
$n_1 = 0.01$
$n_2 = 0.01$
$n_3 = 0.02$
$\Sigma n = 0.065$

Split 4 - Looking D/S, 1580' ± west of 163RD Ave. on White Wing Rd.

P50

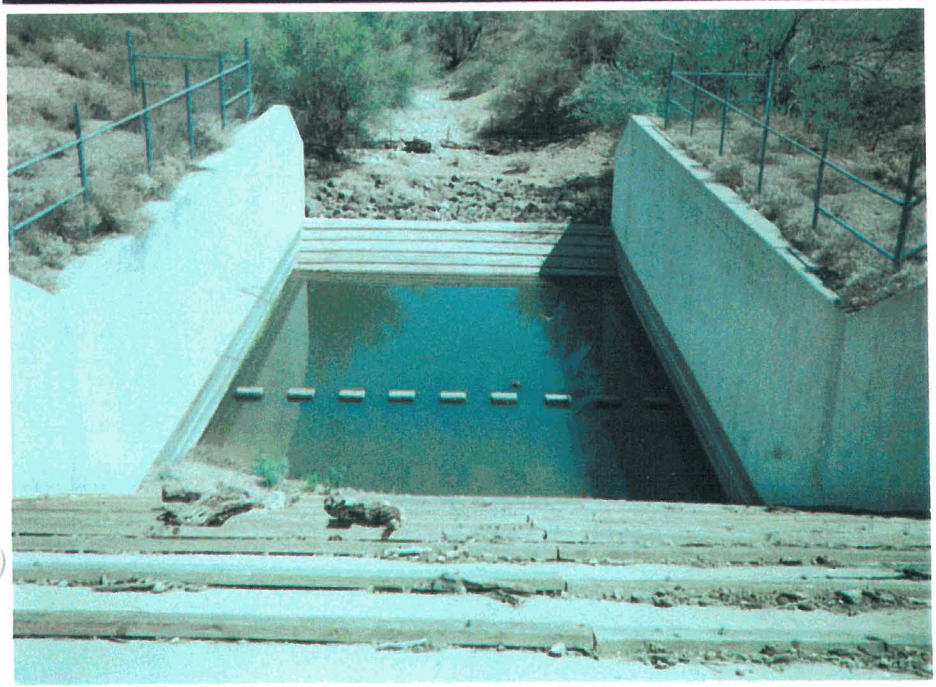
Looking D/S at
Inlet to CAP
Sta 315+00
3-6 FT DIA.
Steel Overchutes

P51

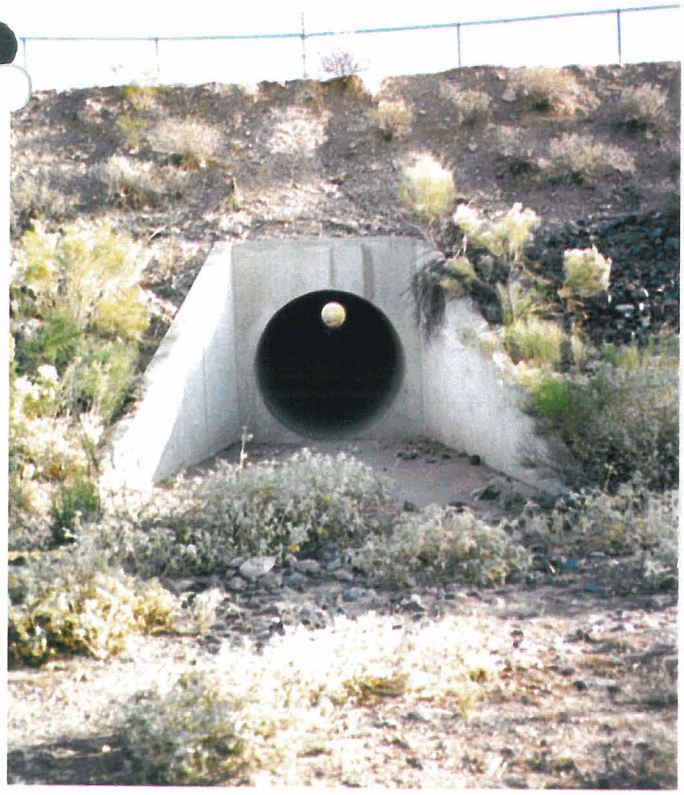


Looking D/S From
outlet at Energy
Dissipator

P52



Looking D/S at
Energy Dissipator



Looking D/S at Inlet
of CAP Sta 298+70
(1) 6 FT. DIA. Steel
overchute

Note: Outlet Photo Not
Available As Hornets
Nest at Inlet
Precluded Entry.

P54

Looking D/S at Inlet
To CAP Sta. 279 + 00
(1) 6 FT DIA. Overchute

P55

Looking U/s at Outlet
sta. 279+00

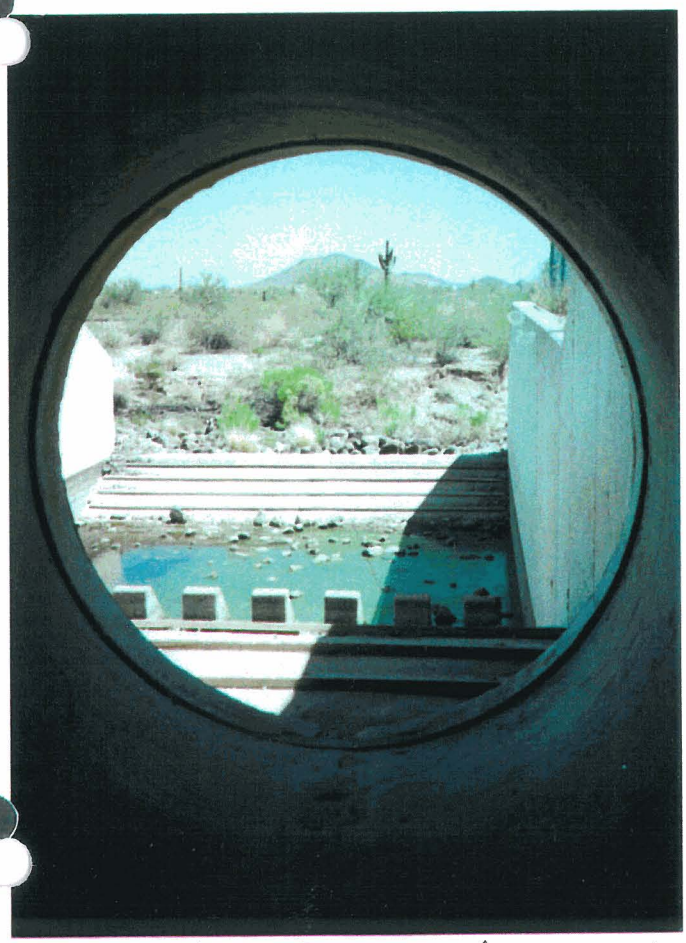
P56

Looking D/S From outlet
sta 279+00

P 57

CAP Sta. 272+35 Looking D/S at Inlet of (3) 6 FT DIA steel Overchutes

P 58

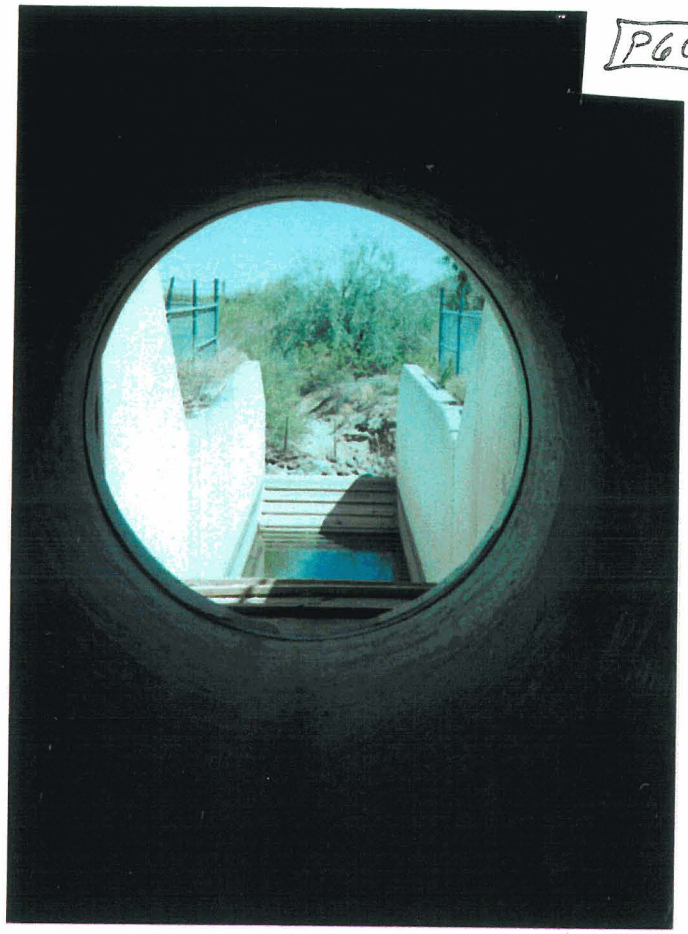


Looking Downstream From Outlet at Energy Dissipator

P59

Looking Downstream at Inlet
To CAP Sta 253+00
One 6' Dia. Steel Overchute

P60



Looking D/S
From Outlet
at Energy
Disipator

P61

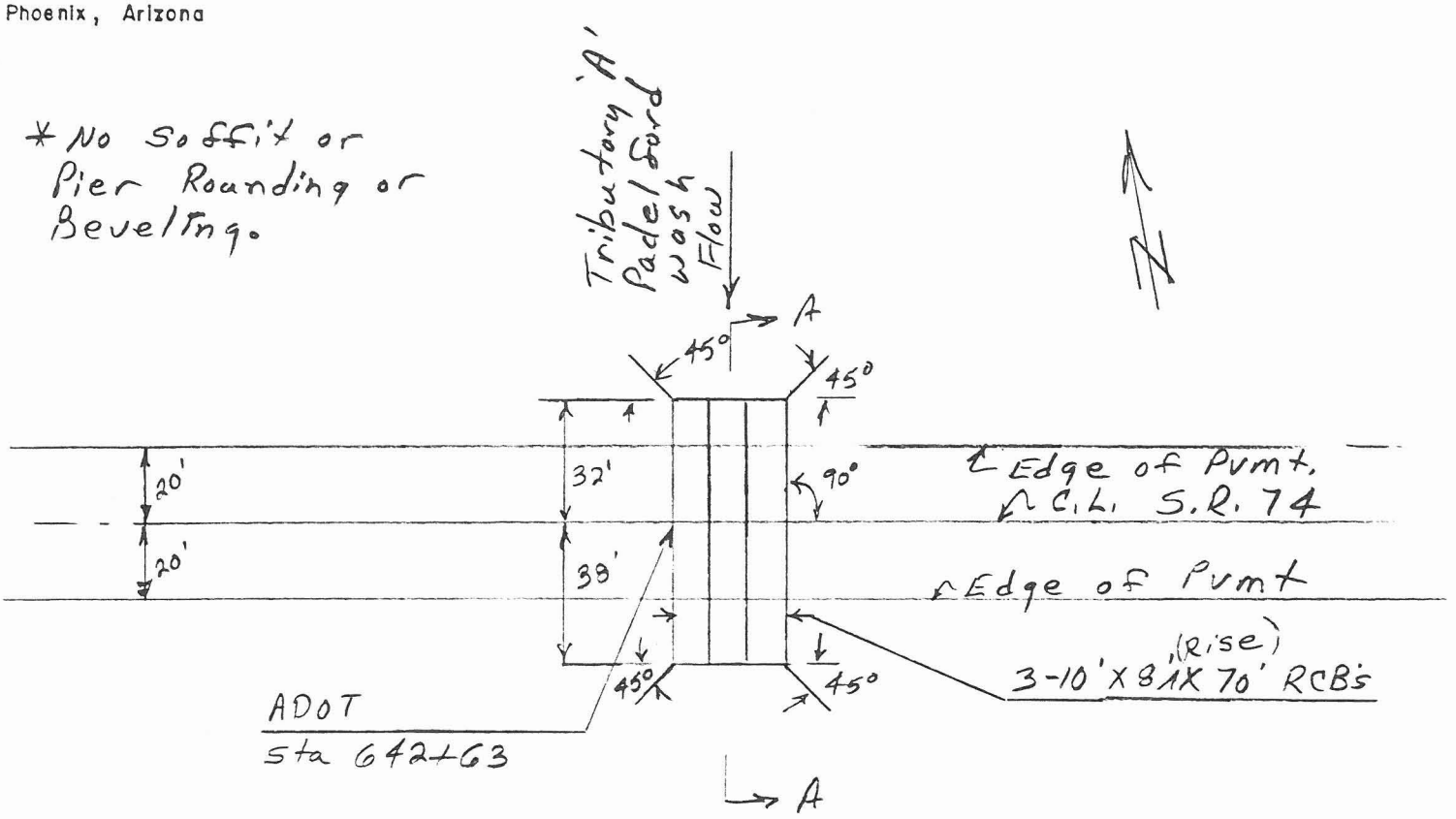
Looking Downstream at 6' Dia.
Steel Overchute at CAP Sta 240+00

P62

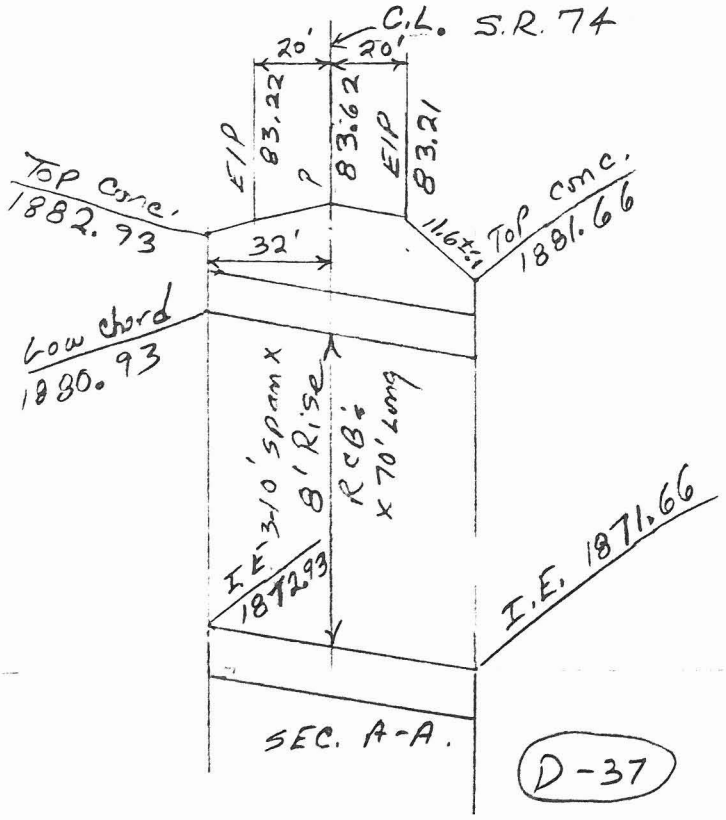
Looking Downstream From outlet At Energy Dissipator

AN WEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project 7158-07 Sht. ___ of ___
Podelford Wash
Calc. By GAS Date 3/31/00
FCD #99-12
Chkd. ___ Date ___



PLAN



D-37

P63

Looking Downstream at Inlet

ADOT Sta 642+63 on S.R. 74
3 - 10' span x 8' Rise x 70' RCBs

P64

Looking Upstream at Outlet
ADOT sta 642+63 at S.R. 74

FEDERAL EMERGENCY MANAGEMENT AGENCY BRIDGE/CULVERT	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: _____

Flooding Source: Podelford wash, Tributary A

Project Name/Identifier: _____

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): ADOT sta 642+63

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):
State Route 74, sta 642+63

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   _____

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☒ **No** ☐ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

ADOT sta 642+63 (cont'd.)

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- [x] Dimensions (height, width, span, radius, length)
- [x] Shape (culverts only)
- [x] Material
- [x] Beveling or Rounding No Soffit or Pier Rounding or Beveling
- [x] Wing Wall Angle
- [x] Low Chord Elevations - Upstream and Downstream
- [x] Top of Road Elevations - Upstream and Downstream
- [x] Structure Invert Elevations - Upstream and Downstream
- [x] Stream Invert Elevations - Upstream and Downstream
- [x] Skew Angle
- [ ] Cross-Section Locations
- [ ] Distances Between Cross Sections
- [ ] Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information (Check the box if provided):

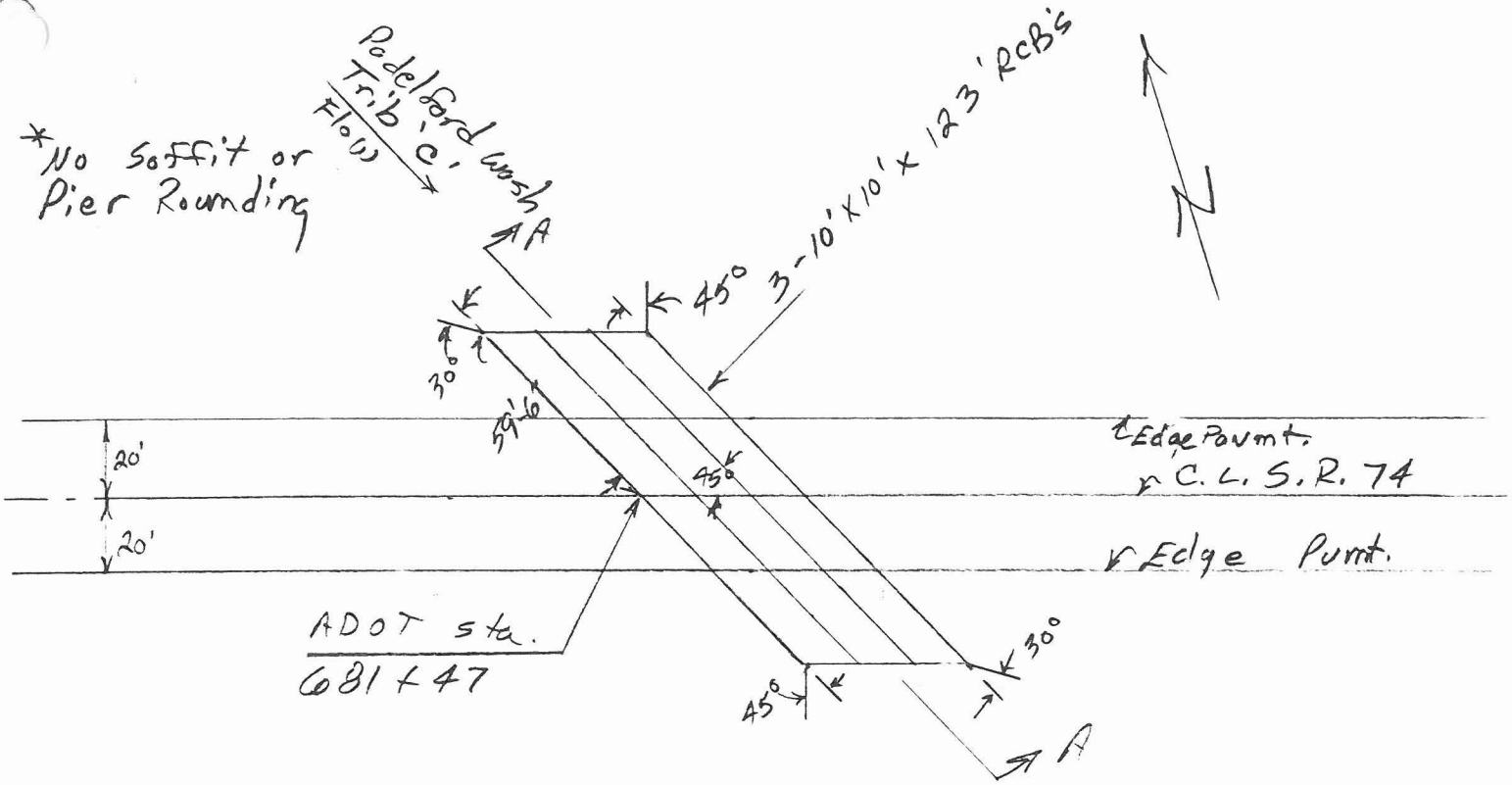
- [ ] Estimated sediment load
- [ ] Method used to estimate sediment transport
- [ ] Method used to estimate scour and/or deposition
- [ ] Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

No Significant Deposition Observed. Structure As-Blt in 10/7/70 Therefore, No Apparent Long-Term Aggradation or Degradation.

