

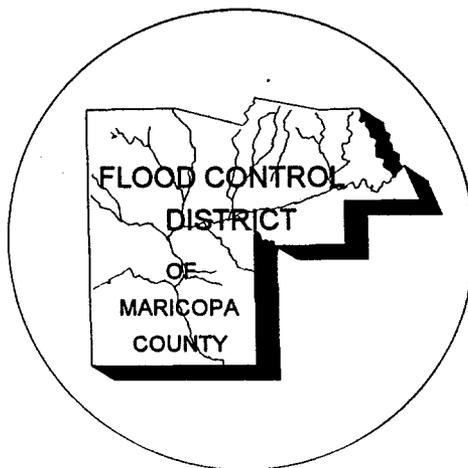
EASTERN CANAL
FLOODPLAIN DELINEATION STUDY

TECHNICAL DATA NOTEBOOK

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Phoenix, AZ 85009

Submitted to:

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85008
(602) 506-1501



**EASTERN CANAL TECHNICAL DATA NOTEBOOK (TDN)
STUDY DOCUMENTATION ABSTRACT**

SECTION 1: GENERAL INFORMATION

- 1A. Community: City of Mesa
- 1B. Community Number: 040048
- 1C. County: Maricopa
- 1D. State: Arizona
- 1E. Date Study Accepted: Pending
- 1F. Study Contractor: Michael Baker, Jr., Inc.
1313 East Osborn Road
Suite 150
Phoenix, Arizona 85014
(602) 279-1234
FCDMC Contract No. 96-10

Subconsultants: Aerial Mapping Company, Inc.
3141 West Clarendon Avenue
Phoenix, Arizona 85017
(602) 263-5728
Aerial Mapping

A-N West, Inc.
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200
Hydraulics/Floodplain Mapping

Project Engineering Consultants, Ltd.
2320 W. Peoria Avenue, Suite C-122
Phoenix, Arizona 85029
(602) 906-1901
Field Survey

Primatech Engineers
2929 North 44th Street
Phoenix, Arizona 85018
(602) 952-2828
Hydrology

- 1G. FEMA Technical Reviewer: Pending
- 1H. FEMA Regional Reviewer: Pending
- 1I. State Reviewer: Arizona Department of Water Resources
(602) 417-2445
- 1J. Local Reviewer: Flood Control District of Maricopa County
(602) 506-1501
- 1K. River or Stream Name: Eastern Canal
- 1L. Reach Description: From 200 feet downstream of Baseline to Hermosa Vista Drive, a distance of 5.5 River Miles. Located on FIRM Panel Nos. 2185D, 2195D and 2215F.
- 1M. Study Type: Approximate Zone A

SECTION 2: MAPPING INFORMATION

- 2A. USGS Quad Sheets: 7.5 Minute Series; Buckhorn, AZ, 1956, Photo Rev. 1982 and Mesa, Arizona, 1952, Photo Rev. 1982.
- 2B. Mapping for Hydrologic Study: Same as Section 2C.
- 2C. Mapping for Hydraulic Study: Aerial Photography Flown at Scale of 1:8400. Topographic Mapping Compiled at Scale of 1" = 200' and 2 feet. C.I. Photography Flown on 3/20/96.
Mapping Consultant: Aerial Mapping Company, Inc., of Phoenix, Arizona.

SECTION 3: HYDROLOGY

- 3A. Model or Method Used: Note 1: see Primatch Engineers Hydrology Report under separate cover. U.S. Army Corps of Engineers HEC-1 Model, Flood Hydrograph Package Computer Model, Version 4.0, September 1990.
- 3B. Storm Duration: 24-hour duration
- 3C. Hyetograph Type: Note 1.
- 3D. Peak Flow Frequencies Estimated in Hydrologic Study: 100-year storm
- 3E. List of Gauges Used to Calibrate Model: Note 1.
- 3F. List of Rainfall Amounts: Note 1.
- 3G. Description of Unique Conditions: Note 1. Numerous split-flows at streets, and storm drains as well as retention basins were analyzed as part of study. Hydrology assumed no breakout of flow over canal which was determined to occur in preliminary hydraulic analysis. Thus, approximate Zone A floodplain pursued with no refinement of hydrology.
- 3H. Coordination with Applicable Agencies: Note 1.

SECTION 4: HYDRAULICS

- 4A. Model of Method Used: U.S. Corps of Engineers HEC-2 Model, Water Surface Profiles
Vendor: McTrans Center
512 Weil Hall
Gainesville, Florida 32611-2083
Version: 4.6.2, May, 1991
- 4B. Regime: Subcritical

- 4C. Frequency for which profiles computed: No specific storm events modeled as detailed floodplain not considered possible as flow not contained upstream of canal.
- 4D. Method Floodway Calculation: No floodway modeled per FCDMC and City of Mesa direction.
- 4E. Unique Conditions and Problems: Letter Report of May 1, 1997 by A-N West, discusses preliminary hydraulic analysis estimating discharges for Profile 1, where flow begins breaking over east canal bank and Profile 2, where flow is approximately 0.5 feet over east top of canal bank. Over 14 breakout areas were identified and a detailed analysis for 100-year flood was not considered possible. Updating the Approximate Zone A floodplain was noted as possible alternate solution. Per City request May 9, 1997, meeting updated Approximate Zone A was initiated and submitted with May 15, 1997 letter.

SECTION 5: ADDITIONAL STUDY INFORMATION

Length and Area of Floodplain Delineated

Main Channel - 5.5 Miles and 428.8 Acres
(Updated Zone A)

Length and Area of Floodway Delineated

No Floodway Delineated.