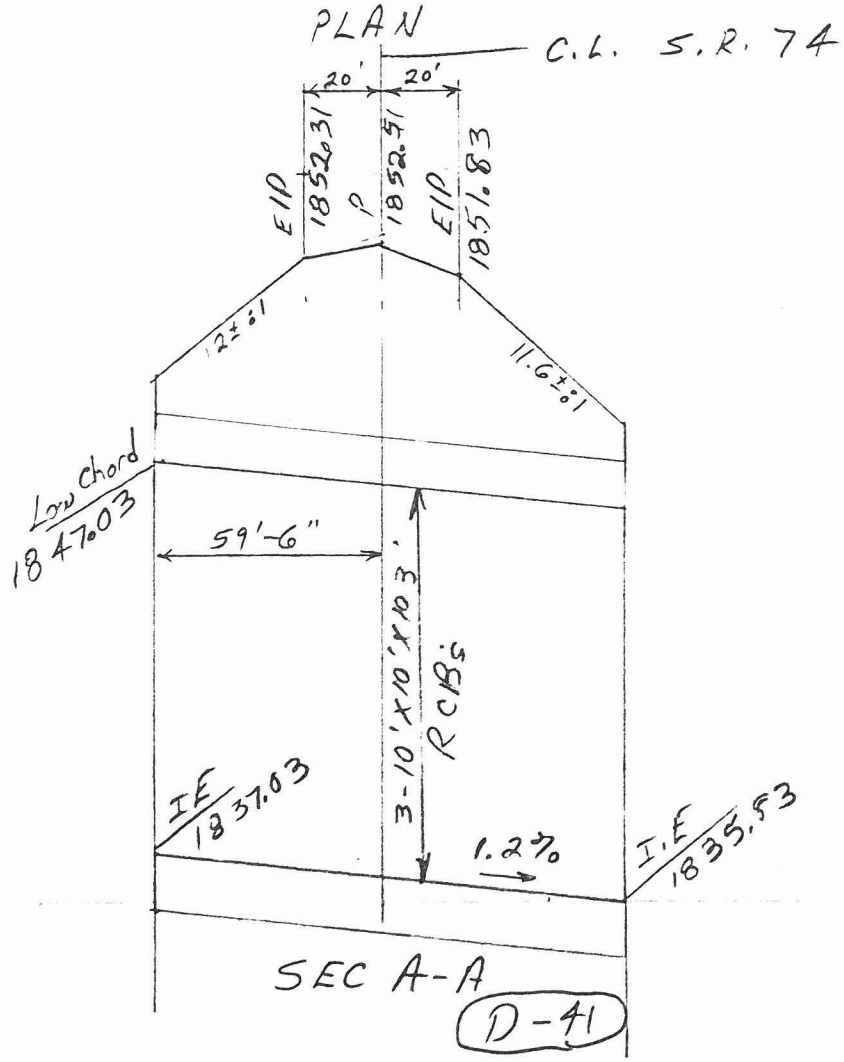
AN WEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Podelford Wash
FCD #99-12

Project 7158-07 Sht. ___ of ___
Calc. By GAS Date 4/3/00
Chkd. ___ Date ___



PLAN



D-41

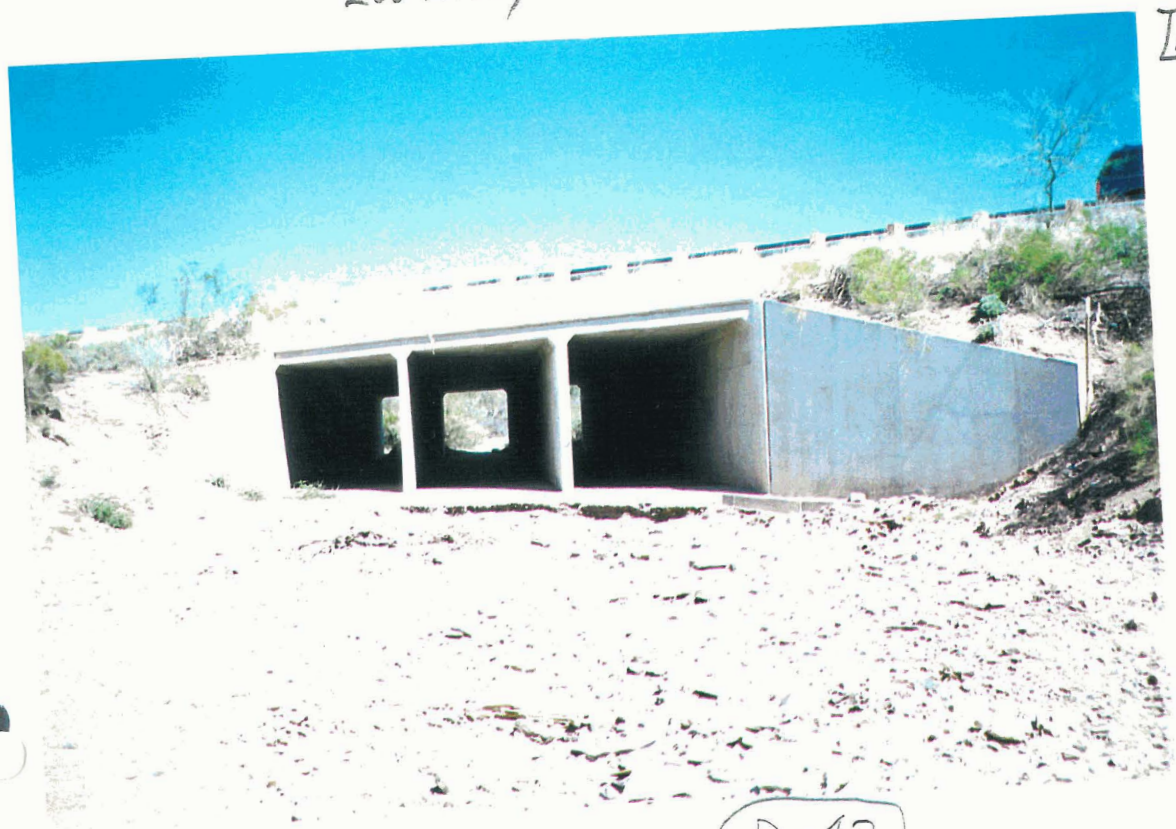
P65

Looking Downstream at Inlet

ADOT Sta 681+47 on S.R. 74
3-10' X 10' X 103' RCB's

Looking Upstream at Outlet

P66



FEDERAL EMERGENCY MANAGEMENT AGENCY BRIDGE/CULVERT	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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Community Name: _____

Flooding Source: Padelford wash, Tributary C

Project Name/Identifier: _____

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): ADOT Sta. 681+47

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):
State Route 74, Sta 681+47

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*
HEC-RAS, Ver 2.2

If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

Justification attached ☐ Yes ☒ No ☐ N/A

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- [x] Dimensions (height, width, span, radius, length)
- [x] Shape (culverts only)
- [x] Material
- [x] Beveling or Rounding (No Pier or Soffit Rounding
- [x] Wing Wall Angle
- [x] Low Chord Elevations - Upstream and Downstream
- [x] Top of Road Elevations - Upstream and Downstream
- [x] Structure Invert Elevations - Upstream and Downstream
- [x] Stream Invert Elevations - Upstream and Downstream
- [x] Skew Angle
- [ ] Cross-Section Locations
- [ ] Distances Between Cross Sections
- [ ] Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information (Check the box if provided):

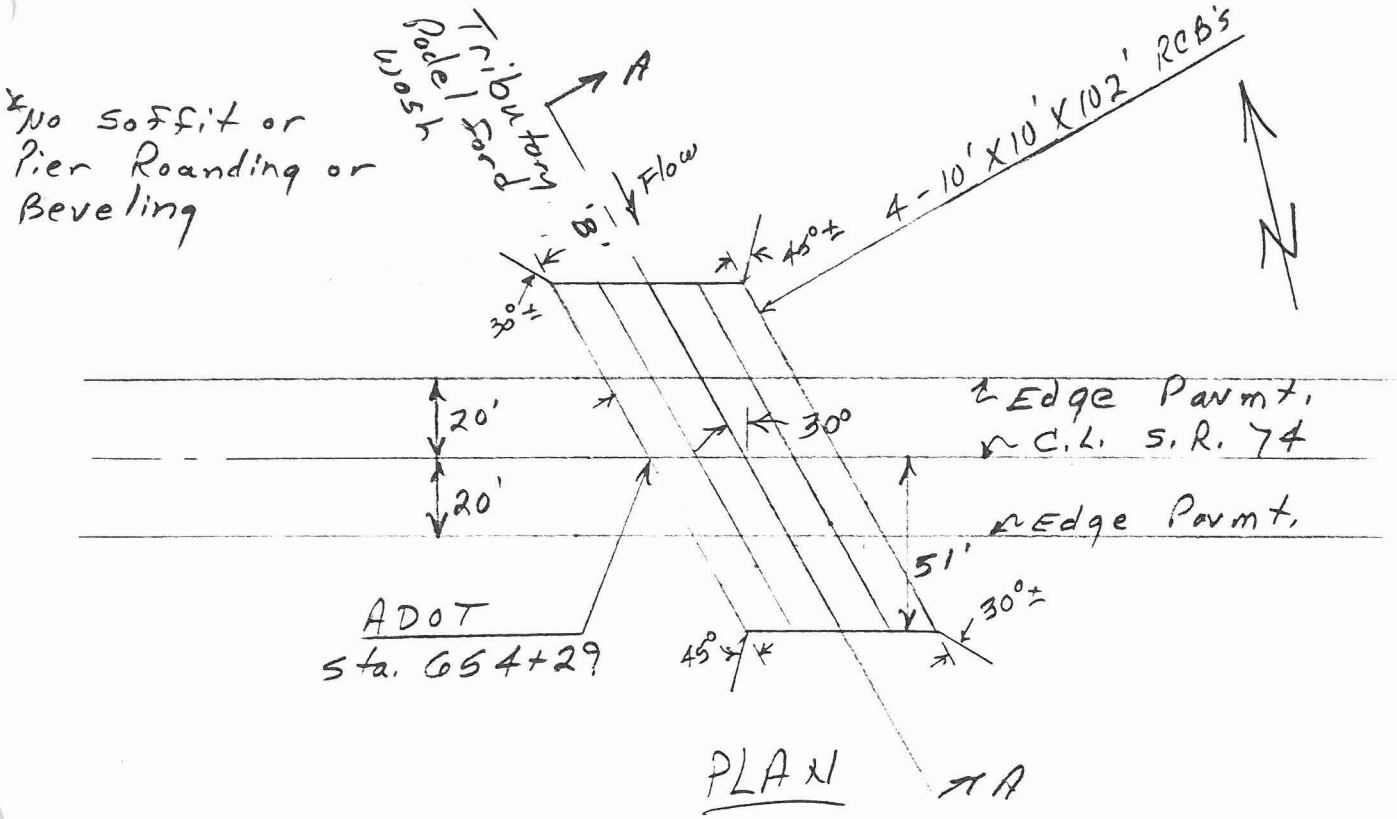
- [ ] Estimated sediment load
- [ ] Method used to estimate sediment transport
- [ ] Method used to estimate scour and/or deposition
- [ ] Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

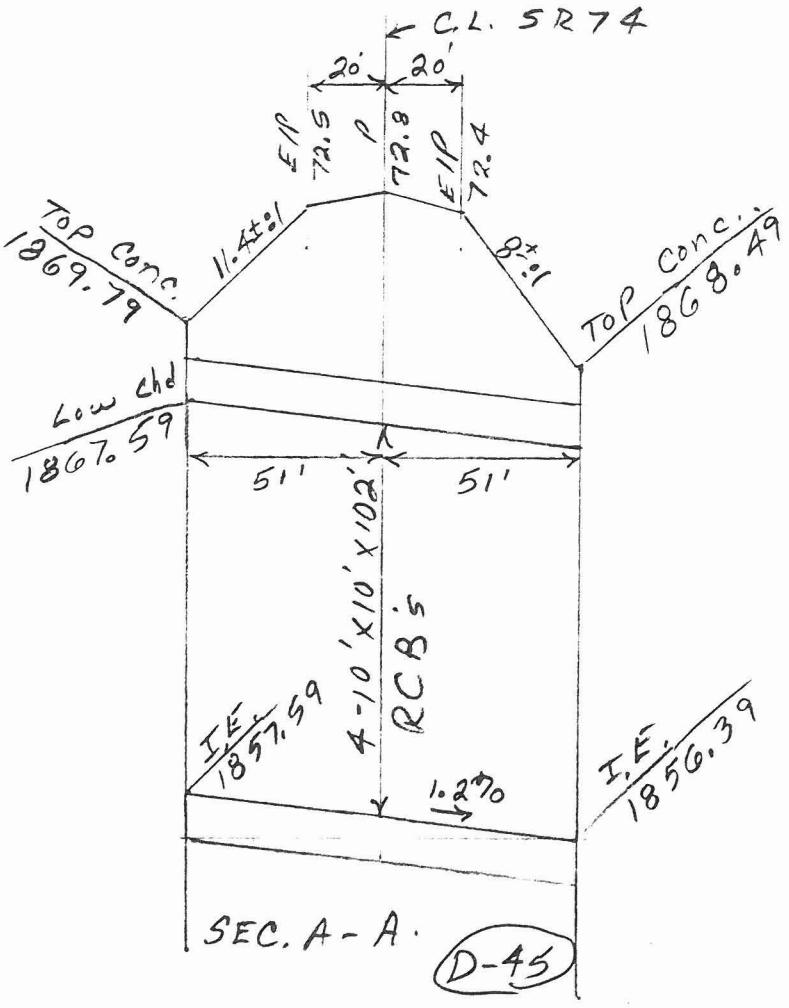
No Significant Deposition observed. Structure As-Built in 10/7/71. Therefore, No Apparent Long-Term Aggradation / Degradation.

AMWEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Padelford Wash
FCD # 99-12

Project 7158-07 Sht. ___ of ___
Calc. By GAS Date 3/31/00
Chkd. ___ Date ___





P67

Looking Downstream at Inlet

ADOT Sta 654+29 on S.R. 74
4-10'x10'x102' RCB's

Looking Upstream at Outlet

P68

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: _____

Flooding Source: Padelford Wash, Tributary B

Project Name/Identifier: _____

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): ADOT Sta. 654+29

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):
State Route 74, sta 654+29

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*
HEC-RAS, Ver. 2.2

If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

Justification attached ☐ Yes ☒ No ☐ N/A

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

ADOT Sta 654+29 cont'd.

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- [x] Dimensions (height, width, span, radius, length)
- [x] Shape (culverts only)
- [x] Material
- [x] Beveling or Rounding (No Pier or Soffit Rounding)
- [x] Wing Wall Angle
- [x] Low Chord Elevations - Upstream and Downstream
- [x] Top of Road Elevations - Upstream and Downstream
- [x] Structure Invert Elevations - Upstream and Downstream
- [ ] Stream Invert Elevations - Upstream and Downstream
- [x] Skew Angle
- [ ] Cross-Section Locations
- [ ] Distances Between Cross Sections
- [ ] Erosion Protection

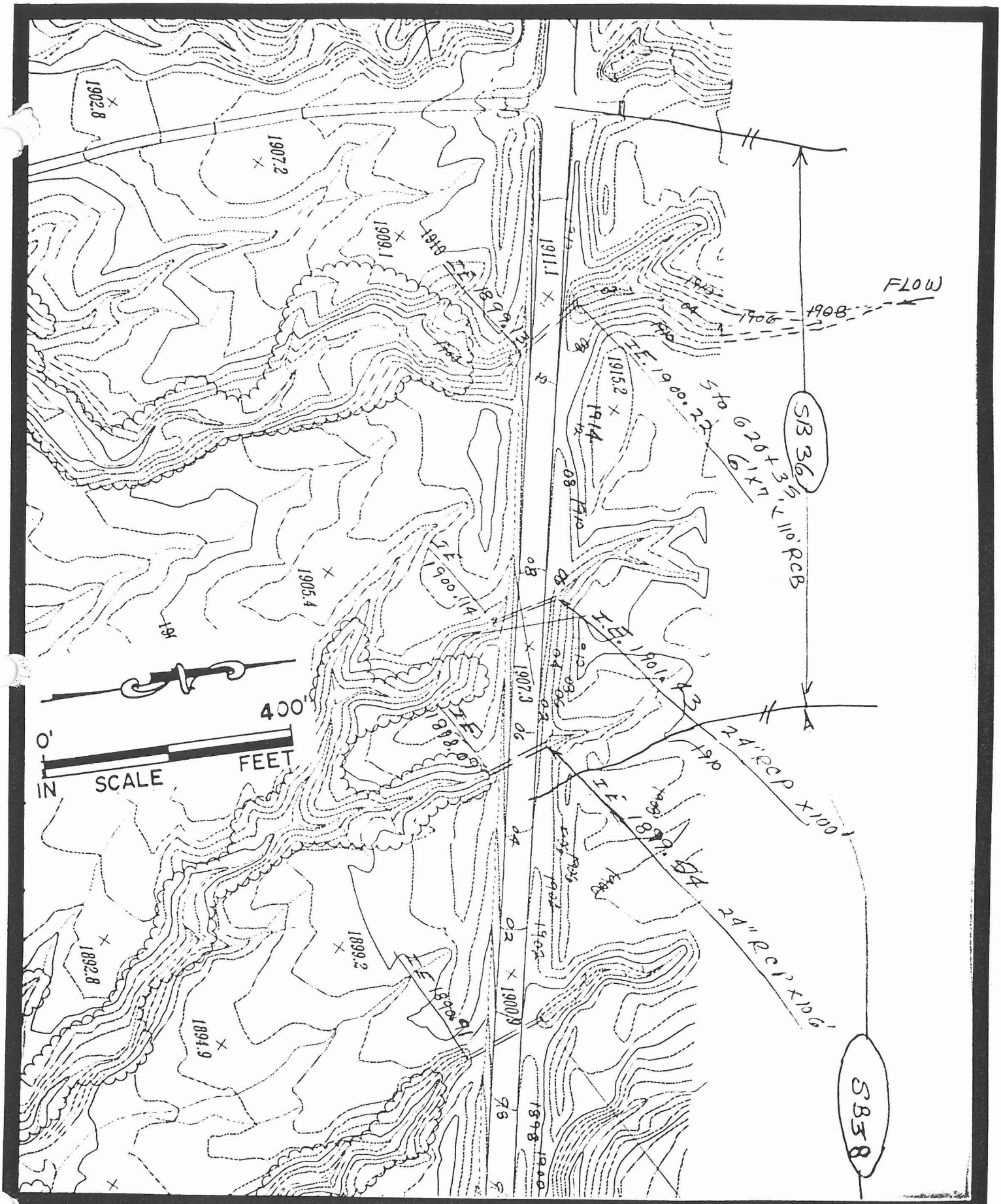
3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information (Check the box if provided):

No Significant Deposition Observed, Structure As-Blt. in 10/7/71. Therefore No Apparent Long-Term Aggradation Degradation

- [ ] Estimated sediment load
- [ ] Method used to estimate sediment transport
- [ ] Method used to estimate scour and/or deposition
- [ ] Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

AVERY



A-N WEST NO.7158-07
FCD.NO.99-12

A-N WEST INC.
Consulting Engineers

EXPLANATION

SB36 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

S.R.74 CULVERT DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

E-1

FIGURE SB/DR36

HI WEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project Padelford Wash FIS — Sht. ___ of ___
FCD No. 99-12
Calc. By GAS — Date 9/5/00
Chkd. ___ — Date ___

Retention / Detention Basin Data

LOCATION: ADOT Sta. 620+35; (1)-6'x7'x110' RCB

INFLOW I.D. NO.: SB 36

OUTFLOW I.D. NO: DR 36

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS) 6'x7'x110' RCB	SPILLWAY DISCHG (CFS)	TOTAL DISCHARGE CFS
1900.22	0.0	0	0		
1902	0.057	0.051	43		
1904	0.185	0.293	133		
1906	0.413	0.891	246		
1908	0.740	2.040	373		

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir Storage									
SV 0	0.051	0.293	0.89	2.040					
SQ Record - Discharge									
SQ 0	43	133	246	373					
SE Record - Elevation									
SE 1900.2	1902	1904	1906	1908					
SS Record - Spillway Characteristics									
SS	N/A								
ST Record - Top of Dam Overflow									
ST	N/A								

CURRENT DATE: 09-06-2000 FILE DATE: 09-06-2000
CURRENT TIME: 11:50:27 FILE NAME: SR62035

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

SITE DATA				CULVERT SHAPE, MATERIAL, INLET				
CULVERT NO.	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1900.22	1899.13	110.01	1 RCB	6.00	7.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: SR62035 DATE: 09-06-2000

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1900.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1901.95	41.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1902.96	82.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1903.81	123.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1904.59	164.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1905.30	205.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1905.97	246.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1906.61	287.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1907.27	328.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1907.93	369.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1908.64	410.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: SR62035 DATE: 09-06-2000

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1900.22	0.000	0.00	0.00	0.00
1901.95	0.000	41.00	0.00	0.00
1902.96	0.000	82.00	0.00	0.00
1903.81	0.000	123.00	0.00	0.00
1904.59	0.000	164.00	0.00	0.00
1905.30	0.000	205.00	0.00	0.00
1905.97	0.000	246.00	0.00	0.00
1906.61	0.000	287.00	0.00	0.00
1907.27	0.000	328.00	0.00	0.00
1907.93	0.000	369.00	0.00	0.00
1908.64	0.000	410.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

E-3

CURRENT DATE: 09-06-2000 FILE DATE: 09-06-2000
CURRENT TIME: 11:50:27 FILE NAME: SR62035

PERFORMANCE CURVE FOR CULVERT 1 - 1(6.00 (ft) BY 7.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1900.22	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
41.00	1901.95	1.73	1.73	1-S2n	0.76	1.13	0.78	1.09	8.71	3.29
82.00	1902.96	2.74	2.74	1-S2n	1.20	1.80	1.28	1.52	10.67	3.96
123.00	1903.81	3.59	3.59	1-S2n	1.60	2.36	1.74	1.84	11.79	4.41
164.00	1904.59	4.37	4.37	1-S2n	1.97	2.86	2.15	2.09	12.72	4.75
205.00	1905.30	5.08	5.08	1-S2n	2.31	3.32	2.55	2.32	13.42	5.03
246.00	1905.97	5.75	5.75	1-S2n	2.64	3.75	2.93	2.51	14.02	5.27
287.00	1906.62	6.40	6.40	1-S2n	2.96	4.15	3.28	2.69	14.58	5.48
328.00	1907.26	7.04	7.04	5-S2n	3.28	4.54	3.64	2.85	15.03	5.67
369.00	1907.93	7.71	7.71	5-S2n	3.59	4.91	3.97	3.00	15.50	5.85
410.00	1908.64	8.42	8.42	5-S2n	3.89	5.27	4.31	3.14	15.87	6.01

El. inlet face invert 1900.22 ft El. outlet invert 1899.13 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1900.22 ft
OUTLET STATION	110.00 ft
OUTLET ELEVATION	1899.13 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0099
CULVERT LENGTH ALONG SLOPE	110.01 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	6.00 ft
BARREL RISE	7.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

C[illegible] DATE: 09-06-2000
CURRENT TIME: 11:50:27

FILE DATE: 09-06-2000
FILE NAME: SR62035

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD TAILWATER DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	6.00 ft
SIDE SLOPE H/V (X:1)	5.0
CHANNEL SLOPE V/H (ft/ft)	0.012
MANNING'S n (.01-0.1)	0.040
CHANNEL INVERT ELEVATION	1899.13 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	1899.13 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1899.13	0.000	0.00	0.00	0.00
41.00	1900.22	0.556	1.09	3.29	0.81
82.00	1900.65	0.567	1.52	3.96	1.14
123.00	1900.97	0.573	1.84	4.41	1.38
164.00	1901.22	0.578	2.09	4.75	1.57
205.00	1901.45	0.583	2.32	5.03	1.74
246.00	1901.64	0.586	2.51	5.27	1.88
287.00	1901.82	0.589	2.69	5.48	2.01
328.00	1901.98	0.592	2.85	5.67	2.14
369.00	1902.13	0.594	3.00	5.85	2.25
410.00	1902.27	0.597	3.14	6.01	2.35

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDD ROADWAY OVERTOPPING DATA DDDDDDDDDDDDDDDDDDDDDDDDDD
DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

WEIR COEFFICIENT	3.00
EMBANKMENT TOP WIDTH	0.00 ft
CREST LENGTH	10.00 ft
OVERTOPPING CREST ELEVATION	1909.00 ft

DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD

Culvert Designer/Analyzer Report
STA620+35

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,908.02 ft	Discharge	390.00 cfs
Inlet Control HW Elev	1,907.68 ft	Tailwater Elevation	1,902.21 ft
Outlet Control HW Elev	1,908.02 ft	Control Type	Entrance Control
Headwater Depth/ Height	1.30		

Grades			
Upstream Invert	1,900.22 ft	Downstream Invert	1,899.13 ft
Length	110.00 ft	Constructed Slope	0.009909 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	3.62 ft
Slope Type	Steep	Normal Depth	3.21 ft
Flow Regime	Supercritical	Critical Depth	4.59 ft
Velocity Downstream	15.41 ft/s	Critical Slope	0.003857 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.012
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 6 ft	Rise	6.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,908.02 ft	Upstream Velocity Head	2.29 ft
Ke	0.40	Entrance Loss	0.92 ft

Inlet Control Properties			
Inlet Control HW Elev	1,907.68 ft	Flow Control	Transition
Inlet Type	45 ° wingwall flares - offset	Area Full	42.0 ft²
K	0.49700	HDS 5 Chart	13
M	0.66700	HDS 5 Scale	1
C	0.03020	Equation Form	2
Y	0.83500		

E-6

Culvert Designer/Analyzer Report
STA620+35

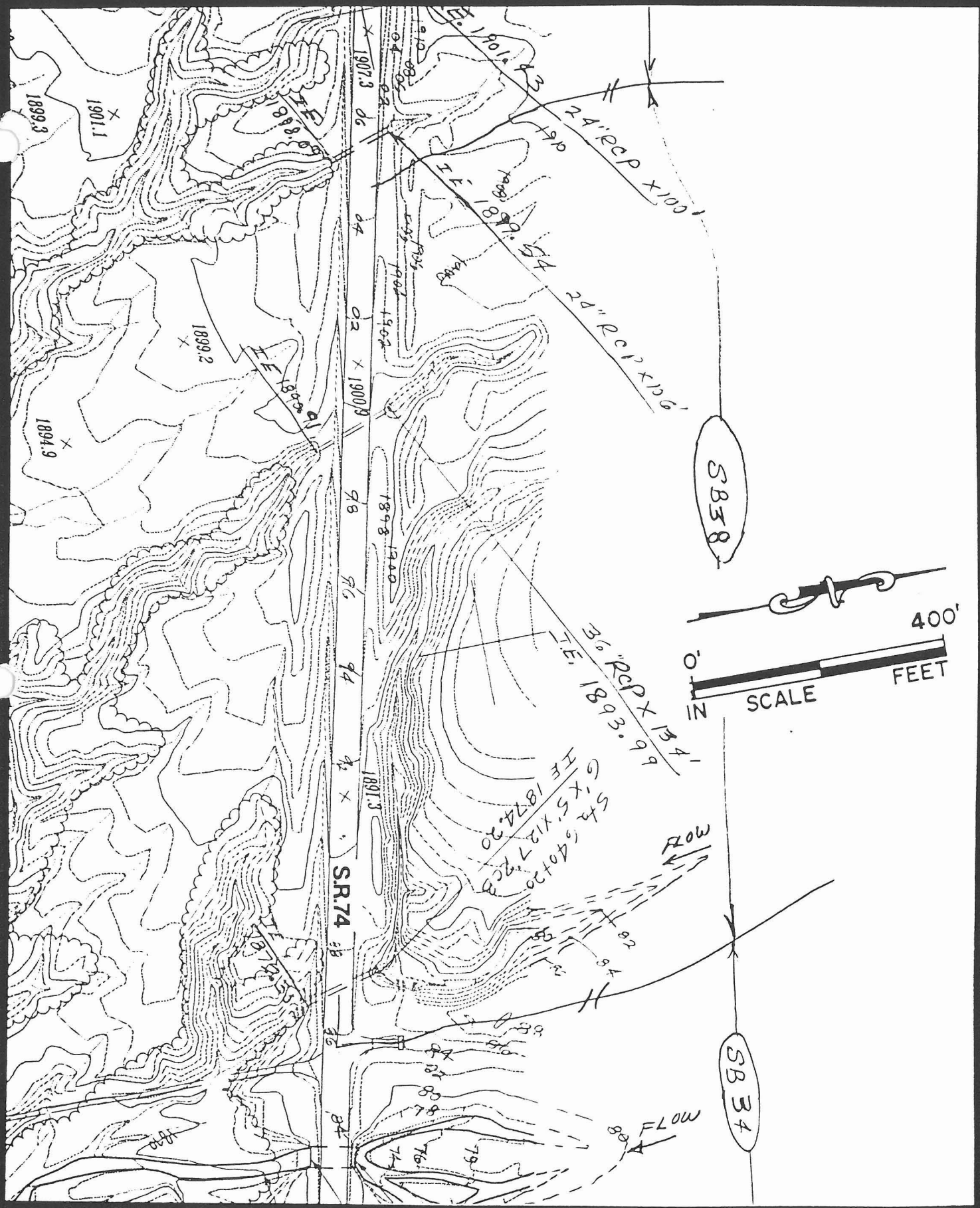
Analysis Component			
Storm Event	Design	Discharge	390.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	390.00 cfs	Check Discharge	400.00 cfs

Tailwater properties: Trapezoidal Channel			
Slope	0.012000 ft/ft	Mannings Coefficient	0.040
Depth	3.08 ft	Left Side Slope	5 H : V
Right Side Slope	5 H : V	Bottom Width	6.00 ft

Tailwater conditions for Design Storm.			
Discharge	390.00 cfs	Bottom Elevation	1,899.13 ft
Depth	3.08 ft	Velocity	5.93 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-7 x 6 ft Box	390.00 cfs	1,908.02 ft	15.41 ft/s
Weir	Not Considered	N/A	N/A	N/A



A-N WEST NO.7158-07
FCD.NO.99-12

A-N WEST INC.
Consulting Engineers

EXPLANATION

SB 36 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

S.R.74 CULVERT DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

FIGURE SB/DR 38

HWEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project: Podelford Wash FIS
FCD No 99-12

Calc. By: GAS Date: 9/5/00
Chkd. Date

Retention / Detention Basin Data

LOCATION: ADOT Sta 640+20; 6'x5'x127' RCB
Inlet IE. 1874.20
Outlet IE 1872.30

INFLOW I.D. NO.: SB 38

OUTFLOW I.D. NO: DR 38

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS)	SPILLWAY DISCHG (CFS)	TOTAL DISCHARGE CFS
1874.2	0	0	0		
1876	0.100	0.09	45.1		
1878	0.129	0.319	114.4		
1880	0.285	0.733	214.8		
1882	0.484	1.502	327.5		
1884	0.782	2.768	445.4		
1886	1.337	4.887	477.2		

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir storage									
SV 0	0.09	0.319	0.733	1.502	2.768	4.887			
SQ Record - Discharge									
SQ 0	45.1	114.4	214.8	327.5	445.4	477.2			
SE Record - Elevation									
SE 1874.2	1876	1878	1880	1882	1884	1886			
SS Record - spillway Characteristics									
SS	N/A								
ST Record - Top of Dam Overflow									
ST	N/A								

Culvert Designer/Analyzer Report
STA640+20

Analysis Component			
Storm Event	Design	Discharge	450.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	450.00 cfs	Check Discharge	500.00 cfs

Tailwater properties: Trapezoidal Channel			
Slope	0.025000 ft/ft	Mannings Coefficient	0.037
Depth	2.77 ft	Left Side Slope	4 H : V
Right Side Slope	5 H : V	Bottom Width	6.00 ft

Tailwater conditions for Design Storm.			
Discharge	450.00 cfs	Bottom Elevation	1,872.30 ft
Depth	2.77 ft	Velocity	8.77 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-6 x 5 ft Box	450.00 cfs	1,885.13 ft	18.19 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
STA640+20

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,885.13 ft	Discharge	450.00 cfs
Inlet Control HW Elev	1,885.13 ft	Tailwater Elevation	1,875.07 ft
Outlet Control HW Elev	1,884.10 ft	Control Type	Inlet Control
Headwater Depth/ Height	2.19		

Grades			
Upstream Invert	1,874.20 ft	Downstream Invert	1,872.30 ft
Length	127.00 ft	Constructed Slope	0.014961 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	4.12 ft
Slope Type	Steep	Normal Depth	3.57 ft
Flow Regime	Supercritical	Critical Depth	5.00 ft
Velocity Downstream	18.19 ft/s	Critical Slope	0.009704 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.012
Section Material	Concrete	Span	6.00 ft
Section Size	6 x 5 ft	Rise	5.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,884.10 ft	Upstream Velocity Head	3.50 ft
Ke	0.40	Entrance Loss	1.40 ft

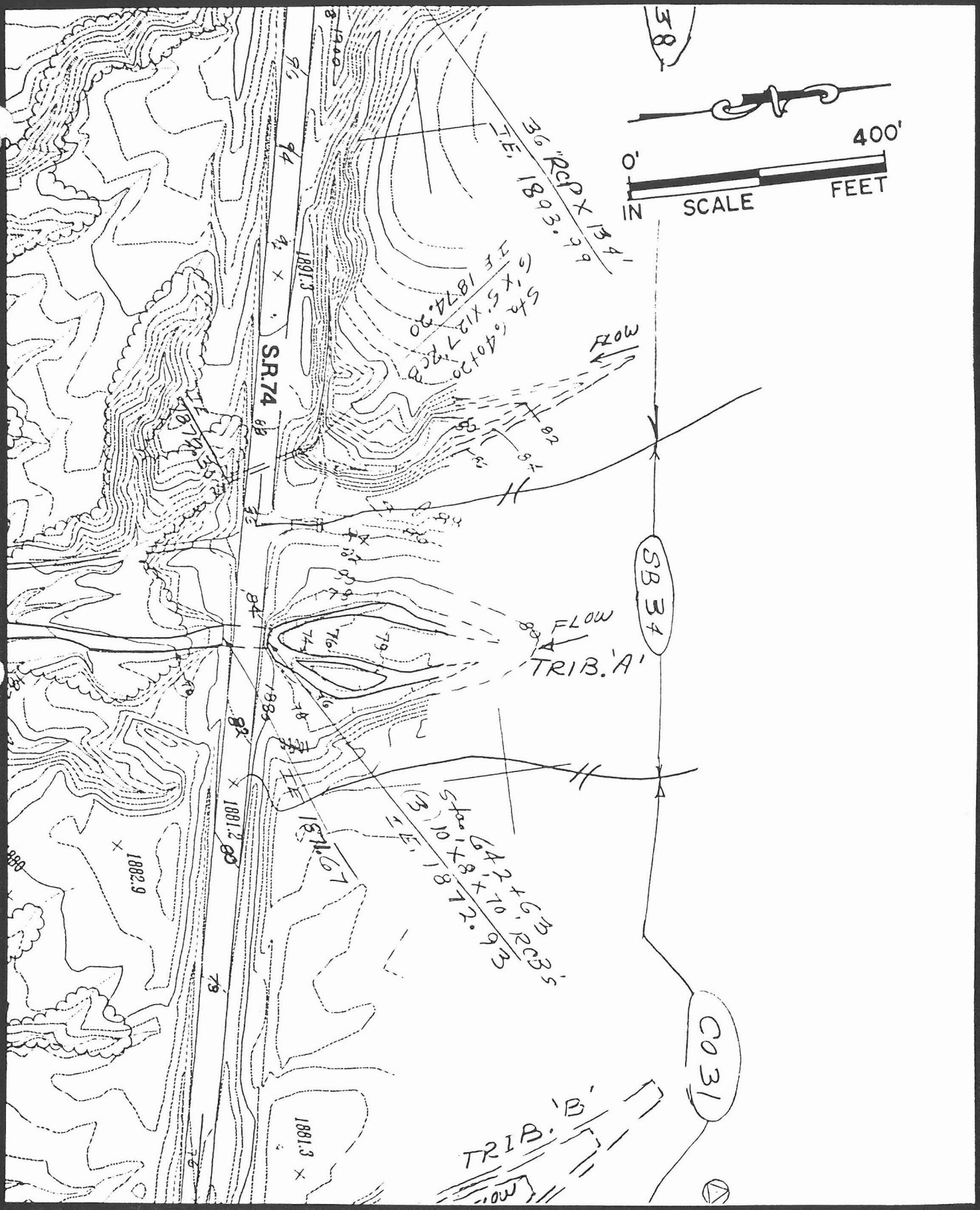
Inlet Control Properties			
Inlet Control HW Elev	1,885.13 ft	Flow Control	Submerged
Inlet Type	45 ° wingwall flares - offset	Area Full	30.0 ft²
K	0.49700	HDS 5 Chart	13
M	0.66700	HDS 5 Scale	1
C	0.03020	Equation Form	2
Y	0.83500		

Rating Table Report
STA640+20

ange Data:

	Minimum	Maximum	Increment
Discharge	0.00	500.00	50.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo
0.00	1,872.30	1,872.30	1,872.30
50.00	1,876.40	1,876.24	1,876.40
100.00	1,877.69	1,877.44	1,877.69
150.00	1,878.77	1,878.45	1,878.77
200.00	1,879.74	1,879.35	1,879.74
250.00	1,880.62	1,880.30	1,880.62
300.00	1,881.45	1,881.36	1,881.45
350.00	1,882.45	1,882.45	1,882.24
400.00	1,883.71	1,883.71	1,883.07
450.00	1,885.13	1,885.13	1,884.10
500.00	1,886.73	1,886.73	1,885.24