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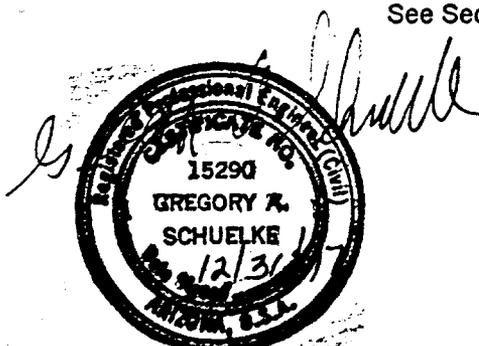
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	1.3 MEETING MINUTES OR REPORTS AND REVIEW COMMENTS	1.3 (1) - (13)
	1.4 GENERAL CORRESPONDENCE	
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	1.4.2 State Coordinator	—
	1.4.3 Other Agencies	—
	1.4.4 FEMA Regional Office	—
	1.4.5 FEMA Washington	—
	1.4.6 FEMA Technical Consultant	—
	1.4.7 Copy of Public Notices - No Public Notice Published Per City Direction	—
	1.5 CONTRACT DOCUMENTS	1.5 (1) - (5)
SECTION	2.0 MAPPING AND SURVEY INFORMATION	
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	2.2 INDEX OF MAPS	Under Separate Cover
	2.3 SURVEY FIELD NOTES - BY PROJECT ENGINEERING SUPPLEMENTAL FIELD SURVEY NOTES - BY PROJECT ENGINEER OF CANAL BRIDGES	2.3 (1) - 2.0 (13)
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	2.4 WATERSHED MAPS, HYDROLOGIC ANALYSIS MAPS	See Section 3.0
	2.5 HYDRAULIC ANALYSIS MAPS	See Exhibit 3 of Attached FIS Study
	2.6 FIRM, FHBM DRAFT MAPS; EFF. DELINEATION INCL. ON EXHIBIT 3 OF ATTACHED FIS STUDY	
	2.7 COMMUNITY MAPS	In FIS Report
	2.8 MISCELLANEOUS MAPS	None
SECTION	3.0 HYDROLOGIC ANALYSIS	
	3.1 METHOD DESCRIPTION	Note 1 - Hydrology Report for Eastern Canal FIS By Primatech Engineers under separate cover
	3.2 PARAMETER ESTIMATION	Note 1
	3.2.1 Drainage Area Boundaries	
	3.2.2 Physical Parameters	
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	3.6 FINAL MODELING RESULTS ON DISKETTE(S)	Note 1

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SECTION 4.0	HYDRAULIC ANALYSIS	See Attached Eastern Canal Flood Insurance Study (FIS) Report By A-N West Dated: May, 1997
4.1	METHOD DESCRIPTION	See Section 3 of attached FIS Report
4.2	PARAMETER ESTIMATION	Note 2 - See Attached Field Reconnaissance & Hydraulic Parameter Estimation Report By A-N West Dated: January 30, 1997
4.2.1	Manning's 'n' Value	See Section 4.2.1 of attached Report (Note 2)
4.2.2	Expansion and Contraction Coefficients	See Section 4.2.2 of attached Report (Note 2)
4.2.3	Hydraulic Jump/Drop Analysis	See Section 4.2.3 of attached Report (Note 2)
4.3	CROSS-SECTION DESCRIPTION	
4.3.1	Channel and Overbank Cross-Section Plots (17 - 24" x 36" sheets)	Under Separate Cover See Cross-Section Plots Note 2 and FIS Reports
4.3.2	Bridge or Constriction	
4.3.3	Grade Control Structures	
4.4	CALIBRATION	See Section 3.2 of FIS Report
4.5	SPECIAL PROBLEMS/SOLUTIONS	
	Subject: Eastern Canal - Preliminary HEC-2 Model Results and Canal Breakout Identification Detailed Analysis Not Possible and Subsequent Approximate Zone A Delineation	See Letter Report By A-N West Dated: May 1 and 15, 1997 4.5(1) - 4.5 (31)
4.6	FLOODWAY MODELING	N/A
4.7	FINAL RESULTS/COMPUTER RUNS	N/A
4.8	FINAL MODELING RUN ON DISKETTES	N/A
SECTION 5.0	EROSION/SEDIMENT TRANSPORT	N/A
SECTION 6.0	REFERENCE MATERIALS	
6.1	OTHER PUBLISHED FLOOD STUDIES	See FIS Report
6.2	PREVIOUS FEMA STUDIES	See Section 6 of FIS Report
6.3	OTHER APPLICABLE STUDIES	See Section 6 of FIS Report
6.4	PUBLISHED/UNPUBLISHED HISTORICAL FLOOD INFO.	See Section 2.3 and 6 of FIS Report
6.5	REFERENCED TECHNICAL PAPERS/DOCUMENTS	See Section 8 of FIS Report
SECTION 7.0	CROSS-REFERENCE AND LABELING INFORMATION	
7.1	OTHER STUDIES IMPACTED	N/A
7.2	KEY TO CROSS-SECTION LABELING	N/A - Mapping and Cross-Section Plots
SECTION 8.0	DRAFT FIS REPORT	See Section 8.0
SECTION 9.0	FEMA REVISION REQUESTER FORMS	See Section 9.0



12/19/96

G.S. called Rajh - FCD MC 506-4071

X-Section markups OK

He will have them ^{x-sec. markups} delivered to ANW

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

2801 West Durango Street
Phoenix, Arizona 85009

(602) 506-1501

LETTER OF TRANSMITTAL

TO Greg Schuelke

DATE	12/19/96	JOB NO.	96-10
ATTENTION	Greg Schuelke		
RE:	FCD 96-10		
	Eastern Canal FIS		

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

- Shop drawings Prints Plans Samples Specifications
 Copy of letter Change order _____

COPIES	DATE	NO.	DESCRIPTION
1	12/19		Blue line maps of x-section layouts.

THESE ARE TRANSMITTED as checked below:

- 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 _____
 FOR BIDS DUE _____ 19 _____ PRINTS RETURNED AFTER LOAN TO US

REMARKS Greg, I have looked at the locations and alignment of the x-sections. It looks fine.