A-N WEST NO.7158-07
FCD.NO.99-12

A-N WEST INC.
Consulting Engineers

EXPLANATION

SB3 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

S.R.74 CULVERT DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

E-13

FIGURE SB/DR 34

HH WEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project Podelford Wash FIS | Sht. ___ of ___
Calc. By GAS | Date 9/5/00
FCD No. 99-12 | Chkd. ___ | Date ___

Retention / Detention Basin Data

LOCATION: ADOT STA. 642+63, 3-10'x 8'x 70' RCB's
Inlet IE 1872.93
Outlet IE. 1871.67
Breakout El. 1880.5±

INFLOW I.D. NO.: SB 34

OUTFLOW I.D. NO: DR 34

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS)	SPILLWAY DISCHG (CFS)	TOTAL DISCHARGE CFS
1872.93	0	0	0		
1874	0.10	0.054	52.1		
1876	0.271	0.425	412.9		
1878	0.926	1.622	877.9		
1880	1.708	4.256	1443.8		

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir Storage									
SV 0	0.054	0.425	1.622	4.256					
SQ Record - Discharge									
SQ 0	52.1	412.9	877.9	1443.8					
SE Record - Elevation									
SE 1872.93	1874	1876	1878	1880					
SS Record - Spillway Characteristics									
SS	—	N/A	—						
ST Record - Top of Dam Overflow									
ST	—	N/A	—						

Culvert Designer/Analyzer Report
STA.642+63

Analysis Component			
Storm Event	Design	Discharge	2,800.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	2,800.00 cfs	Check Discharge	3,400.00 cfs

Tailwater properties: Trapezoidal Channel			
Slope	0.019000 ft/ft	Mannings Coefficient	0.035
Depth	4.82 ft	Left Side Slope	3 H : V
Right Side Slope	3 H : V	Bottom Width	30.00 ft

Tailwater conditions for Design Storm.			
Discharge	2,800.00 cfs	Bottom Elevation	1,871.67 ft
Depth	4.82 ft	Velocity	13.81 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 8 ft Box	2,800.00 cfs	1,883.93 ft	19.13 ft/s
Weir	Not Considered	N/A	N/A	N/A

Culvert Designer/Analyzer Report
STA.642+63

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,883.93 ft	Discharge	2,800.00 cfs
Inlet Control HW Elev	1,883.65 ft	Tailwater Elevation	1,876.49 ft
Outlet Control HW Elev	1,883.93 ft	Control Type	Entrance Control
Headwater Depth/ Height	1.37		

Grades			
Upstream Invert	1,872.93 ft	Downstream Invert	1,871.67 ft
Length	70.00 ft	Constructed Slope	0.018000 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	4.88 ft
Slope Type	Steep	Normal Depth	3.48 ft
Flow Regime	Supercritical	Critical Depth	6.47 ft
Velocity Downstream	19.13 ft/s	Critical Slope	0.003407 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.012
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 8 ft	Rise	8.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev	1,883.93 ft	Upstream Velocity Head	3.23 ft
Ke	0.40	Entrance Loss	1.29 ft

Inlet Control Properties			
Inlet Control HW Elev	1,883.65 ft	Flow Control	Submerged
Inlet Type	45 ° wingwall flares - offset	Area Full	240.0 ft²
K	0.49700	HDS 5 Chart	13
M	0.66700	HDS 5 Scale	1
C	0.03020	Equation Form	2
Y	0.83500		

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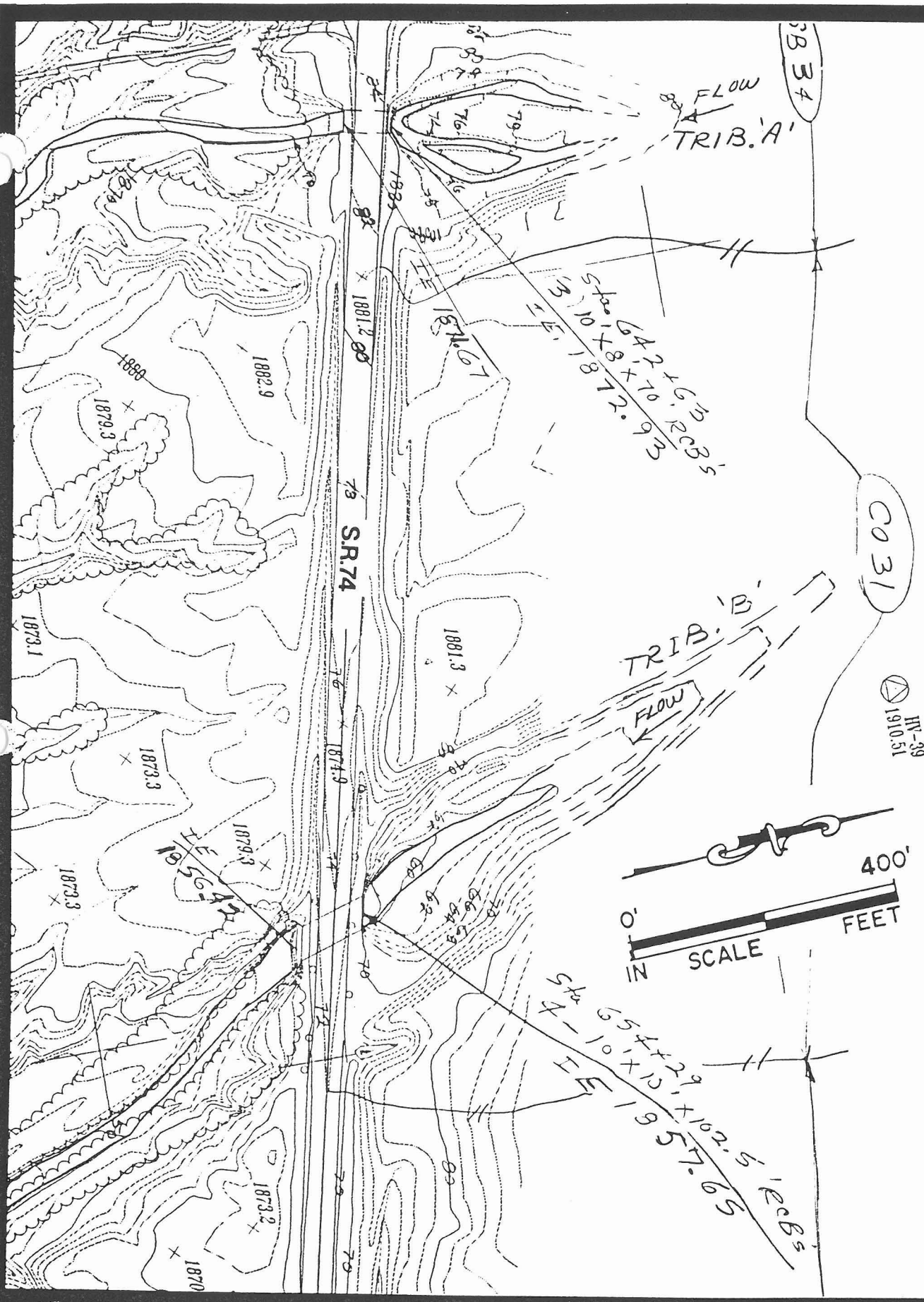
Rating Table Report
STA.642+63

Range Data:

	Minimum	Maximum	Increment
Discharge	0.00	3,000.00	200.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo
0.00	1,871.67	1,871.67	1,871.67
200.00	1,874.82	1,874.69	1,874.82
400.00	1,875.94	1,875.72	1,875.94
600.00	1,876.87	1,876.59	1,876.87
800.00	1,877.70	1,877.37	1,877.70
1,000.00	1,878.47	1,878.08	1,878.47
1,200.00	1,879.18	1,878.74	1,879.18
1,400.00	1,879.86	1,879.37	1,879.86
1,600.00	1,880.50	1,879.97	1,880.50
1,800.00	1,881.12	1,880.55	1,881.12
2,000.00	1,881.72	1,881.10	1,881.72
2,200.00	1,882.29	1,881.64	1,882.29
2,400.00	1,882.85	1,882.19	1,882.85
2,600.00	1,883.40	1,882.96	1,883.40
2,800.00	1,883.93	1,883.65	1,883.93
3,000.00	1,884.45	1,884.26	1,884.45



A-N WEST NO.7158-07
FCD.NO.99-12

A-N WEST INC.
Consulting Engineers

EXPLANATION

SB 37 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

S.R.74 CULVERT DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

E-18

FIGURE CO/DR 31

HI WEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project 1156 01 Sht. ___ of ___
Podel Sord Wash FIS
Calc. By GAS Date 9/5/00
FCD No 99-12
Chkd. ___ Date ___

Retention / Detention Basin Data

LOCATION: ADOT STA. 654+29; 4-10'x10'x102.5' RCB's

INFLOW I.D. NO.: C031

OUTFLOW I.D. NO: DR31

Inlet I.E. 1857.65
outlet IE 1856.42
Breakout El 1871

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS)	SPILLWAY DISCHG (CFS)	TOTAL DISCHARGE CFS
1857.65	0	0	0		
1860	0.128	0.150	435.5		
1862	0.441	0.719	934.9		
1864	0.939	2.099	1642.9		
1866	1.466	4.504	2470.1		
1868	1.879	7.849	3411.8		
1870	2.491	12.219	4441.5		
1871	2.797	14.863	4994.4		

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir Storage									
SV 0	0.150	0.719	2.099	4.504	7.849	12.219	14.863		
SQ Record - Discharge									
SQ 0	435.5	934.9	1642.9	2470.1	3411.8	4441.5	4994.4		
SE Record - Elevation									
SE 1857.65	1860	1862	1864	1866	1868	1870	1871		
SS Record - Spillway Characteristics									
SS	—	N/A	—						
ST Record - Top of Dam Overflow									
ST	—	N/A	—						

Culvert Designer/Analyzer Report
STA.65429

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,871.89 ft	Discharge	5,500.00 cfs
Inlet Control HW Elev	1,871.65 ft	Tailwater Elevation	1,862.99 ft
Outlet Control HW Elev	1,871.89 ft	Control Type	Entrance Control
Headwater Depth/ Height	1.42		

Grades			
Upstream Invert	1,857.65 ft	Downstream Invert	1,856.42 ft
Length	102.50 ft	Constructed Slope	0.012000 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	6.73 ft
Slope Type	Steep	Normal Depth	5.37 ft
Flow Regime	Supercritical	Critical Depth	8.38 ft
Velocity Downstream	20.43 ft/s	Critical Slope	0.003837 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.012
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 10 ft	Rise	10.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev	1,871.89 ft	Upstream Velocity Head	4.19 ft
Ke	0.40	Entrance Loss	1.68 ft

Inlet Control Properties			
Inlet Control HW Elev	1,871.65 ft	Flow Control	Submerged
Inlet Type	45 ° wingwall flares - offset	Area Full	400.0 ft²
K	0.49700	HDS 5 Chart	13
M	0.66700	HDS 5 Scale	1
C	0.03020	Equation Form	2
Y	0.83500		

Culvert Designer/Analyzer Report
STA.65429

Analysis Component			
Storm Event	Design	Discharge	5,500.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	5,500.00 cfs	Check Discharge	6,000.00 cfs

Tailwater properties: Trapezoidal Channel			
Slope	0.016000 ft/ft	Mannings Coefficient	0.035
Depth	6.57 ft	Left Side Slope	2 H : V
Right Side Slope	2 H : V	Bottom Width	40.00 ft

Tailwater conditions for Design Storm.			
Discharge	5,500.00 cfs	Bottom Elevation	1,856.42 ft
Depth	6.57 ft	Velocity	15.76 ft/s

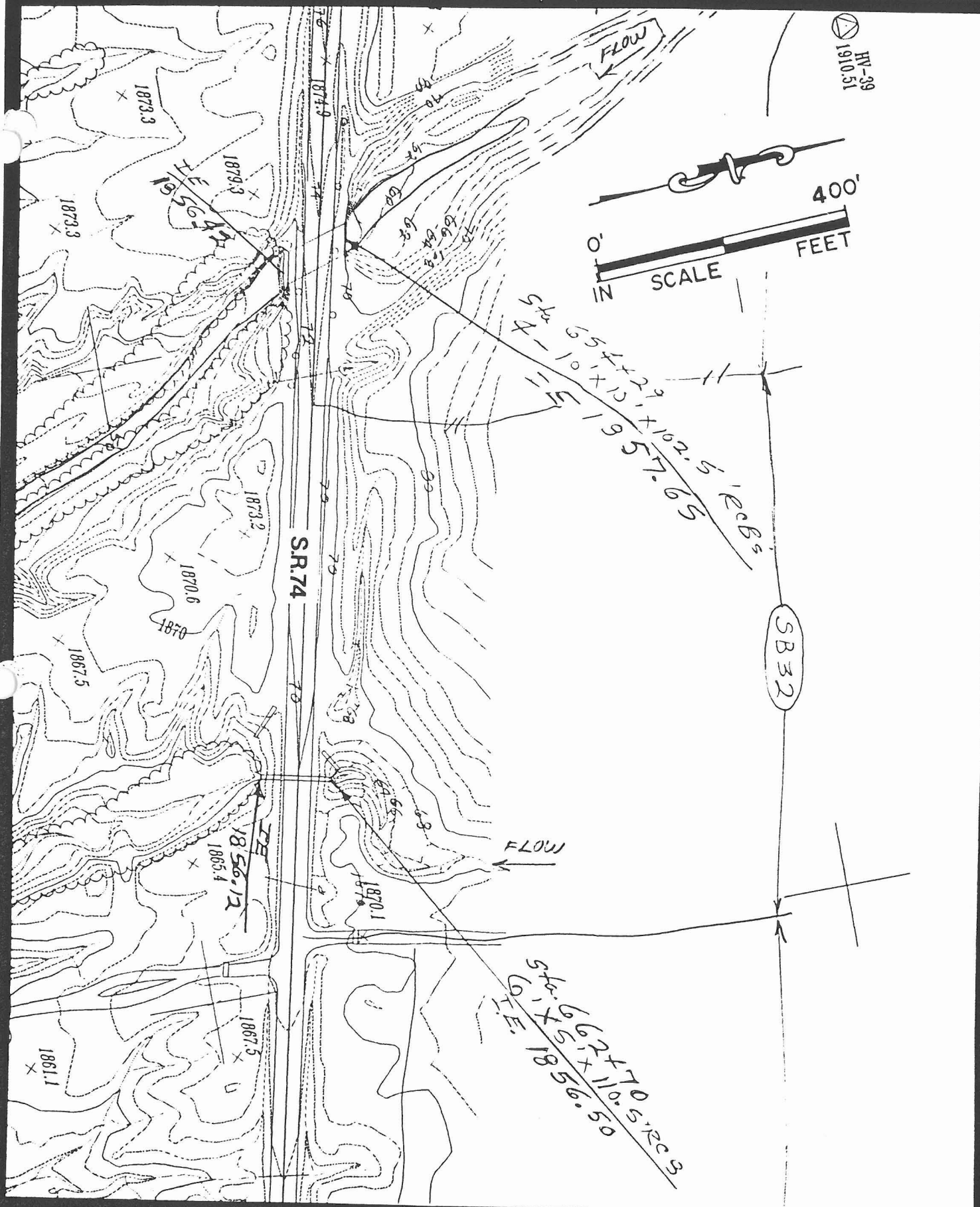
Name	Description	Discharge	HW Elev	Velocity
Culvert-1	4-10 x 10 ft Box	5,500.00 cfs	1,871.89 ft	20.43 ft/s
Weir	Not Considered	N/A	N/A	N/A

Rating Table Report
STA.65429

ange Data:

	Minimum	Maximum	Increment
Discharge	0.00	5,500.00	500.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo
0.00	1,856.42	1,856.42	1,856.42
500.00	1,860.53	1,860.33	1,860.53
1,000.00	1,862.22	1,861.90	1,862.22
1,500.00	1,863.64	1,863.22	1,863.64
2,000.00	1,864.90	1,864.40	1,864.90
2,500.00	1,866.07	1,865.48	1,866.07
3,000.00	1,867.16	1,866.49	1,867.16
3,500.00	1,868.18	1,867.45	1,868.18
4,000.00	1,869.17	1,868.36	1,869.17
4,500.00	1,870.11	1,869.30	1,870.11
5,000.00	1,871.01	1,870.62	1,871.01
5,500.00	1,871.89	1,871.65	1,871.89



A-N WEST NO.7158-07
FCD.NO.99-12

A-N WEST INC.
Consulting Engineers

EXPLANATION

SB30 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

S.R.74 CULVERT DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

E-23

FIGURE SB/DR32

HI WEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project: Padelford Wash FIS — Calc. By: GAS — Date: 9/5/00
FCD No 99-12 — Chkd. — Date

Retention/Detention Basin Data

LOCATION: ADOT Sta. 662+70; (1) 6'x5'x110.5' RCB

Inlet IE 1856.50
Outlet IE 1856.12
Breakout El = 1869

INFLOW I.D. NO.: SB 32

OUTFLOW I.D. NO: DR 32

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS)	SPILLWAY DISCHG (CFS)	TOTAL DISCHARGE CFS
1856.5	0	0	0		
1858	0.014	0.105	36.4		
1860	0.028	0.147	100.5		
1862	0.043	0.218	200.0		
1864	0.085	0.346	314.2		
1866	0.242	0.673	398.4		
1868	0.640	1.555	466.9		
1869	0.854	3.049	498.2		

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir storage									
SV 0	0.105	0.147	0.218	0.346	0.673	1.555	3.049		
SQ Record - Discharge									
SQ 0	36.4	100.5	200.0	314.2	398.4	466.9	498.2		
SE Record - Elevation									
SE 1856.5	1858	1860	1862	1864	1866	1868	1869		
SS Record - Spillway Characteristics									
SS	—	—	N/A	—	—				
ST Record - Top of Dam Overflow									
ST	—	—	N/A	—	—				

Culvert Designer/Analyzer Report
STA662+70

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,869.06 ft	Discharge	500.00 cfs
Inlet Control HW Elev	1,869.06 ft	Tailwater Elevation	1,857.66 ft
Outlet Control HW Elev	1,868.49 ft	Control Type	Inlet Control
Headwater Depth/ Height	2.51		

Grades			
Upstream Invert	1,856.50 ft	Downstream Invert	1,856.12 ft
Length	110.50 ft	Constructed Slope	0.003439 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	5.00 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	5.00 ft
Velocity Downstream	16.67 ft/s	Critical Slope	0.011980 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.012
Section Material	Concrete	Span	6.00 ft
Section Size	6 x 5 ft	Rise	5.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1,868.49 ft	Upstream Velocity Head	4.32 ft
Ke	0.40	Entrance Loss	1.73 ft

Inlet Control Properties			
Inlet Control HW Elev	1,869.06 ft	Flow Control	Submerged
Inlet Type	45 ° wingwall flares - offset	Area Full	30.0 ft²
K	0.49700	HDS 5 Chart	13
M	0.66700	HDS 5 Scale	1
C	0.03020	Equation Form	2
Y	0.83500		