COPY TO File 1.3 (2)
SIGNED: [Signature]

2/19/97

Rajh - of FED. called G.S.

N^o Value Report OK'd

Prematec says ^{Preliminary} Hydrology 90% Final

DATA COLLECTION SUMMARY REPORT

Project Name: Eastern Canal Floodplain Delineation Study
FCDMC No.: 96-10
A-N West No.: 7158-04
Date: 4/7/97
Discussion: The following is a summary of the data collection effort by A-N West. More detailed documentation will be included in the Technical Data Notebook.

Contact No.	Agency Organization	Contact Date	Method of Contract	Data Requested and/or Obtained Requested Flood Hazard
1	ADOT - Engr. Records	2/26/97 & 4/13/97	Meeting	Obtained As-Builts on S.R. 360 and Greenfield Rd. T.I. at Eastern Canal.
2	Salt River Project	4/4/97	Meeting Telephone	Obtained As-Builts on Eastern Canal - Baseline Rd. to Gilbert Rd.
3.	A-N West Field Survey	3/13/97	Meeting	Obtained invert elevation of Drainage Structures at Baseline Rd., Greenfield Rd., U.S. 60 (S.R. 360), Southern Ave., Broadway Rd., Apache Blvd.
4.	FCDMC - Mr. Raju Shah	12/11/96 - 4/4/97	Fax Telephone Meeting	a) Requested reproducibles of current FEMA maps. b) Obtained field survey notes, disks by Project Engineering. c) Obtained Preliminary Hydrology Summary by Primatech.

Letter of Transmittal

TO: FCDMC
2801 West Durango Street
Phoenix Az 85009

DATE: 4/9/97

JOB TITLE: _____

JOB NO.: A-N west 7158-04

RE: Eastern Canal FIS

ATTN: Mr Raj Shah - Proj Manager FCD No 96-10

FROM: Greg Schuelle

WE ARE SENDING YOU ATTACHED UNDER SEPARATE COVER VIA Mail & Fax

THE FOLLOWING ITEMS:

- SPECIFICATIONS
- SHOP DRAWINGS
- PLANS
- ORIGINALS
- PRINTS
- SAMPLES
- COPY OF LETTER
- REPORT
- OTHER _____

QUAN.	I.D./DWG. NO.	TITLE/DESCRIPTION
1		Monthly Progress Report For Month Ending 2/23/97 and 3/30/97
1		Data Collection Summary Report

THESE ARE TRANSMITTED FOR REVIEW FOR YOUR USE AS REQUESTED OTHER _____

REMARKS: Raj, per your request attached are
monthly progress reports for last months billing
and this months upcoming billing.

Also, I've included a data collection summary
report for your review and approval/comments

REC'D. BY: _____ DATE: _____

MONTHLY PROGRESS REPORT

Report Month Ending: March 30, 1997
Project Name: Eastern Canal Floodplain Delineation Study
FCDMC No.: 96-10
A-N West No.: 7158-04
Project Notice to Proceed: 11/25/96
Current Schedule Completion Date: 6/30/97

<u>Project Task</u>	<u>Percent Complete Reporting Month</u>	<u>Cumulative Percent Complete</u>
Task 1 Coordination	10	25
Task 2 Data Collection	60	100
Task 3 Floodplain Delineation		
a) Recon. Report	100	100
b) Cross-section Location/Digitizing	15	40
c) HEC-2 Floodplain Modeling	0	0
d) Final Hydraulic Report	0	0
Task 4 HIS Data Preparation		
a) A-N West	0	0
Task 5 Final Products/Deliverables	0	0
Task 6 Direct Expenses	48	90

Work Performed in Month of March, 1997

- a) Field Surveyed on 3/13/97, invert elevations on culverts along Eastern Canal at Baseline, Greenfield, U.S. 60, Southern, Broadway, and Apache Boulevard.
- b) Continued work on digitizing cross-sections.
- c) Begin analyzing culvert capacities by HEC-5 manual at roads noted in (a) above.

Work to be Accomplished in Month of April, 1997

Digitize cross-sections and perform preliminary HEC-2 model analysis and floodplain modeling.

Problem Discussion

- Continued problems encountered in digitizing cross-section data. Attempting to resolve.
- Time Extension Request to 6/30/97; applied for on 3/26/97.
- Preliminary review of 100-year discharges received from FCD/Primatch and culvert capacity versus top of canal and road indicates canal overtopping at most major roads.

MONTHLY PROGRESS REPORT

Report Month Ending: February 23, 1997
Project Name: Eastern Canal Floodplain Delineation Study
FCDMC No.: 96-10
A-N West No.: 7158-04
Project Notice to Proceed: 11/25/96
Current Schedule Completion Date: 3/31/97

Project Task	Percent Complete Reporting Month	Cumulative Percent Complete
Task 1 Coordination	0	15
Task 2 Data Collection	0	40
Task 3 Floodplain Delineation		
a) Recon. Report	100	100
b) Cross-section Location/Digitizing	4	25
c) HEC-2 Floodplain Modeling	0	0
d) Final Hydraulic Report	0	0
Task 4 HIS Data Preparation		
a) A-N West	0	0
Task 5 Final Products/Deliverables	0	0
Task 6 Direct Expenses	32	42

Work Performed in Months of January and February, 1997

- a) Got Compact Disk (CD) of Eastern Canal Digital Data (12/27/96 Revision) from Aerial Mapping Company in Micro-Station Format on 1/15/97, and sent to A-N West in Richmond, California office for conversion to Auto-Cadd format.
- b) A-N West's Phoenix office got digital topo data (TIN) back, converted to Auto-Cadd on 1/31/97.
- c) Sent Field Reconnaissance Report to FCDMC on 1/30/97.
- d) Field Reconnaissance Report approved by Flood Control District on 2/19/97.
- e) Received Preliminary Hydrology Summary from Flood Control District by Primattech on 2/26/97.

Work to be Accomplished in Month of March, 1997

Digitize cross-sections, begin HEC-2 model analysis and culvert analysis.

Problem Discussion

Some problems encountered in digitizing cross-section data. Attempting to resolve.

Letter of Transmittal

TO: FCD MC
2801 West Durango Str.
Phoenix AZ 85008

DATE: 5/6/97
JOB TITLE: _____
JOB NO.: A-N west No 7158-07
RE: Eastern Canal FLS
FCD No 96-10

ATTN: Mr Rajh Shah
FROM: Greg Schuelke

WE ARE SENDING YOU ATTACHED UNDER SEPARATE COVER

VIA Mail

THE FOLLOWING ITEMS:

- SPECIFICATIONS ORIGINALS COPY OF LETTER
- SHOP DRAWINGS PRINTS REPORT
- PLANS SAMPLES OTHER _____

QUAN.	I.D./DWG. NO.	TITLE/DESCRIPTION
1		<u>Monthly Progress Report</u> <u>For Month Ending 4/30/97</u>

THESE ARE TRANSMITTED FOR REVIEW FOR YOUR USE AS REQUESTED
 OTHER _____

REMARKS: _____

REC'D. BY: _____ DATE: _____

COPY TO: File ^{1,3 (8)} WITH ENCLOSURES

MONTHLY PROGRESS REPORT

Report Month Ending: April 30, 1997
Project Name: Eastern Canal Floodplain Delineation Study
FCDMC No.: 96-10
A-N West No.: 7158-04
Project Notice to Proceed: 11/25/96
Current Schedule Completion Date: 6/30/97

Project Task	Percent Complete Reporting Month	Cumulative Percent Complete
Task 1 Coordination	10	35
Task 2 Data Collection	60	100
Task 3 Floodplain Delineation		
a) Recon. Report	100	100
b) Cross-section Location/Digitizing	60	100
c) HEC-2 Floodplain Modeling	40	40
d) Final Hydraulic Report	10	10
Task 4 HIS Data Preparation		
a) A-N West	0	0
Task 5 Final Products/Deliverables	10	10
Task 6 Direct Expenses	48	90

Work Performed in Month of April, 1997

- a) Prepared Preliminary HEC-2 Model of full length of project, which analyzed capacity of reaches of canal for Profile 1 (WSEL at critical east top of bank elevations), and Profile 2 (WSEL 0.5 foot above east top of bank. The preliminary floodplain mapping, cross-section and letter were submitted on May 1, 1997, in meeting with FCDMC. A copy was mailed to the City of Mesa.

Work to be Accomplished in Month of May, 1997

Meet with the City of Mesa and FCDMC to discuss approach for continued study, given that 100-year computed flow greatly exceeds capacity along canal.

Problem Discussion

As discussed in May 1, 1997 letter with supporting preliminary data to FCDMC and the City, the floodplain along upstream side of canal does not provide continuous conveyance of flow close to computed 100-year flows.

Letter of Transmittal

TO: FCD MC
2801 West Durango Str.
Phoenix AZ 85008

DATE: 5/30/97
JOB TITLE: _____
JOB NO.: A-N west No 7158-07
RE: Eastern Canal FZS
FCD No 96-10

ATTN: Mr Rajh Shah

FROM: Greg Schuelke

WE ARE SENDING YOU

ATTACHED

VIA Mail

UNDER SEPARATE COVER

THE FOLLOWING ITEMS:

SPECIFICATIONS

ORIGINALS

COPY OF LETTER

SHOP DRAWINGS

PRINTS

REPORT

PLANS

SAMPLES

OTHER _____

QUAN.	I.D./DWG. NO.	TITLE/DESCRIPTION
1		Monthly Progress Report For Month Ending 5/30/97

THESE ARE TRANSMITTED

FOR REVIEW

FOR YOUR USE

AS REQUESTED

OTHER _____

REMARKS: _____

REC'D. BY: _____

DATE: _____

COPY TO: File

1.3 (10)

WITH ENCLOSURES

MONTHLY PROGRESS REPORT

Report Month Ending: May 31, 1997
 Project Name: Eastern Canal Floodplain Delineation Study
 FCDMC No.: 96-10
 A-N West No.: 7158-04
 Project Notice to Proceed: 11/25/96
 Current Schedule Completion Date: 6/30/97

Project Task	Percent Complete Reporting Month	Cumulative Percent Complete
Task 1 Coordination	50	85
Task 2 Data Collection	0	100
Task 3 Floodplain Delineation		
a) Recon. Report	0	100
b) Cross-section Location/Digitizing	0	100
c) HEC-2 Floodplain Modeling	60	100
d) Final Hydraulic Report	90	100
Task 4 HIS Data Preparation		
a) A-N West	100	100
b) Aerial Mapping Co.	10	10
Task 5 Final Products/Deliverables	50	60
Task 6 Direct Expenses	10	100

Work Performed in Month of May, 1997

a) Meeting held in Mesa on May 9, 1997 to discuss 5/1/97 letter report. Subsequent updated Zone A floodplain submitted 5/15/97 in draft version. On May 28, 1997, draft FIS report submitted with CADD drawn floodplain mapping which was also submitted to Aerial Mapping Company to start HIS translation.

Work to be Accomplished in month of June, 1997

Aerial Mapping Company to finish HIS translation. A-N West to submit Tech. Data Notebook.

MEETING SUMMARY

DATE: May 9, 1997

RE: Eastern Canal and UEMF FIS, FCD No. 96-10 and 94-26
Review of Preliminary Results from May 1, 1997 Letter Report
A-N West No. 7158-04 and 7158-03

AUTHOR: Mr. Greg Schuelke

ATTENDEES: Mr. Pedro Calza, FCDMC
Mr. Rajh Shah, FCDMC
Mr. Peter Knudson, City of Mesa
Mr. Keith Nath, City of Mesa
Mr. Humphreys, Primatech
Mr. Greg Schuelke, A-N West, Inc
Mr. Greg Barry, A-N West, Inc.