Culvert Designer/Analyzer Report
STA662+70

Analysis Component			
Storm Event	Design	Discharge	500.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	500.00 cfs	Check Discharge	350.00 cfs

Tailwater properties: Trapezoidal Channel			
Slope	0.018000 ft/ft	Mannings Coefficient	0.038
Depth	1.54 ft	Left Side Slope	3 H : V
Right Side Slope	3 H : V	Bottom Width	45.00 ft

Tailwater conditions for Design Storm.			
Discharge	500.00 cfs	Bottom Elevation	1,856.12 ft
Depth	1.54 ft	Velocity	6.55 ft/s

Name	Description	Discharge	HW Elev	Velocity
Culvert-1	1-6 x 5 ft Box	500.00 cfs	1,869.06 ft	16.67 ft/s
Weir	Not Considered	N/A	N/A	N/A

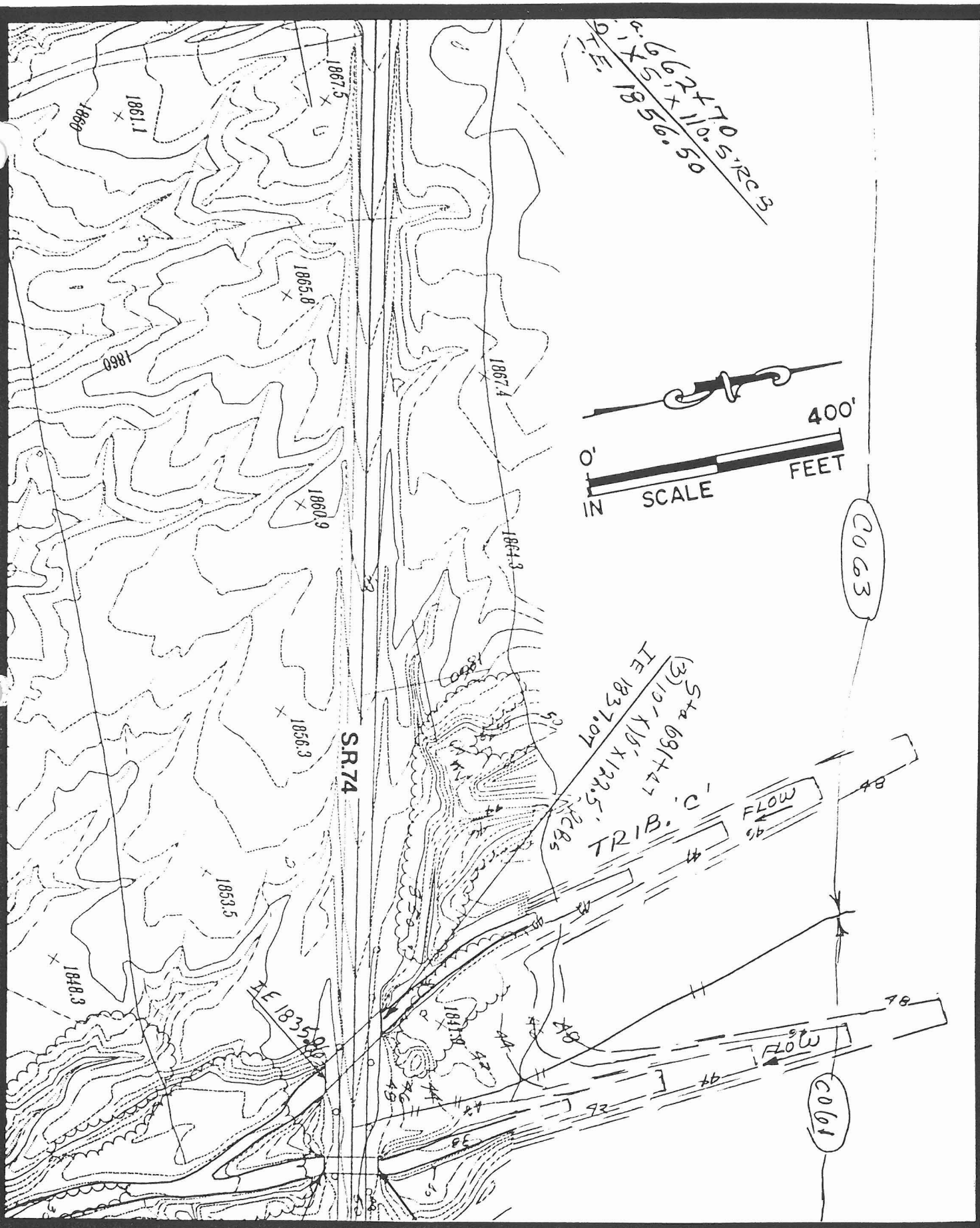
E-26

Rating Table Report
STA662+70

Range Data:

	Minimum	Maximum	Increment
Discharge	0.00	500.00	50.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo
0.00	1,856.12	1,856.12	1,856.12
50.00	1,858.70	1,858.54	1,858.70
100.00	1,859.99	1,859.74	1,859.99
150.00	1,861.06	1,860.75	1,861.06
200.00	1,862.00	1,861.65	1,862.00
250.00	1,862.86	1,862.62	1,862.86
300.00	1,863.69	1,863.69	1,863.67
350.00	1,864.78	1,864.78	1,864.66
400.00	1,866.04	1,866.04	1,865.84
450.00	1,867.46	1,867.46	1,867.09
500.00	1,869.06	1,869.06	1,868.49



A-N WEST NO.7158-07
FCD.NO.99-12

A-N WEST INC.
Consulting Engineers

EXPLANATION

SB30 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

S.R.74 CULVERT DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

FIGURE CO/DR63

HI WEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project: Padelford Wash
FCD No. 99-12

Calc. By: GAS Date: 9/5/00
Chkd. Date

Retention / Detention Basin Data

LOCATION: ADOT sta 681+47; (3) - 10'X10'X122.5' RCB's

Inlet IE 1837.07
Outlet IE 1835.86
Breakout El 1848±

INFLOW I.D. NO.: C063

OUTFLOW I.D. NO: DR 63

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS)	SPILLWAY DISCHG (CFS)	TOTAL DISCHARGE CFS
1837.07	0	0	0		
1838	0.057	0.027	156.9		
1840	0.271	0.355	391.5		
1842	0.584	1.210	842.8		
1844	1.395	3.189	1403.6		
1846	2.242	6.826	2048.6		
1848	3.309	12.377	2773.1		

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS 1	STOR	0							
SV Record - Reservoir storage									
SV 0	0.027	0.355	1.210	3.189	6.826	12.377			
SQ Record - Discharge									
SQ 0	156.9	391.5	842.8	1403.6	2048.6	2773.1			
SE Record - Elevation									
SE 1837.07	1838	1840	1842	1844	1846	1848			
SS Record - Spillway Characteristics									
SS	N/A								
ST Record - Top of Dam Overflow									
ST	N/A								

Culvert Designer/Analyzer Report
STA68147

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	1,849.83 ft	Discharge	3,500.00 cfs
Inlet Control HW Elev	1,849.16 ft	Tailwater Elevation	1,841.49 ft
Outlet Control HW Elev	1,849.83 ft	Control Type	Entrance Control
Headwater Depth/ Height	1.28		

Grades			
Upstream Invert	1,837.07 ft	Downstream Invert	1,835.86 ft
Length	122.50 ft	Constructed Slope	0.009878 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	6.06 ft
Slope Type	Steep	Normal Depth	5.11 ft
Flow Regime	Supercritical	Critical Depth	7.51 ft
Velocity Downstream	19.24 ft/s	Critical Slope	0.003639 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.012
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 10 ft	Rise	10.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev	1,849.83 ft	Upstream Velocity Head	3.75 ft
Ke	0.40	Entrance Loss	1.50 ft

Inlet Control Properties			
Inlet Control HW Elev	1,849.16 ft	Flow Control	Transition
Inlet Type	45 ° wingwall flares - offset	Area Full	300.0 ft²
K	0.49700	HDS 5 Chart	13
M	0.66700	HDS 5 Scale	1
C	0.03020	Equation Form	2
Y	0.83500		

Culvert Designer/Analyzer Report
STA68147

Analysis Component			
Storm Event	Design	Discharge	3,500.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	3,500.00 cfs	Check Discharge	3,500.00 cfs

Tailwater properties: Trapezoidal Channel			
Slope	0.012000 ft/ft	Mannings Coefficient	0.035
Depth	5.63 ft	Left Side Slope	3 H : V
Right Side Slope	3 H : V	Bottom Width	35.00 ft

Tailwater conditions for Design Storm.			
Discharge	3,500.00 cfs	Bottom Elevation	1,835.86 ft
Depth	5.63 ft	Velocity	11.98 ft/s

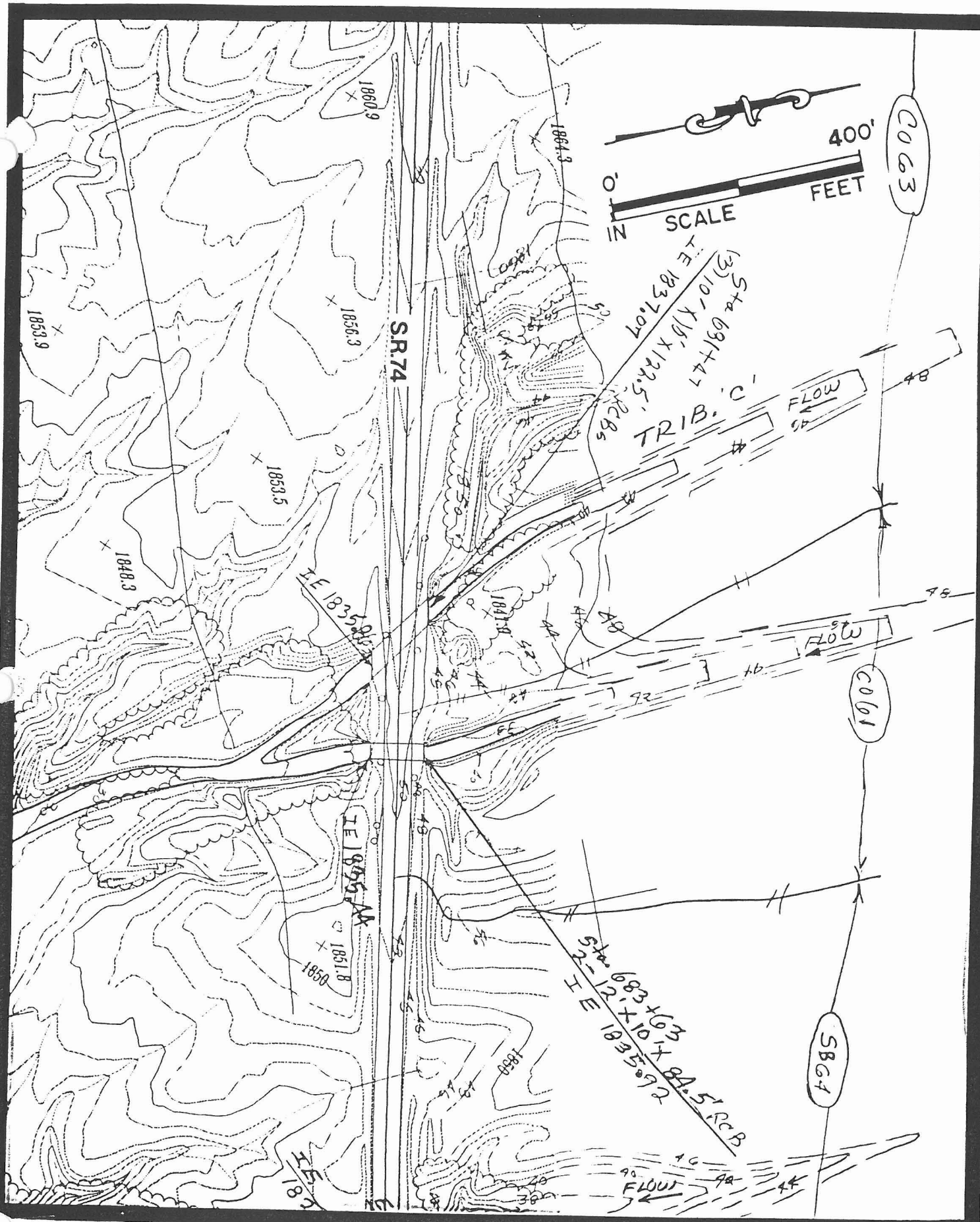
Name	Description	Discharge	HW Elev	Velocity
Culvert-1	3-10 x 10 ft Box	3,500.00 cfs	1,849.83 ft	19.24 ft/s
Weir	Not Considered	N/A	N/A	N/A

Rating Table Report
STA68147

Range Data:

	Minimum	Maximum	Increment
Discharge	0.00	3,500.00	250.00 cfs

Discharge (cfs)	HW Elev (ft)	(I) HWi	(O) HWo
0.00	1,835.86	1,835.86	1,835.86
250.00	1,839.27	1,839.11	1,839.27
500.00	1,840.56	1,840.31	1,840.56
750.00	1,841.64	1,841.32	1,841.64
1,000.00	1,842.61	1,842.22	1,842.61
1,250.00	1,843.49	1,843.04	1,843.49
1,500.00	1,844.32	1,843.82	1,844.32
1,750.00	1,845.11	1,844.55	1,845.11
2,000.00	1,845.86	1,845.24	1,845.86
2,250.00	1,846.58	1,845.91	1,846.58
2,500.00	1,847.27	1,846.56	1,847.27
2,750.00	1,847.94	1,847.18	1,847.94
3,000.00	1,848.59	1,847.78	1,848.59
3,250.00	1,849.22	1,848.37	1,849.22
3,500.00	1,849.83	1,849.16	1,849.83



A-N WEST NO.7158-07
FCD.NO.99-12

A-N WEST INC.
Consulting Engineers

EXPLANATION

SB36 DRAINAGE SUBAREA BOUNDARY

PADELFORD WASH FIS

S.R.74 CULVERT DETENTION ROUTING (DR)
DATA SHEETS FOR HEC-1 MODELING

FIGURE CO/DR 61

HHWEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Project: Podelford Wash FIS
FCD No 99-12

Calc. By: GAS Date: 9/5/00
Chkd. Date

Retention/Detention Basin Data

LOCATION: ADOT Sta. 683+63; (2)-12'X10'X84.5' RCB's
Inlet IE 1835.92
outlet IE 1835.86
Breakout El 1848

INFLOW I.D. NO.: C061

OUTFLOW I.D. NO: DR61

ELEV.	AREA (Ac)	ACCUML. VOL. (Ac-FT.)	PIPE DISCHG. (CFS)	SPILLWAY DISCHG (CFS)	TOTAL DISCHARGE CFS
1835.92	0	0	0		
1838	0.043	0.045	190.2		
1840	0.206	0.294	517.0		
1842	0.541	1.041	938.6		
1844	0.939	2.521	1437.8		
1846	1.366	4.826	2003.0		
1848	2.02	8.212	2629.5		

HEC-1 ROUTING INPUT DATA

Field (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RS Record - Storage Routing									
RS	1	STOR	0						
SV Record - Reservoir storage									
SV	0								
SQ Record - Discharge									
SQ	0								
SE Record - Elevation									
SE									
SS Record - Spillway Characteristics									
SS									
ST Record - Top of Dam Overflow									
ST									

AVERY

HWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Padelford Wash FIS

Calc. By GAS Date 8/26/00

FCD No 99-12

Chkd. ___ Date ___

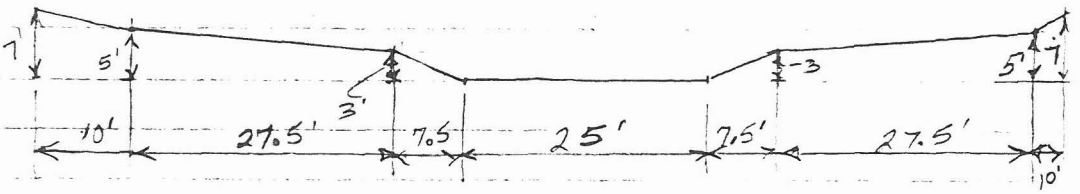
Modified Puls (Normal-Depth) Channel Routing Data

Location: Approx 1.4 To 1.7 Mi U/S Confluence with Trib "A"
Also upper 0.3 Miles of Detail Study Padelford Wash

HEC-1 Routing I.D: R171 - C0169 to C0173

$$NSTPS\ Estimate = \frac{L}{V \times \Delta t} = \frac{1750\,ft}{5.8\,fps \times 2\,Min \times 60\,s/min} = 2.5,\ Try\ 3$$

V = 5.8 fps = Channel Vel. at 3 ft deep



Average Section From 200 Scale Mapping and (2) Site Measurements and Photos.