DISCUSSION:

1) Mr. Schuelke explained May 1, 1997 Letter Report and Mapping/Hydraulic Analysis. Mr. Schuelke noted that as A-N West evaluated potential culvert capacity of significant culverts along Eastern Canal as shown in Tables 1 and 2 and compared to 100-year discharges by Primatech, it was apparent that culverts did not have near the 100-year discharge capacity.

On discussion of above observations with Mr. Shah, A-N West recommended a preliminary HEC-2 analysis to identify conveyance capacity of various reaches along the canal that will produce Water Surface Elevations (WSEL) near the east top of canal (Profile 1) and also the capacity that would produce WSEL 0.5 foot above top of east canal bank (Profile 2).

As shown on the May 1, 1997 letter report Table 3, the resultant computed conveyance capacity for the Profile 1 or 2 analysis was only a fraction of the computed 100-year discharges to the canal and approximately 14 breakouts over the canal were identified on the floodplain mapping and Table 3.

Mr. Schuelke explained that the Profile 2 WSEL of 0.5 foot above the east top of canal was chosen as approximately the maximum potential 100-year ponding level as at this level breakouts over the canal would approximate 1 cfs/foot of weir flow length along canal. A rough estimate of the number of breaches and the 100-year computed flows suggested an equilibrium at this depth of weir flow over the canal versus 100-year inflows.

Mr. Nath stated that the City was concerned that this analysis assumed longitudinal flow along the canal between breakouts that may not be possible. Also, the potential uncertainty of inflows to the canal may not coincide with breakout locations.

Mr. Nath stated that the City didn't believe a detailed riverine analysis of the canal was feasible. Mr. Schuelke stated that this was A-N West's conclusion also.

Mr. Nath stated that the City would like to see an updated Approximate Zone A delineation for comparison to the effective Zone A delineation. Based on the City's experience the Zone A delineation should be based on the low top of high canal bank within approximately 200 feet of any point of interest along the canal. To reiterate for any point along the canal the delineation width would be based on the elevation within 200 feet longitudinally along the canal that would allow water to cross over both the top of east and west canal bank.

Mr. Nath indicated the City would then review this updated Approximate Zone A delineation to determine if an update through FEMA would be pursued.

Mr. Calza stated that A-N West should present the Profile 1 and 2 preliminary analysis and delineations along with the updated Approximate Zone A delineation in the Technical Data Notebook (TDN) supportive data as well as the floodplain mapping for digital translation to HIS format.

Mr. Calza asked if any hydrology refinements by Primattech would affect the conclusion that a detailed study was not possible. Mr. Schuelke said that A-N West did not believe any hydrology refinements would be significant, which Mr. Humphrey concurred and that therefore hydrology refinements would not result in a possible detailed floodplain analysis without canal breakouts.

Mr. Calza stated that A-N West needed to get the digital floodplain data to Aerial Mapping Co. by the end of May to allow time for their HIS translation such that completion of project by end of June could be accomplished.

2) Mr. Calza then brought up the issue of the Upper East Maricopa Floodway (UEMF) study which A-N West had also prepared and which had been on hold awaiting a decision of what type of floodplain delineation and zone to utilize based on the outcome of the Eastern Canal Study.

For this study reach, A-N West did not identify canal breakouts. However, the 100-year detailed WSEL was at the top of the east canal and bank at several cross-sections.

Mr. Nath was concerned that the hydrology analysis north of McKellips Road which was based on existing conditions concluded that runoff to this existing orchard area ponded and was stored with minimal flow bleeding off by culvert into the RWCD canal and no flow crossing McKellips Road south to the UEMF.

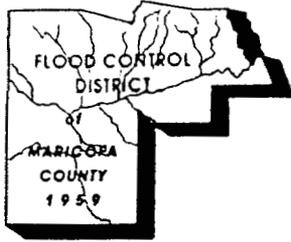
Mr. Nath said the City has no requirement of future development to maintain this existing storage upon development, only to provide retention for onsite runoff from the 50-year 24-hour storm. Thus, upon development this area could produce runoff south across McKellips with resultant increased discharges which could increase the WSEL's from A-N West's detailed hydraulic analysis.

Mr. Nath also questioned whether the lack of canal freeboard identified at several cross-sections by A-N West would be accepted by FEMA if a detailed analysis was pursued.

For these reasons Mr. Nath requested an updated Approximate Zone A delineation be prepared for this reach of the UEMF also, using the same procedure as discussed for the Eastern Canal. This would allow for a consistent delineation of both canal studies.

Mr. Calza stated that this delineation should also be performed and submitted to Aerial Mapping Company by the end of May to allow HIS translation and completion of this project by the end of June, 1997.

Meeting concluded.



FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
Betsey Bayless
Ed King
Tom Rawles
Don Stapley
Rose Garrido Wilcox



November 26, 1996

Larry Tysiac, P.E., Vice President
A-N West Engineering Consultants
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020

Subject: Contract FCD 96-10 Eastern Canal FDS

Dear Mr. Tysiac:

This will confirm our verbal notice to proceed of November 26, 1996 for the subject contract. Performance is 120 days, for expiration date of March 26, 1997. One fully executed copy of the contract is enclosed for your file.

Call the undersigned if you have any questions.

Sincerely,

Dortha Klaahsen
Contracts Coordinator

Letter of Transmittal

TO: Flood Control District of Mar. Co. DATE: 12/15/96
2801 West Durango Str. JOB TITLE: _____
Phoenix Az. 85009 JOB NO.: ANW # 7158-04
 RE: FCD 96-10 Eastern Canal
FIS

ATTN: Mr Raja Shah
 FROM: Greg Schuelke

WE ARE SENDING YOU ATTACHED VIA Delivery
 UNDER SEPARATE COVER

- THE FOLLOWING ITEMS:
- SPECIFICATIONS
 - ORIGINALS
 - COPY OF LETTER
 - SHOP DRAWINGS
 - PRINTS
 - REPORT
 - PLANS
 - SAMPLES
 - OTHER _____

QUAN.	I.D./DWG. NO.	TITLE/DESCRIPTION
1		Blueline (200 scale) markup of x-section locations (5 shts. trimmed and taped together in one continuous roll)

THESE ARE TRANSMITTED FOR REVIEW FOR YOUR USE AS REQUESTED
 OTHER _____

REMARKS: Raja, Attached is a mark up of proposed cross-section and hydraulic baseline locations for the referenced study with section I.D.'s in river miles. We have located the sections from downslope top of berm upslope a distance sufficient to obtain ground elevations at least one foot above adjacent canal bed elevs. Please review and return this on my copy markup for our further use in preparing coded cross-sections

REC'D. BY: _____ DATE: _____
 COPY TO: File 1,4.1 (2)
 WITH ENCLOSURES

12/31/96

Karl Larry Maldonado called G.S. back
He wasn't sure if ex. culvert sizes & Inverts
were surveyed abn of Eastern Canal
He would check with Karl Mortenson and get
back with us.

→ Larry Maldonado called G.S.
→ Didn't do ex. struct. survey.
Baker Engrs took out of scope
Re: Robert Davis.

G.S. called Robert Davies, Baker Engr 279-123.
Re: Eastern Canal FIS.

Why ~~were~~ ^{were} ex. structure survey not done?

How ~~it~~ ^{it} was were those structure

Robert to get back to G.S. on this question.
He thought storm drain inventory was deleted
~~that~~ Maybe Project Engr. misunderstood and
assumed storm drain as well as culverts along
canal were to be deleted.

12/31/96 (9:40 AM)

G.S. called Larry Maldonado Project Engr.
Ph. # 484-7691

Lt. Mess to call back

Re: Eastern Canal FIS.

12/31/96

Robert Davies called called back

Project Engr. will do these structure surveys.

Proj. Engr. busy

when do we need? G.S. couple wks.

How about pipes into or out of
canal ~~it~~? G.S. No.

1/7/97 4:30 PM
G.S. called Robert Parks 263-572

142 Cross-Sections

G.S. called Robert Parks 1/14/97

G.S. said we got hits 1/14/97 proposal

We have Micro sta. in our other office and
want to try for time and money savings to convert
the data thru ~~our~~ our other office's Micro station.

Robert to get CD-Rom of data ready tomorrow.

Robert said Baker had asked for street names
to be added.

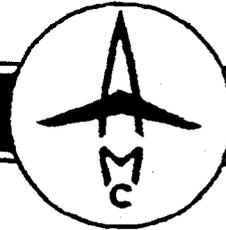
G.S. called

1/15/97 Raj FCD back

Asked if conversion of data
from Micro station to
Auto cad per Aerial Mapping Letter would
result in added costs.

G.S. sold ^{just} ~~at~~ ^{to} West & received
at Micro station date, 1/15/97 and
Richmond, a. office to convert. and didn't
think there would be added cost.

aerial mapping company, inc.



3141 west clarendon avenue, phoenix, arizona 85017, (602) 263-5728 fax (602) 263-0165

Richard D. Cook, R.L.S. - President

Gerald E. Francis - Director

Robert G. Parks - Vice President

To: Mr. Greg Schuelke
A-N West, Inc.
7600 North 15th Street, Suite 200
Phoenix, Arizona 85028

January 14, 1997

Re: Eastern Canal Data Conversion and Cross Sections

Mr. Schuelke:

We, at Aerial Mapping Company, Inc. are pleased to present the fee estimates for conversion services on the Eastern Canal mapping and cross sections.

We will convert the MicroStation DGN file data to AutoCAD Rel-12 DWG files for your use. The area to be covered with this conversion is from the west edge of the mapping, extending approximately 1/2 mile eastward. The existing mapping will be trimmed to this line, and the data converted. All topographic and DTM data will be included in the conversion. The digital terrain data will be breaklines within the DWG files, and mass points and spot elevations as ASCII files of Easting, Northing and Elevation. A new DTM model will need to be generated by your system. Conversion to the FCDMC HIS standards is not included in this scope.

Our fee for this conversion will be Two Thousand Seven Hundred Dollars (\$2,700.00), and we anticipate two weeks will be needed to accomplish this task. Delivery of the CAD data will be on CD-Rom or QIC-80 tape.

AMCI will extract cross section data from the MicroStation DTM model, locate the thalweg by coordinate comparison and provide HEC-2 GR card data for each cross section for a fee of \$55.00 per each cross section. The data is sampled at each edge of the DTM surface triangles that the cross section intersects. A digital file or ASCII file of the cross section endpoint pairs will be needed from your office to locate the cross sections within the DTM model.

Aerial Mapping Company thanks you for the opportunity to provide our quality services for your use on this project. If we may assist your efforts in any other way, please contact us at our offices.

Sincerely yours,

Robert G. Parks
Vice President
Aerial Mapping Company, Inc.
RGP/bp *docs/lanwbaker*
cc: Raj Shah, FCDMC

1.4.1 (7)

AERIAL MAPPING COMPANY, INC.
 3141 W. Clarendon Avenue
 PHOENIX, AZ 85017-4588

LETTER OF TRANSMITTAL

TEL (602) 263-5728
 FAX (602) 263-0165

DATE	1/15/97	JOB NO.	96020
ATTENTION	Grey Schutte		
RE:	Eastern Canal DBN DATA		

TO AN West

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

- Shop drawings Prints Plans Samples Specifications
 Copy of letter Change order _____

COPIES	DATE	NO.	DESCRIPTION
1	1/15/97		CD - EASTERN Canal pl.
			12-27-96 revision

THESE ARE TRANSMITTED as checked below:

- 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 _____
 FOR BIDS DUE _____ 19 _____ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

COPY TO _____

RECYCLED PAPER:
 Contents: 40% Pre-Consumer • 10% Post-Consumer

1.4.1 (8) SIGNED: [Signature]

If enclosures are not as noted, kindly notify us at once.