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS	CLOSS	PERCRT	ELVINV						
RL									
RS Record - Storage Routing									
NSTPS	ITYP	RSVRIC	X						
RS 3	FLOW	0							
RC Record - Normal Depth Channel Routing									
ANL	ANCH	ANR	RLNTH	SEL	ELMAX				
RC 0.065	0.037	0.065	1750	0.0067					
RX Record - Cross-Section X Coordinates									
X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)		
RX 0	10	37.5	45	70	77.5	105	115		
RY Record - Cross-Section Y Coordinates									
Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)		
RY 7	5	3	0	0	3	5	7		

PBWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Podelford Wash FIS — Calc. By GAS — Date 8/26/00

FCD No 99-12 — Chkd. ___ Date ___

Modified Puls (Normal-Depth) channel Routing Data

Location: SR74 Near Sub 92 To Podelford wash Bnflume

HEC-1 Routing I.D: R161 - S92 to C0173

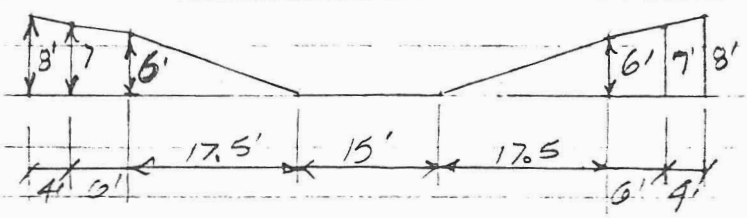
Estimate Vel. @ 2.5 ft deep initially V=8.3 fps

NSTPS Estimate

$= \frac{L}{V \times \Delta t \times 60}$

$= \frac{7950 \text{ ft}}{8.3 \times 2 \text{ min} \times 60}$

$= 8 \leftarrow$



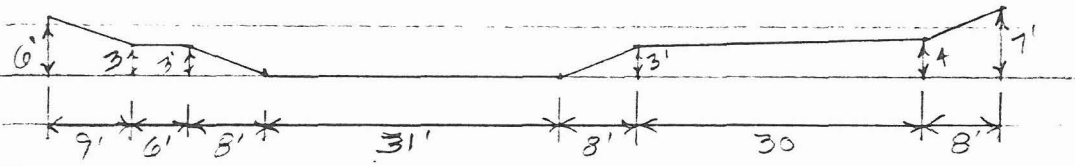
Average Chann. Section From 200 scale Mapping

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS	CLOSS	PERCRT	ELVINV						
RL									
RS Record - Storage Routing									
NSTPS	ITYP	RSVRIC	X						
RS 8	FLOW	-1							
RC Record - Normal Depth Channel Routing									
ANL	ANCH	ANR	RLNTH	SEL	ELMAX				
RC 0.065	0.037	0.065	7950	0.019					
RX Record - Cross-Section X Coordinates									
X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)		
RX 0	4	10	27.5	42.5	60	66	70		
RY Record - Cross-Section Y Coordinates									
Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)		
RY 8	7	6	0	0	6'	7	8		

Modified Puls (Normal-Depth) Channel Routing Data
Junction HEC-1 #R0145 to C0173
Location: 0.56± to 1.12 Miles U/S of Confluence of Padelford W. with Trib 'A'
HEC-1 Routing I.D: R 175 - C0173 - C0155

Vel. at 3' Deep = 4.2 fps

NSTPS Estimate
$= \frac{L}{V \times \Delta t \times 60}$
$= \frac{3200 \text{ ft}}{4.2 \text{ fps} \times 2 \text{ min} \times 60}$
= 6.3 Use 6



Looking D/S Typical Section
From 200 Scale Topo and Site Visit Measurements

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS	CLOSS	PERCRT	ELVINV						
RL									
RS Record - Storage Routing									
NSTPS	ITYP	RSVRIC	X						
RS 6	FLOW	-1							
RC Record - Normal Depth Channel Routing									
ANL	ANCH	ANR	RLNTH	SEL	ELMAX				
RC 0.065	0.037	0.065	3200	0.0075					
RX Record - Cross-Section X Coordinates									
X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)		
RX 0	9	15	23	54	62	92	100		
RY Record - Cross-Section Y Coordinates									
Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)		
RY 6	3	3	0	0	3	4	7		

AMWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Podelford Wash FIS

Calc. By GAS Date 8/28/00

FCD No. 99-12

Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: S.R. 74 To Podelford Wash

HEC-1 Routing I.D: R153 576 to C0155

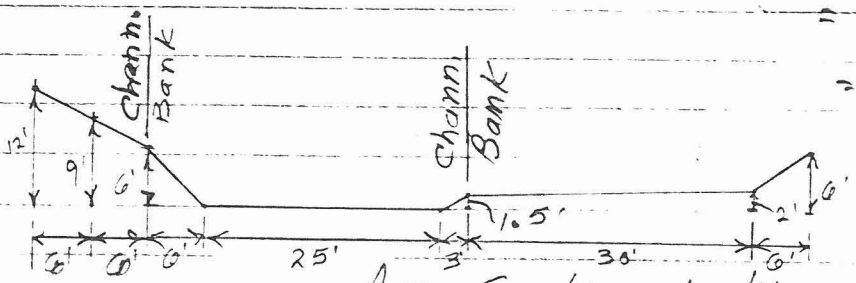
Vel @ 1.5' Deep = 7.8 fps

NSTPS Estimate

$= \frac{L}{V \times \Delta t \times 60}$

$= \frac{5200'}{7.8 fps \times 2 min \times 60}$

$= 5.6$ — use 6



Ave. Section Looking D/S From 200 Scale Mapping and Site Visit Measurement

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS	CLOSS	PERCRT	ELVINV						
RL									
RS Record - Storage Routing									
NSTPS	ITYP	RSVRIC	X						
RS 5	FLOW	-1							
RC Record - Normal Depth Channel Routing									
ANL	ANCH	ANR	RLNTH	SEL	ELMAX				
RC 0.065	0.037	0.065	5200	0.014					
RX Record - Cross-Section X Coordinates									
X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)		
RX 0	6	12	18	43	46	76	82		
RY Record - Cross-Section Y Coordinates									
Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)		
RY 12	9	6	0	0	1.5	2	6		

AN WEST INC.
Consulting Engineers

Project 7158-07 Sht. ___ of ___
Padelford Wash FIS
Calc. By GAS Date 8/28/00
FCD No 99-12
Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: SR 74 to Padelford wash

HEC-1 Routing I.D.: R145; C0141 to C0147

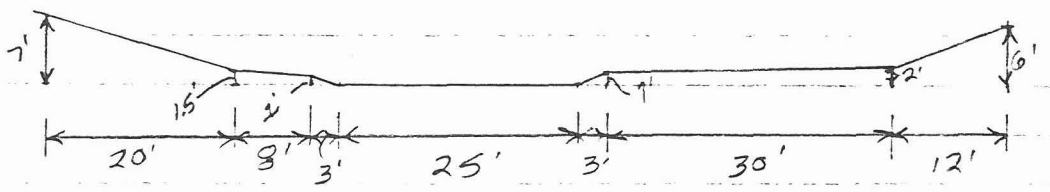
Vel. @ 10.5' Deep = 5.8 fps

NSTPS Estimate =

$$= \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{4910 \text{ ft}}{5.8 \text{ fps} \times 2 \text{ min} \times 60}$$

= 7.1 – use 7



(Field) 1	2	3	4	5	6	7	8	9	10
RL Record – Channel Loss									
QLOSS	CLOSS	PERCRT	ELVINV						
RL									
RS Record – Storage Routing									
NSTPS	ITYP	RSVRIC	X						
RS 7	FLOW	-1							
RC Record – Normal Depth Channel Routing									
ANL	ANCH	ANR	RLNTH	SEL	ELMAX				
RC 0.065	0.037	0.065	4910'	0.015					
RX Record – Cross-Section X Coordinates									
X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)		
RX 0	20	28	31	56	59	89	101		
RY Record – Cross-Section Y Coordinates									
Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)		
RY 7	10.5	1	0	0	1	2	6		

AMWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Pedelford Wash FIS — Calc. By GAS — Date 8/29/00

FCD No 99-12 — Chkd. ___ — Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: CO 155 To CO133

1800 FT (0.34 Mi) to 4100 FT (0.78 Mi). U/S Trib. "A" Confluence

HEC-1 Routing I.D: R149 : CO147 To CO133

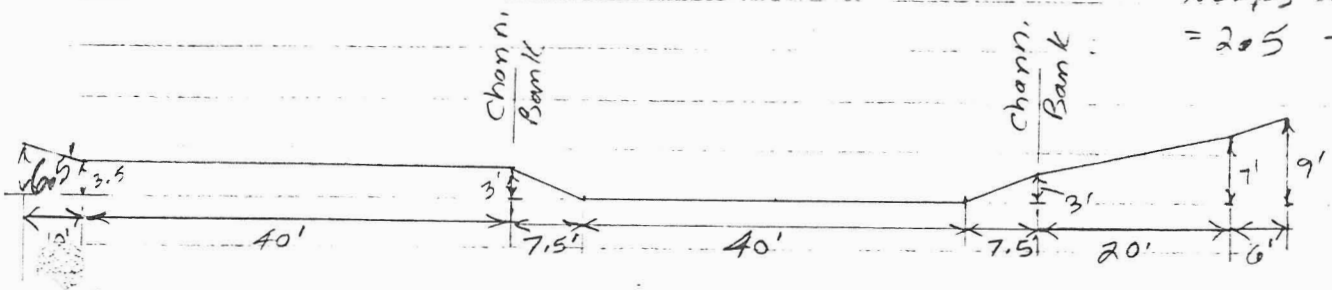
Vel. at 3' Deep = 7.8 fps

NSTPS Estimate

$= \frac{L}{V \times \Delta t \times 60}$

$= \frac{2300 \text{ ft}}{7.8 \text{ fps} \times 2 \text{ min} \times 60}$

= 2.5 — Use 3



Typical Section Looking D/S From 200 Scale Mapping and Site Visit Measurements.

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS	CLOSS	PERCRT	ELVINV						
RL									
RS Record - Storage Routing									
NSTPS	ITYP	RSVRIC	X						
RS 3	FLOW	-1							
RC Record - Normal Depth Channel Routing									
ANL	ANCH	ANR	RLNTH	SEL	ELMAX				
RC 0.065	0.037	0.065	2300	0.011					
RX Record - Cross-Section X Coordinates									
X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)		
RX 0	10	50	57.5	97.5	105	125	131		
RY Record - Cross-Section Y Coordinates									
Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)		
RY 6.5	3.5	3	0	0	3	7	9		

HNWEST INC. Consulting Engineers	Project 7158-07	Sht. ___ of ___	
Padelford Wash FIS	Calc. By GAS	Date 8/29/00	
FCD No 99-12	Chkd.	Date	

Modified Puls (Normal-Depth) Channel Routing Data

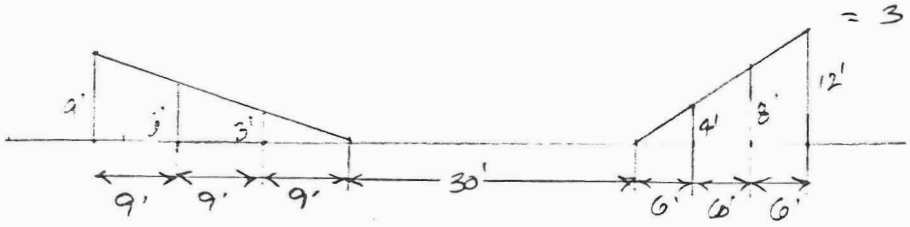
Location: SB 54 To CO 57
From 4500' To 8300 FT U/S OF ADOT Sta

HEC-1 Routing I.D: R55 - SS4 683+36 - (2) 12 x 10' RCBs To CO 57

Vel = 9.5 fps @ 3' Deep

Estimate NSTPS

$$NS = \frac{L}{V \times \Delta t \times 60} = \frac{3800 \text{ FT}}{9.5 \text{ fps} \times 2 \text{ min} \times 60} = 3.3 \text{ Use } 3$$



(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 3	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 3800	SEL 0.017	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 9	X(3) 18	X(4) 27	X(5) 57	X(6) 63	X(7) 69	X(8) 75		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 9	Y(2) 6	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 4	Y(7) 8	Y(8) 12		

AHWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Padelford Wash FIS

Calc. By GAS Date 8/29/00

FCD No 99-12

Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: From ADOT Sta 683+36 – (2)-12'X10' RCB's Upstream

HEC-1 Routing I.D: R59 – C057 to C061

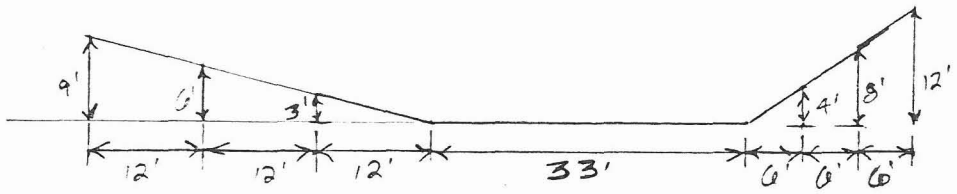
Vel. at 3' Dep = 8.7 fps

Estimated NSTPS

$$= \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{4500 ft}{8.7 fps \times 2 min \times 60}$$

$= 4.3$ Use 4



Typical Section Looking D/S
From Site Visit Measurements

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record – Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record – Storage Routing									
NSTPS RS 4	ITYP FLOW	RSVRIC -1	X						
RC Record – Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 4500'	SEL 0.015	ELMAX				
RX Record – Cross-Section X Coordinates									
X(1) RX 0	X(2) 12	X(3) 24	X(4) 36	X(5) 69	X(6) 75	X(7) 81	X(8) 87		
RY Record – Cross-Section Y Coordinates									
Y(1) RY 9	Y(2) 6	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 4	Y(7) 8	Y(8) 12		

Modified Puls (Normal-Depth) Channel Routing Data

Location: From ADOT Sta 681+47 (SR74) 3-10'x10' RCBs upstream 6400 FT ±

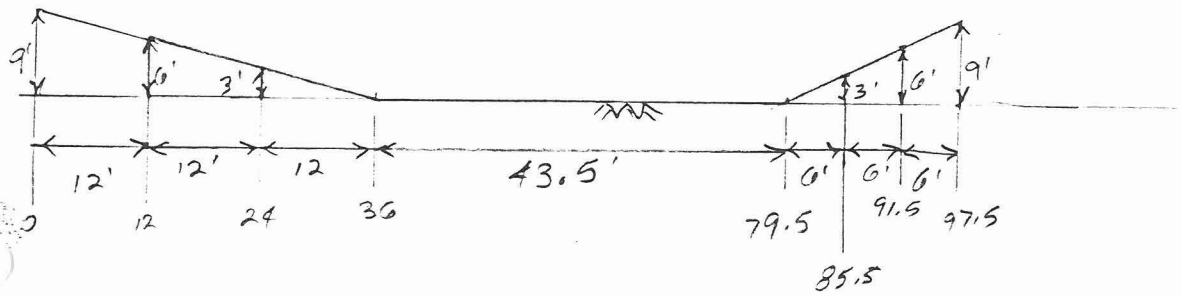
HEC-1 Routing I.D: R49 — C047 to C063

Vel = 8.3 fps @ 3 ft deep — NSTPS Estimate

$= \frac{L}{V \times \Delta L \times 60}$

$= \frac{6200 \text{ ft}}{8.3 \text{ fps} \times 2 \times 60}$

= 6.2 — Use 6



Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS PL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 6	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.041	ANR 0.065	RLNTH 6200	SEL 0.0125	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 12	X(3) 24	X(4) 36	X(5) 79.5	X(6) 85.5	X(7) 91.5	X(8) 97.5		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 9	Y(2) 6	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 3	Y(7) 6	Y(8) 9		

AHWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Pedelford Wash FIS

Calc. By GAS Date 3/29/00

FCD No 99-12

Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: Trib 'C' - SR 74 sta 6814+47 (3)-10'x10' RCB's To 1400 FT Downstream

HEC-1 Routing I.D: R123 - CO65 TO CO127

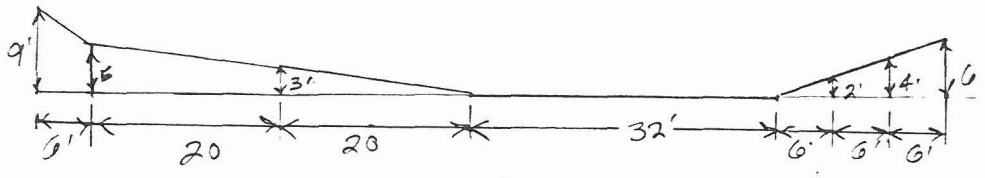
Vel. @ 3' Dep = 8.3 fps

Estimate NSTPS as

$= \frac{L}{V \times \Delta t \times 60}$

$= \frac{1400 \text{ ft}}{8.3 \text{ fps} \times 2 \text{ min} \times 60}$

$= 1.4$ use 1



(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 1	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 1400	SEL 0.015	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 6	X(3) 26	X(4) 46	X(5) 78	X(6) 84	X(7) 90	X(8) 96		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 9	Y(2) 5	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 4	Y(8) 6		

HWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Podelford Wash FIS — Calc. By GAS — Date 8/29/00

FCD No 99-12 — Chkd. ___ — Date ___

Modified Puls (Normal-Depth) Channel Routing Data

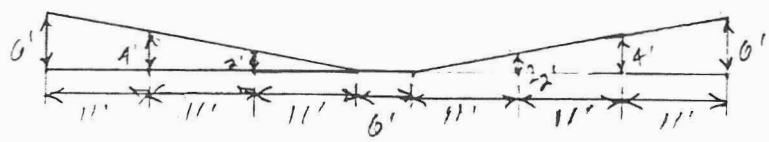
Location: From ADOT Sta. 691+30 (n-10'x6' RCB To Confluence with Trib. 'C'

HEC-1 Routing I.D: R121 - SC4 to CO127

Vel @ 3 FT Deep: 8.1 fps

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60} = \frac{700 \text{ FT}}{8.1 \times 2 \text{ min} \times 60} = 0.7 \quad \text{Use } 1$$



Typical Section Looking D/S From 200 Scale Mapping

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELINV						
RS Record - Storage Routing									
NSTPS RS 1	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 700	SEL 0.023	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 11	X(3) 22	X(4) 33	X(5) 39	X(6) 50	X(7) 61	X(8) 72		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 6	Y(2) 4	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 4	Y(8) 6		

AHWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Pedelford wash FIS

Calc. By GAS Date 8/29/05

FCD # 99-12

Chkd. ___ Date ___

Modified Puls (Normal-Depth) channel Routing Data

Location: Trib 'C' - SR 74 Sta 681+47 - (3) 10'x10' RCB's from 1400 D/S of To Pedelford wash.

HEC-1 Routing I.D: R129 - C0127 to C0133

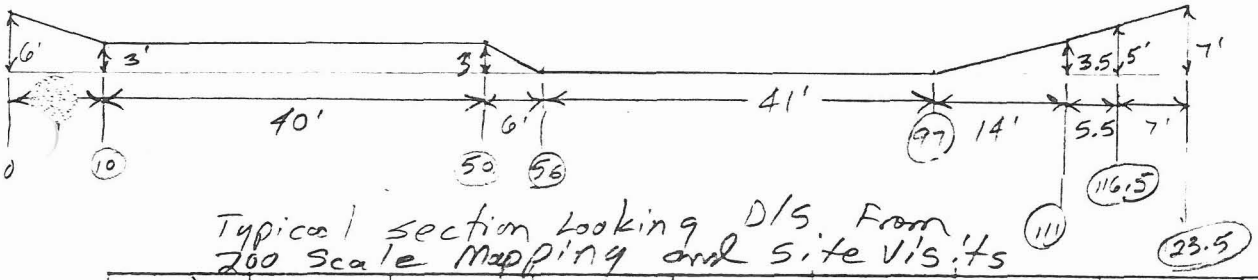
Vel at 3' Deep = 7.9 fps

NSTPS Estimate

$= \frac{L}{V \times \Delta t \times 60}$

$= \frac{5600\text{ ft}}{7.9\text{ fps} \times 2\text{ min} \times 60}$

= 5.9 - use 6



Typical section Looking D/S from 200 Scale Mapping and Site Visits

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 6	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.038	ANR 0.065	RLNTH 5600	SEL 0.012	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 10	X(3) 50	X(4) 56	X(5) 97	X(6) 111	X(7) 116.5	X(8) 123.5		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 6	Y(2) 3	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 3.5	Y(7) 5	Y(8) 7		

HWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Pedelford wash FIS Calc. By GAS Date 8/29/00

FCD No 99-12 Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: Pedelford wash From Confluence with Trib 'A' to 1920' U/S

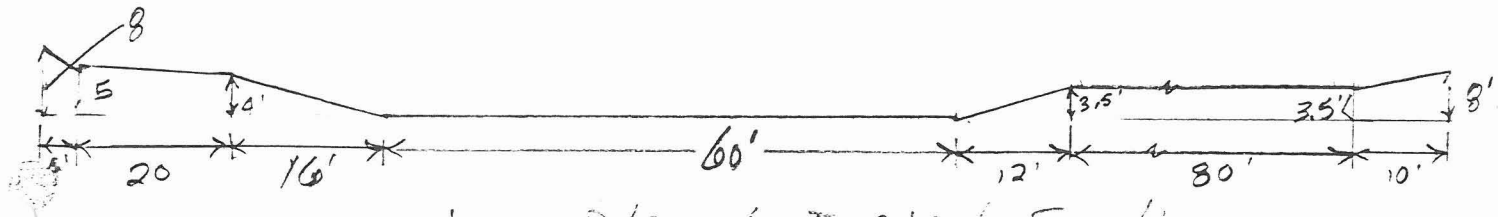
HEC-1 Routing I.D: R137 - C0133 to C0125

Vel. at 3' Deep = 7.1 fps Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{1920 \text{ FT}}{7.1 \text{ fps} \times 2 \text{ min} \times 60}$$

$= 2.3$ use 2



Looking D/S at Typical Section from 200 scale Topo and Site Visit Measurements

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	DEPCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 2	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.055	ANCH 0.037	ANR 0.055	RLNTH 1920	SEL 0.0089	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 4	X(3) 24	X(4) 40	X(5) 100	X(6) 112	X(7) 192	X(8) 202		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 8.0	Y(2) 5	Y(3) 4	Y(4) 0	Y(5) 0	Y(6) 3.5	Y(7) 3.5	Y(8) 8		

HWEST INC. Consulting Engineers	Yodelbird Wash FIS	Project 7158-07	Sht. ___ of ___
	FCD No 99-12	Calc. By GAS	Date 8/30/00
		Chkd. ___	Date ___

Modified Puls (Normal-Depth) Channel Routing Data

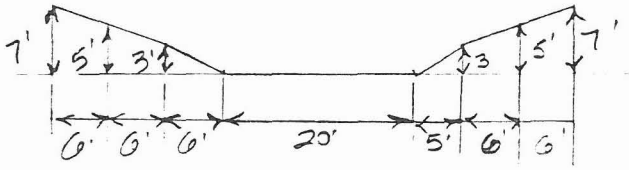
Location: SB 10 to C017

HEC-1 Routing I.D: R11 — S10 to C017

Vel. at 3' Doap = 8.6 fps

Estimate NSTPS

$$\Delta S = \frac{L}{V \times \Delta t \times 60} = \frac{4600 \text{ ft}}{8.6 \text{ fps} \times 2 \text{ min} \times 60} = 4.5 \text{ — use } 5$$



Looking D/S, Based on Site Visit Observations

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS PL	CLOSS	PERCRT	ELININV						
RS Record - Storage Routing									
NSTPS RS 5	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.04	ANR 0.065	RLNTH 4600	SEL 0.017	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 6	X(3) 12	X(4) 18	X(5) 38	X(6) 43	X(7) 49	X(8) 55		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 7	Y(2) 5	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 3	Y(7) 5	Y(8) 7		

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Padelford Wash Calc. By GAS Date 8/30/00
FCD No 99-12 Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: C017 to C025

HEC-1 Routing I.D: R19 - C017 to C025

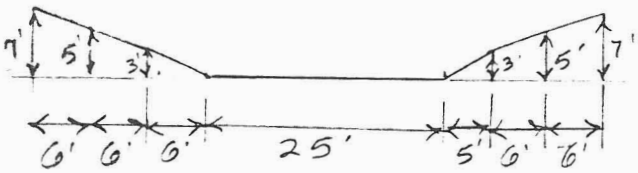
VEL. at 3 FT Depth = 9.3 fps

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{6200\ ft}{9.3\ fps \times 2\ min \times 60}$$

$$= 5.6 - \text{Use } 6$$



Looking D/S, Based on Site Visit Observations

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 6	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 6200	SEL 0.019	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 6	X(3) 12	X(4) 18	X(5) 43	X(6) 48	X(7) 54	X(8) 60		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 7	Y(2) 5	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 3	Y(7) 5	Y(8) 7		

AMWEST INC. Consulting Engineers	Project 7158-07	Sht. ___ of ___	
Pedel Ford wash	Calc. By GAS	Date 8/29/03	
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Modified Puls (Normal-Depth) Channel Routing Data

Location: From ADOT Sta 654+29 (SR74) 4-10'x10' RCB's Upstream

HEC-1 Routing I.D: R27 - C025 TO C031

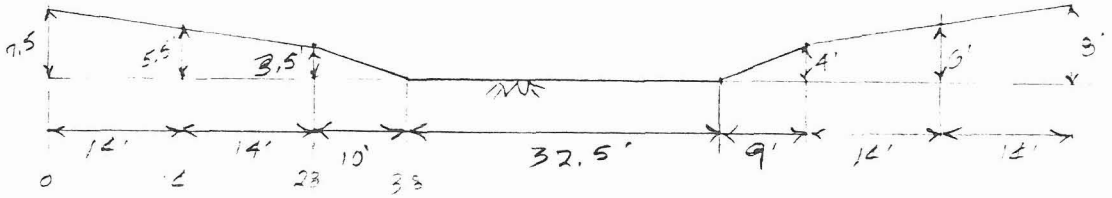
Vel. at 3' Deep: 9.3 fps

Estimated NSTPS

$= \frac{L}{V \times \Delta t \times 60}$

$= \frac{11200 \text{ ft}}{9.3 \text{ fps} \times 2 \text{ min.} \times 60}$

$= 10.$



Typical Channel Section Looking D/S From Site Visit Measurements

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS PL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 10	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 11200	SEL 0.016	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 14	X(3) 28	X(4) 38	X(5) 70.5	X(6) 79.5	X(7) 93.5	X(8) 107.5		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 7.5	Y(2) 5.5	Y(3) 3.5	Y(4) 0	Y(5) 0	Y(6) 4	Y(7) 6	Y(8) 8		

Padelford Wash FIS

FCD No 99-12

Modified Puls (Normal-Depth) Channel Routing Data

Location: From ADOT Sta 654+29 (4-10'x10' RCB's) D/S 3300 FT TO CO 115 on Trib. 'B'

HEC-1 Routing I.D: R113 - CO31 to CO115

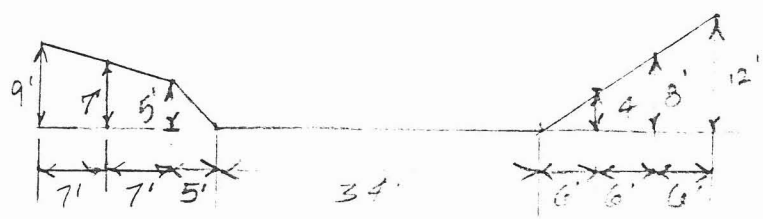
Vel. @ 3' Deep: 8.6 fps

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{3300\ ft}{8.6\ fps \times 2\ min \times 3}$$

$$= 3$$



Typical Section Looking D/S
From 200 Scale Topo and Site Visit

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 3	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 3300	SEL 0.015	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 7	X(3) 14	X(4) 19	X(5) 53	X(6) 59	X(7) 65	X(8) 71		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 9	Y(2) 7	Y(3) 5	Y(4) 0	Y(5) 0	Y(6) 4	Y(7) 8	Y(8) 12		

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Podelford Wash FIS — Calc. By GAS — Date 8/30/00

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Modified Puls (Normal-Depth) Channel Routing Data

Location: Sub 32 to C0115

ADOT Sta 662+70 (S.R. 74) 6'x5' RCP To Confluence with Trib 'B'

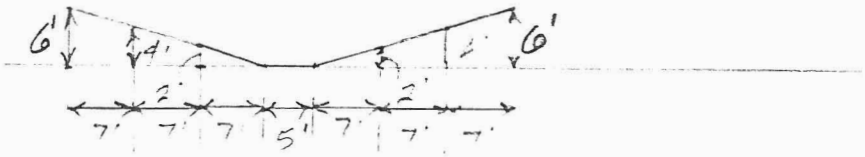
HEC-1 Routing I.D: R111 ; S32 to C0115

Vel. = 5.6 fps @ 2' Deep Estimate NSTPS

$$as = \frac{L}{V \times \Delta t} \times 60$$

$$= \frac{3100\ ft}{5.6\ fps \times 2\ min \times 60}$$

$$= 4.6 - \text{Use } 5$$



(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 5	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 3100	SEL 0.017	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 7	X(3) 14	X(4) 21	X(5) 26	X(6) 33	X(7) 40	X(8) 47		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 6	Y(2) 4	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 4	Y(8) 6		

HWEST INC. Consulting Engineers	Project 7158-07	Sht. ___ of ___	
Padelford Wash FIS	Calc. By GAS	Date 8/30/00	
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Modified Puls (Normal-Depth) channel Routing Data

Location: Trib 'B' CO115 To CO119
3300 FT To 4300 FT D/S of ADOT Sta. 054+29

HEC-1 Routing I.D: R117 - CO115 To CO119

Vel. at 3' Deep = 8.6 fps

Estimated NSTPS

$$= \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{1000 \text{ ft}}{8.6 \text{ fps} \times 2 \text{ min} \times 60}$$

$$= 1.0$$

Same Section As R0113

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 1	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 1000	SEL 0.015	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 7	X(3) 14	X(4) 19	X(5) 53	X(6) 59	X(7) 65	X(8) 71		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 9	Y(2) 7	Y(3) 5	Y(4) 0	Y(5) 0	Y(6) 4	Y(7) 8	Y(8) 12		

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Calc. By GAS Date 8/30/00
Chkd. ___ Date ___

Podel Ford wash FIS
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Modified Puls (Normal-Depth) channel Routing Data
Trib 'A' From ADOT Sta 642+63 D/S To CO 105
Location: Sub 34 To CO105

HEC-1 Routing I.D: R107 - S34 TO CO105

Estimate NSTPS

$$as = \frac{l}{V \times \Delta t \times 60}$$
$$= \frac{1700 \text{ ft}}{8.5 \text{ fps} \times 2 \text{ min} \times 60}$$
$$= 1.7 \text{ use } 2$$

Cross-Section Same as R0109

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 2	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 1700	SEL 0.016	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 6	X(3) 12	X(4) 18	X(5) 45	X(6) 49	X(7) 81	X(8) 85		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 12	Y(2) 8	Y(3) 4	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 5		

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Pedel Ford wash FIS
FCD No 99-12

Project 7158-01 Sht. ___ of ___
Calc. By GAS Date 8/30/00
Chkd. ___ Date ___

Modified Puls (Normal-Depth) channel Routing Data

Location: ADOT sta. 631+48 (36" Pipe)
Sub 38 To CO 105

HEC-1 Routing I.D: R103 S38 to CO105

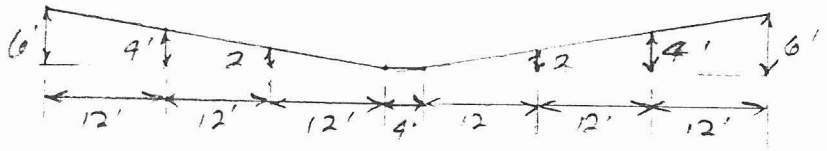
Vel. = 3.6 fps at 1' Deep

Estimate NSTPS

$$\Delta S = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{2560 \text{ ft}}{3.6 \text{ fps} \times 2 \text{ min} \times 60}$$

$= 5.9$ – Use 6



Field 1	2	3	4	5	6	7	8	9	10
RL Record – Channel Loss									
QLOSS PL	CLOSS	PERCRT	ELINV						
PS Record – Storage Routing									
NSTPS PS 3	ITYP FLOW	RSVRIC -1	X						
RC Record – Normal Depth Channel Routing									
ANL RC 0.064	ANCH 0.040	ANR 0.065	RLNTH 2560	SEL 0.018	ELMAX				
RX Record – Cross-Section X Coordinates									
X(1) RX 0	X(2) 12	X(3) 24	X(4) 36	X(5) 40	X(6) 52	X(7) 64	X(8) 76		
RY Record – Cross-Section Y Coordinates									
Y(1) RY 6	Y(2) 4	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 4	Y(8) 6		

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Project 1158-01 Sht. ___ of ___

Pedelford Wash FIS

Calc. By GAS Date 8/30/00

FCD No. 99-12

Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Trib 'A' C0105 D/S To Trib. 'B' Confluence

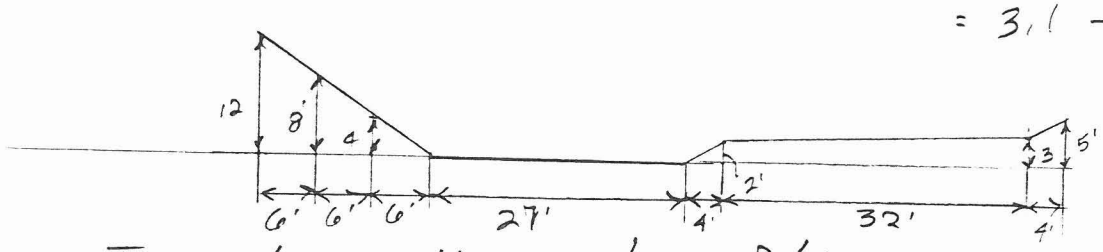
Location: C0105 to C0119

HEC-1 Routing I.D: R109 - C0105 to C0119

Chann. Vel = 8.5 fps at 3' Deep

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60} = \frac{3200 ft}{8.5 \times 2 min \times 60} = 3.1 \text{ — use } 3$$



Typical Section Looking D/S

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELMINV						
RS Record - Storage Routing									
NSTPS RS 3	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 3200	SEL 0.016	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 6	X(3) 12	X(4) 18	X(5) 45	X(6) 49	X(7) 81	X(8) 85		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 12'	Y(2) 8'	Y(3) 4	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 5		

HWEST INC. Consulting Engineers

Project 7158-07 Sht. ___ of ___

Pedelford Wash

Calc. By GAS Date 8/30/00

FCD No 99-12

Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data
CO 119 To CO 125

Location: Trib 'A' From Confluence with Trib 'B' To Pedelford Wash

HEC-1 Routing I.D: R118 — CO119 To CO125

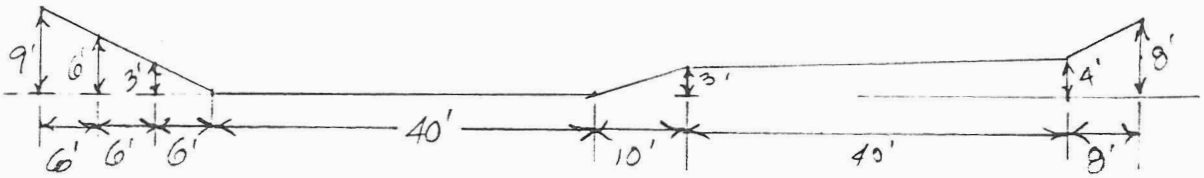
Vel. = 7.2 fps @ 3' Deep

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{5400 \text{ ft}}{7.2 \text{ fps} \times 2 \text{ min} \times 60}$$

$= 6.3$ Use 6



Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 4	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 5400	SEL 0.011	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 6	X(3) 12	X(4) 18	X(5) 58	X(6) 68	X(7) 108	X(8) 116		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 9	Y(2) 6	Y(3) 3	Y(4) 0	Y(5) 0	Y(6) 3	Y(7) 4	Y(8) 8		

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Padelford Wash FIS

Calc. By GAS Date 8/30/00

FCD No 99-12

Chkd. ___ Date ___

* Revised 10/20/00

Modified Puls (Normal-Depth) Channel Routing Data

Location: ADOT st. 620+35 (6'x7' RCB) D/S To South Edge Sec. 36, Sub 36 To R101A

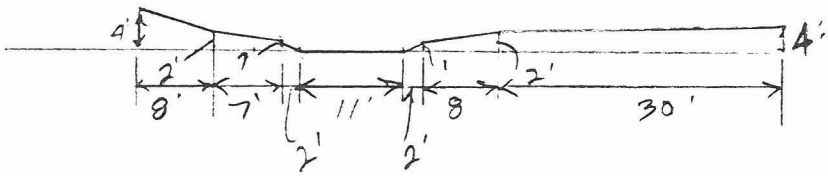
HEC-1 Routing I.D: R101 - S36 To R101A

Estimate NSTPS

*Vel. @ 2' Deep = 5.3 FPS

$$NSTPS = \frac{L}{V \times 60 \times 2\,min} = \frac{\cancel{12750}\ 8460}{*\ 5.3\,fps \times 60 \times 2\,min}$$

* = ~~15~~ ~~29~~ 13



Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 13	ITYP FLOW	RSVRIC -1	X	8460					
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.042	ANR 0.065	RLNTH ~~12760~~	SEL 0.013	ELMAX	1			
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 8	X(3) 15	X(4) 17	X(5) 28	X(6) 30	X(7) 38	X(8) 68		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 4	Y(2) 2	Y(3) 1	Y(4) 0	Y(5) 0	Y(6) 1	Y(7) 2	Y(8) 4		

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Pade/Ford Wash
FCD No 99-12

Project 7158-07 Sht. ___ of ___
Calc. By GAS Date 11/9/00
Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: South Edge Sec. 36 To CO 191
Along Wash D/S ADOT Sta 620+35 (6'x7' RCB)

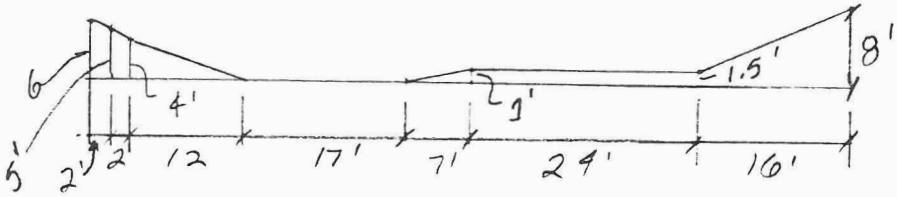
HEC-1 Routing I.D: R 101 A ; R101 To CO191

NSTPS Estimate

$NSTPS = \frac{L}{V \times 60 \times 2\,min}$

$= \frac{4300\,ft}{5.3\,fps \times 60 \times 2\,min}$

$= 6.7$ Use 7



Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELINV						
RS Record - Storage Routing									
NSTPS RS 7	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 4300'	SEL 0.013	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 2	X(3) 4	X(4) 16	X(5) 33	X(6) 40	X(7) 64	X(8) 80		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 6	Y(2) 5	Y(3) 4	Y(4) 0	Y(5) 0	Y(6) 1	Y(7) 1.5	Y(8) 8		

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Project 7158-07 Sht. ___ of ___

Calc. By GAS Date 9/4/00

Chkd. ___ Date ___

Padelford Wash FIS

FCD No 99-12

Modified Puls (Normal-Depth) channel Routing Data

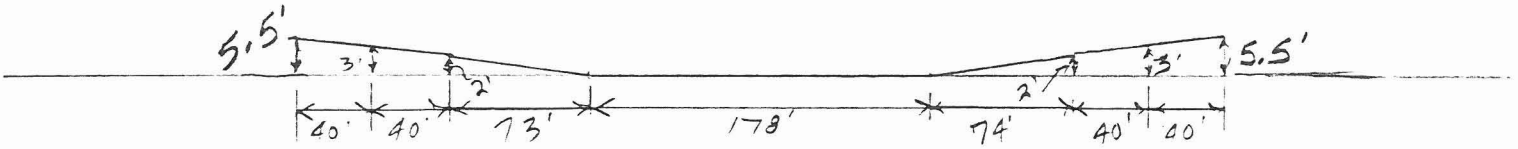
Location: C0193 To C0199 along Main Padelford Wash

HEC-1 Routing I.D: R193 - C0191 To C0195

Vel. at 2' Depth = 5.4 fps

Estimate NSTPS

$$as = \frac{L}{v \times \Delta t \times 60} = \frac{2500 ft}{5.4 fps \times 2 min \times 60 s/min} = 3.9 \text{ Use } 4$$



Average Typical Section Looking D/S From 200 scale Mapping and Site Visit observations

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 4	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 2500	SEL 0.010	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 40	X(3) 163	X(4) 331	X(5) 405	X(6) 445	X(7) 485	X(8) 525		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 5.5	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 5.5		

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Podelford wash FIS
Calc. By GAS Date 9/4/00
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Modified Puls (Normal-Depth) Channel Routing Data

Location: CO199 To Split-1 Confluence along Main Podelford wash.