1/22/97

Ref. of FED MC called Greg S.

Got field survey data from Baker and
Project Engr. on Eastern Canal structure
survey of all culverts.

Survey notes only, no digital data disk
to leave at front desk for pickup.

Letter of Transmittal

TO: Flood Control District of Mar. Co DATE: 1/30/97
2901 West Durango Str.
Phoenix, Az 85009

JOB TITLE: _____
 JOB NO.: A-N West No. 7158-04
 RE: Eastern Canal FIS
FCD No. 96-10

ATTN: Mr Raju Shah
 FROM: Greg Schuelke

WE ARE SENDING YOU ATTACHED VIA Mail
 UNDER SEPARATE COVER

THE FOLLOWING ITEMS:

- SPECIFICATIONS
- ORIGINALS
- COPY OF LETTER
- SHOP DRAWINGS
- PRINTS
- REPORT
- PLANS
- SAMPLES
- OTHER _____

QUAN.	I.D./DWG. NO.	TITLE/DESCRIPTION
1	1/30/97	T.D.N. Sec. 4.2, Field Reconnaissance and Hydraulic Parameter Report

THESE ARE TRANSMITTED FOR REVIEW FOR YOUR USE AS REQUESTED
 OTHER _____

REMARKS: Raju, Attached is a draft Field Recon. report for your review and comments. The report will eventually become a part of the Technical Data Notebook (TDN).

REC'D. BY: 1.4.1 (10) DATE: _____

COPY TO: City of Mesa, Mr Peter Knudson WITH ENCLOSURES
File

A-N WEST, INC.

TRANSMITTAL

DATE: 31-Jan-97

CONSULTING ENGINEERS
4123 LAKESIDE DRIVE
RICHMOND, CA 94806-1942
(510) 222-9800 FAX: (510) 222-6714

PROJECT: Eastern Canal

JOB NO: 5555-01

TO: A-N West, Inc
Phoenix

RE:

ATT: Greg Schuelke

FROM: Tony Lea

WE ARE SENDING YOU ATTACHED UNDER SEPARATE COVER VIA _____

THE FOLLOWING: ELECTRONIC FILE SHOP DRAWINGS ORIGINALS
 PLANS REPRODUCIBLES CHANGE ORDER (S)
 SPECIFICATIONS PRINTS COPY OF LETTER

QUAN.	I.D./DWG. NO.	
		Unedited cross section plots, Autocad Ver. 12 (1=50 H, 1=5V)
		Hard copy of sample computer generated HEC-2 sections
		Electronic file of Computer generated HEC-2 sections
		HEC-RAS plots of computer generated HEC-2 sections
		Electronic files of Autocad cross section plots

THESE ARE TRANSMITTED: FOR REVIEW FOR YOUR USE AS REQUESTED
 OTHER:

REMARKS: Call me so we can review efforts to date.

COPIES TO: RJK

WITH ENCLOSURES
 WITHOUT ENCLOSURES

SIGNED Tony

1.4.1(11)



2929 N. 44th Street
Phoenix, Arizona 85018
(602) 952-2828
(602) 952-0808 FAX

FAX COVER SHEET

DATE: 2/25/97 NUMBER OF PAGES: 3
(Including Cover Sheet)

TO: GREG SCHUEEKE

FAX NO.: 943-1989

FROM: ALISON BOLT

REFERENCE: EASTERN CANAL FLOODPLAIN DELINEATION STUDY

COMMENTS: PRELIMINARY HEC-1 FLOW RATES
FOR YOUR USE IN HEC-2 MODELLING.
PLEASE CALL ME IF YOU HAVE ANY
QUESTIONS.

Summary of Peak Discharges
Along the Eastern Canal

MFC001										Date
Mesa Flood Plain Delineation Study										11/5/96
		100-year		100-year		10-year				
		24-hr		6-hr		6-hr				
STATION	Drainage area (mi ²)	PEAK FLOW cfs	Q/A (cfs/mi ²)	PEAK FLOW cfs	Q/A (cfs/mi ²)	PEAK FLOW cfs	Q/A (cfs/mi ²)	100 - yr Critical Duration	Critical Q ₁₀₀ cfs	
CP3	0.46	273	593.5	225	489.1	78	169.6	24-hr	273	
CP4	0.67	333	723.0	297	645.7	76	165.2	24-hr	333	
CP17	2.45	240	521.7	217	471.7	106	230.4	24-hr	240	
CP18	2.52	218	473.9	219	476.1	105	228.3	6-hr	219	
CP20	2.57	216	489.6	223	484.8	106	230.4	6-hr	223	
CP21	2.61	323	702.2	305	663.0	147	319.6	24-hr	323	
CP37	4.48	637	1384.8	540	1173.9	98	213.0	24-hr	637	
CP38	4.55	703	1529.3	616	1337.0	155	337.0	24-hr	703	
CP39	4.65	692	1504.3	609	1323.9	150	326.1	24-hr	692	
CP43	5.25	791	1719.6	691	1502.2	156	339.1	24-hr	791	
CP44	5.3	781	1697.8	689	1497.8	119	258.7	24-hr	781	
CP45	5.49	774	1682.6	667	1493.5	120	260.9	24-hr	774	
CP53	6.36	767	1667.4	702	1526.1	180	347.8	24-hr	767	
CP54	6.49	726	1578.3	667	1450.0	176	382.6	24-hr	726	
CP56	7.22	1004	2182.6	896	1947.6	463	1006.5	24-hr	1004	
CP57	7.29	1032	2243.5	948	2058.6	490	1065.2	24-hr	1032	
CP58	7.34	1032	2243.5	967	2102.2	499	1084.8	24-hr	1032	
CP68	8.16	1293	2810.9	1231	2676.1	539	1171.7	24-hr	1293	
CP69	8.23	1326	2882.6	1285	2750.0	554	1204.3	24-hr	1326	
CP70	8.28	1342	2917.4	1286	2785.7	582	1221.7	24-hr	1342	
CP77	9.09	1467	3232.6	1435	3119.6	616	1339.1	24-hr	1467	
CP78	9.25	1108	2406.7	1304	2834.8	115	250.0	6-hr	1304	
CP79	9.3	1097	2384.6	1302	2830.4	111	241.3	6-hr	1302	
CP85	10.11	1081	2350.0	1350	2934.8	107	232.6	6-hr	1350	
CP91	11.13	1206	2621.7	1532	3330.4	289	628.3	6-hr	1532	
CP92	11.25	869	1839.1	950	2065.2	33	71.7	6-hr	950	
CP97	12.15	897	1950.0	1009	2193.5	59	128.3	6-hr	1009	