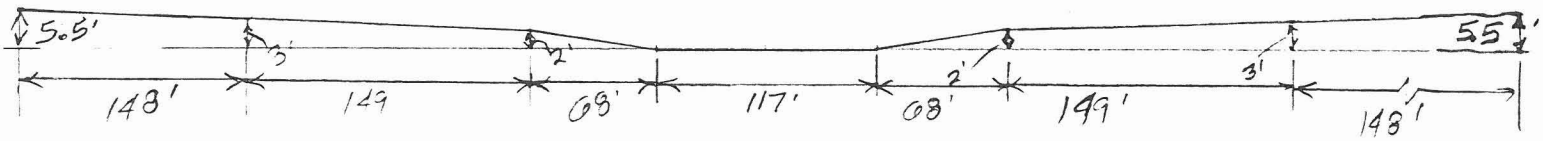
HEC-1 Routing I.D: R197

Ave. Vel at 2 FT Dep = 5.4 fps

Estimate NSTPS as $= \frac{L}{V \times \Delta t \times 60s}$

$= \frac{4700 \text{ ft}}{5.4 \text{ fps} \times 2 \text{ min} \times 60 \text{ s/m}}$

$= 7.3$ use 7



Average Typical Section Looking D/S
Based on 200 scale Mapping
This includes summation of Braided washes This Area.

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 7	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 4700	SEL 0.011	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 148	X(3) 297	X(4) 365	X(5) 482	X(6) 550	X(7) 699	X(8) 847		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 5.5	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 5.5		

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Project 7158-07 Sht. ___ of ___

Podelford Wash Calc. By GAS Date 9/4/00

FCD No 99-12 Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: Split 3 To C021S (At White Wing Rd)

HEC-1 Routing I.D: R301

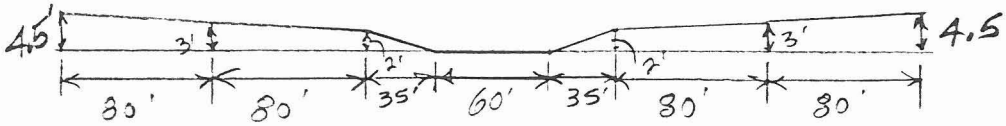
Vel. at 2' Deep = 5.4 fps

Estimate NSTPS

$$\Delta S = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{8920 \text{ ft}}{5.4 \text{ fps} \times 2 \text{ min} \times 60 \text{ s/min}}$$

$= 13.8$ Use 14



Average Typical Section Looking D/S Based on 200 scale Mapping and Site Visit Measurements.

(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELININV						
RS Record - Storage Routing									
NSTPS RS 14	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 8920	SEL 0.011	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 80	X(3) 160	X(4) 195	X(5) 255	X(6) 290	X(7) 370	X(8) 450		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 4.5	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 4.5		

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Project 7158-07 Sht. ___ of ___

Podel Ford Wash FIS — Calc. By GAS — Date 9/4/00

FCD No. 99-12 — Chkd. ___ — Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: Split 3 At White Wing Rd To CO 219

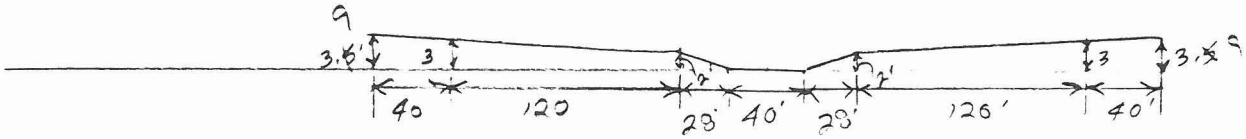
HEC-1 Routing I.D: R323

Vel at 2' Deep = 5.3 fps

Estimate NSTPS as: $\frac{L}{V \times \Delta t \times 60\ s/min}$

$= \frac{3800\ ft}{5.3\ fps \times 2\ min \times 60\ s/min}$

$= 6$ use 6



Average Typical Section Looking D/S Based on 200 scale Mapping and Site Visit Measurements/Observations

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 6	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 3800	SEL 0.011	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 40	X(3) 160	X(4) 188	X(5) 228	X(6) 256	X(7) 376	X(8) 416		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 3.9	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 3.9		

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Podelford Wash EIS — Calc. By GAS — Date 9/4/00
FCD No 99-12 — Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: Split 4 From White wing Rd to CAP Canal

HEC-1 Routing I.D: R 321

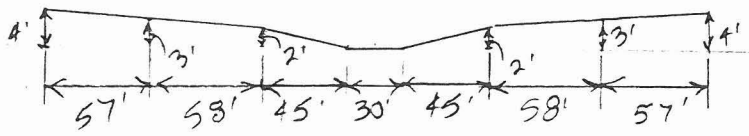
Vel. at 2 FT Doop = 4.7 fps

NSTPS Estimate

$$= \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{3400 \text{ ft}}{4.7 \text{ fps} \times 2 \text{ min} \times 60 \text{ s/min}}$$

$$= 6$$



Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS PL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 6	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 3400	SEL 0.010	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 57	X(3) 115	X(4) 160	X(5) 190	X(6) 235	X(7) 293	X(8) 350		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 4	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 4		

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Calc. By GAS Date 9/14/00
Chkd. ___ Date ___

Podesford Wash FIS
FCD No 99-12

Modified Puls (Normal-Depth) Channel Routing Data

Location: Split 2 To CO410 (CAP canal)

HEC-1 Routing I.D: R318

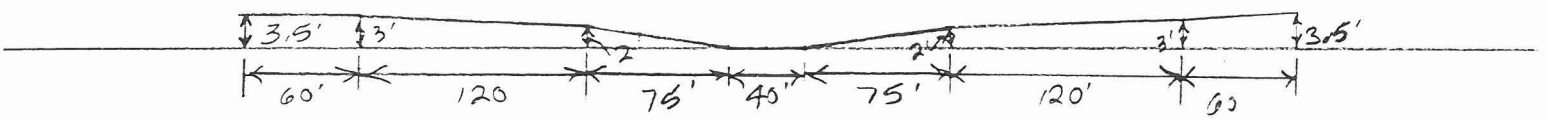
Vel. at 2' Deep = 4.8 fps

Estimate NSTPS

$$\Delta S = \frac{L}{V \times \Delta t \times 60\ s/min}$$

$$= \frac{11200\ ft}{4.8\ fps \times 2\ min \times 60\ s/min}$$

$= 19.4$ use 19



Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS PL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 19	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 11200	SEL 0.011	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 60	X(3) 180	X(4) 255	X(5) 295	X(6) 370	X(7) 490	X(8) 550		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 3.5	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 3.5		

Modified Puls (Normal-Depth) Channel Routing Data

Location: Split 1 To CO 309 Along Split 1

HEC-1 Routing I.D: RO 316

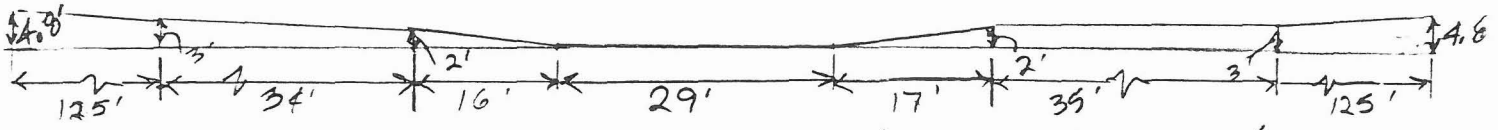
Vel. at 2' Deep = 5.4 fps

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{4520\ ft}{5.4\ fps \times 2\ min \times 60\ \frac{s}{min}}$$

$$= 7.$$



Average Typical Section Looking D/S
Based on 200 scale Mapping and
Site Visit Measurements

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELMINV						
RS Record - Storage Routing									
NSTPS RS 7	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 4520	SEL 0.011	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 125	X(3) 159	X(4) 175	X(5) 204	X(6) 221	X(7) 256	X(8) 381		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 4.8	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 4.8		

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Project 7158-07 Sht. ___ of ___

Podelford Wash — Calc. By GAS — Date 9/4/00

FCD No 99-12 — Chkd. ___ Date ___

Modified Puls (Normal-Depth) Channel Routing Data

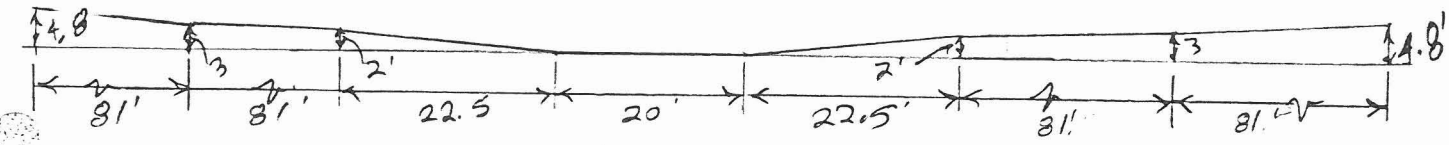
Location: CO209 To CO430 (At CAP Canal Along split 1

HEC-1 Routing I.D: R 211 - CO209 To CO430

Ave. Vel. @ 2' Deep = 4.8 fps

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60} = \frac{6480 ft}{4.8 fps \times 2 min \times 60 \frac{sec}{min}} = 11.2 \quad \text{use } 11$$



Ave. Typical Section Looking D/S
From 200 Scale Mapping & Site observations

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELMINV						
RS Record - Storage Routing									
NSTPS RS 11	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 6480	SEL 0.010	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 81	X(3) 162	X(4) 184.5	X(5) 204.5	X(6) 227	X(7) 308	X(8) 389		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 4.8'	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 4.8'		

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Project 7158-07 Sht. ___ of ___

Padelford Wash FIS

Calc. By GAS Date 8/31/00

FCD No 99-12

Chkd. ___ Date ___

* Rev. 10/20/00

Modified Puls (Normal-Depth) Channel Routing Data

Location: Sub 230 To CO 235

HEC-1 Routing I.D: R 231

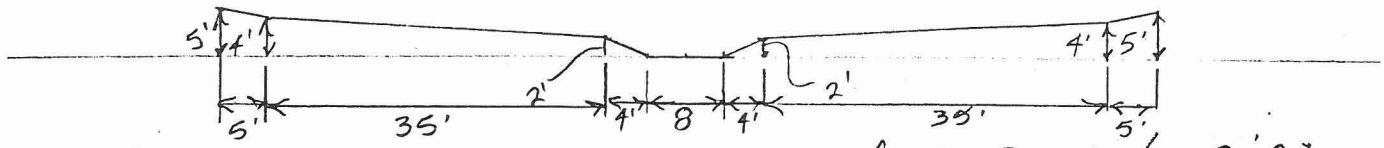
*Vel = 5.3 fps @ 2 FT Deep

Estimate NSTPS $= \frac{L}{V \times 60 \times 2\text{min}}$

$= \frac{4800}{*5.3 \text{ fps} \times 60 \times 2\text{min}}$

~~= 5.7 Use 6~~

*7.5 Use 8



Typical Section Looking D/S Based on 200 scale 2' C.I. Mapping

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELVINV						
RS Record - Storage Routing									
NSTPS RS 8	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.04	ANR 0.065	RLNTH 4800	SEL 0.013	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 4	X(3) 40	X(4) 44	X(5) 52	X(6) 56	X(7) 91	X(8) 96		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 5	Y(2) 4	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 4	Y(8) 5		

HI WEST INC. Consulting Engineers

Project 115 8-01 Sht. ___ of ___

Poldford wash FIS — Calc. By GAS — Date 9/4/00

FCD No. 99-12 — Chkd. ___ — Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: CO 235 to CO247
Confluence sub 240 and CO235 with CAP Canal

HEC-1 Routing I.D: R 237

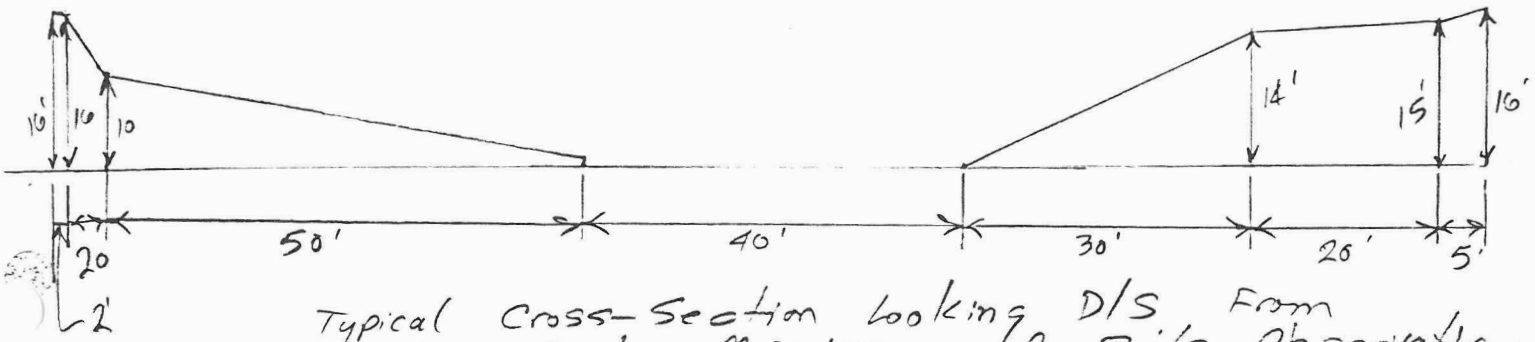
Vel. @ 2' Deep = 4.8 fps

Estimate NSTPS

$$DS = \frac{L}{V \times \Delta t \times 60}$$

$$= \frac{3760 ft}{4.8 fps \times 2 min. \times 60 sec}$$

$= 6.5$ Use 7



Typical Cross-Section looking D/S From 200 scale Mapping and Site Observations

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELMINV						
RS Record - Storage Routing									
NSTPS RS 7	ITYP FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.040	ANR 0.065	RLNTH 3760	SEL 0.0081	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 2	X(3) 22	X(4) 72	X(5) 112	X(6) 142	X(7) 162	X(8) 167		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 16	Y(2) 16'	Y(3) 10'	Y(4) 0	Y(5) 0	Y(6) 14	Y(7) 15	Y(8) 16		

HI WEST INC. Consulting Engineers

Project 115 8-01 Sht. ___ of ___

Padelford Wash FIS — Calc. By GAS — Date 9/4/00

FCD No. 99-12 — Chkd. ___ — Date ___

Modified Puls (Normal-Depth) Channel Routing Data

Location: HEC-1 I.D. Main 1 (Padelford Wash) to CO 420 along Main Padelford wash

HEC-1 Routing I.D: R 203 - MAIN1 TO CO 420 and R 205

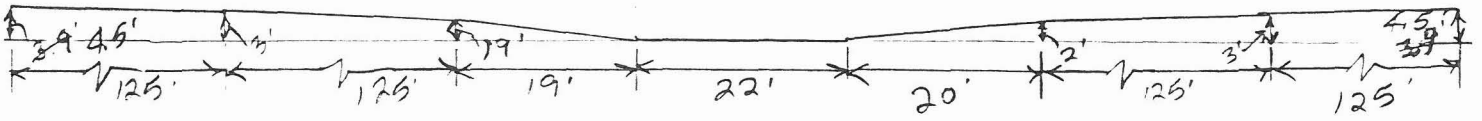
Vel. at 2 FT. Depth: 5.2 fps

Estimate NSTPS

$$as = \frac{L}{V \times \Delta t \times 60\,s/min} = \frac{5600\,ft}{5.2\,fps \times 2\,min \times 60\,s/min} = 9$$

Total L = 11,200 ft

L = 5600 ft for each Reach



Average Typical Section Looking D/S From 200 scale Mapping and site visit Measurements.

Field 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS RL	CLOSS	PERCRT	ELMINV						
RS Record - Storage Routing									
NSTPS RS 9	LTYP Each Reach FLOW	RSVRIC -1	X						
RC Record - Normal Depth Channel Routing									
ANL RC 0.065	ANCH 0.037	ANR 0.065	RLNTH 5600	SEL Each Reach 0.011	ELMAX				
RX Record - Cross-Section X Coordinates									
X(1) RX 0	X(2) 125	X(3) 250	X(4) 269	X(5) 291	X(6) 311	X(7) 436	X(8) 561		
RY Record - Cross-Section Y Coordinates									
Y(1) RY 4.5	Y(2) 3	Y(3) 2	Y(4) 0	Y(5) 0	Y(6) 2	Y(7) 3	Y(8) 4.5		

Project	7158-07	Sht. ___ of ___	
Calc. By	GAS	Date	1/3/01
Chkd.		Date	

Podolford Wash

Modified Puls (Normal-Depth) channel Routing Data

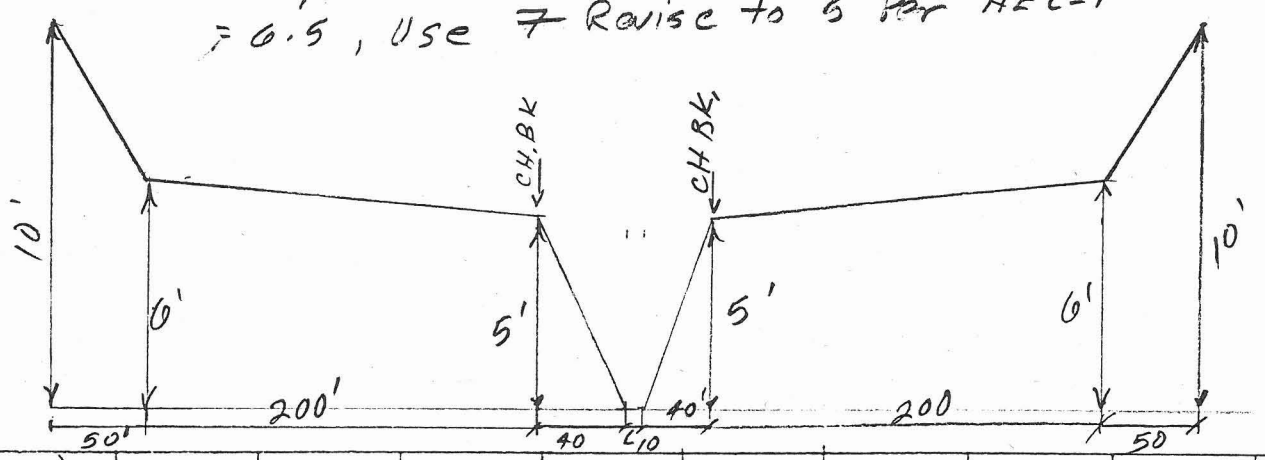
Location: Along Split 5 wash from Split 1 Confluence (HEC-1 * CO209) TO CAP CANAL & CO255

HEC-1 Routing I.D: R251

$NSTPS = \frac{L}{V \times \Delta t \times 60}$, Assume $V_{Ave} = 7$ fps

$= \frac{5475 \text{ ft}}{7 \text{ fps} \times 2 \text{ min} \times 60 \text{ s/m}}$

$= 6.5$, Use 7 Revise to 6 Per HEC-1 check



(Field) 1	2	3	4	5	6	7	8	9	10
RL Record - Channel Loss									
QLOSS	CLOSS	PERCRT	ELVINV						
RL —	—	—	—						
RS Record - Storage Routing									
NSTPS	ITYP	RSVRIC	X						
RS 75	FLOW	-1							
RC Record - Normal Depth Channel Routing									
ANL	ANCH	ANR	RLNTH	SEL	ELMAX				
RC 0.065	0.037	0.065	5475	0.011					
RX Record - Cross-Section X Coordinates									
X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	X(8)		
RX 0	50	250	290	300	340	540	590		
RY Record - Cross-Section Y Coordinates									
Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)		
RY 10	6	5	0	0	5	6	10		