Summary of Peak Discharges
Along the Eastern Canal

MFC001	Mesa Flood Plain Delineation Study			Date
STATION	Location	Drainage area (mi ²)	Q 100 cfs	11/5/96
CP3	N. Rose	0.46	273	
CP4	N. Almond Cir.	0.67	333	
CP17	E. McKellips Rd.	2.45	240	
CP18	E. Ivyglen Cir.	2.52	219	
CP20	N. Lindsay Rd.	2.57	223	
CP21	N. Lindsay Rd.	2.81	323	
CP37	E. Brown Rd.	4.48	637	
CP38	E. Fox St.	4.55	703	
CP39	E. Fairfield	4.65	692	
CP43	E. Adobe St.	5.25	791	
CP44	E. Dartmouth St.	5.3	781	
CP45	E. Covina Cir	5.49	774	
CP53	N. Val Vista Dr.	6.38	767	
CP54	Alpha St.	6.49	726	
CP56	E. Main St.	7.22	1004	
CP57	E. Alder Ave.	7.29	1032	
CP58	E. Balsam Ave.	7.34	1032	
CP68	E. Capri Ave.	8.16	1293	
CP69	E. Carol Cir.	8.23	1326	
CP70	E. Catalina Cir.	8.28	1342	
CP77	E. Pueblo Ave.	9.09	1487	
CP78	E. Emelita Ave.	9.25	1304	
CP79	E. Southern Ave.	9.3	1302	
CP85	E. Hampton Cir.	10.11	1350	
CP91	US 60 - Superstition Freeway	11.13	1532	
CP92	1400' N. Of E. Baseline Rd.	11.25	950	
CP97	E. Baseline Rd.	12.15	1009	

1.4.1 (14)

3/12/97

Raj. ^{FAD} called G.S

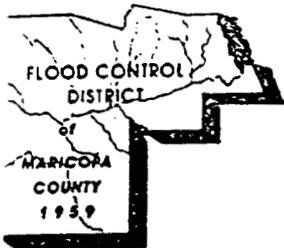
Re: status Eastern Canal FIS.

3/31/97 contract ends.

will need contract time extension

Baker had time extension to, ^{mid-} June

^{estimate}
→ Two month time extension



FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5859

BOARD OF DIRECTORS
Betsey Bayless
Jan Brewer
Fulton Brock
Don Stapley
Mary Rose Garrido Wilcox



March 26, 1997

A-N West, Inc.
7600 N. 15th Street, Suite 200
Phoenix, AZ 85020-4331

Subject: C/O #1 to Contract FCD 96-10
Eastern Canal FDS

Enclosed are two copies of the subject change order extending the expiration date to June 30, 1997. If you concur, please sign and return both copies.

Please call the undersigned if you have any questions.

Sincerely,

Dortha Klaahsen
Contracts Coordinator

1.4.1(16)

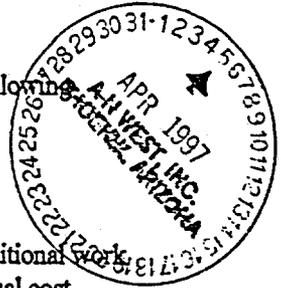
Contract Change Order No. 1

Date: 3/18/1997

FCD Contract No./Name: FCD 96-10 Eastern Canal FDS

To: A-N West, Inc. Consulting Engineers, Contractor/Consultant.

You are hereby directed to make the herein described changes from the plans and specifications or do the following described work not included in the plans and specifications on the above-mentioned project.



Changes requested by: Raj Shah, Project Manager

Provide description of work to be done, estimate of quantities, and prices to be paid. Segregate between additional work at contract price, agreed price, and actual cost. Unless otherwise stated, rates for rental of equipment on actual cost work cover only such time as equipment is actually used and no allowance will be made for idle times.

- * (1) Estimate of increases and/or decreases in contract items at contract prices.
- ** (2) Estimate of extra work at agreed price and/or actual cost.

Sheet No. 1 of 1

Description of Change Order

Extend this contract to June 30, 1997.

This contract is for the floodplain delineation of the Eastern Canal. The Contract was originally awarded to Baker Engineering, Inc. but, because of conflicts of interest between Baker Engineering and FEMA, Baker Engineering pulled out of this part of the project. The delay is caused due to the digital data transformation. The aerial mapping company delivered digital data to Baker Engineering in Microstation format, however, A-N West could not work with microstation. They needed the data in AutoCAD standard. A-N West sent digital data to their California office to translate it to AutoCAD format. The translation of data caused the delay.

We, the undersigned Contractor/Consultant, having given careful consideration to the change(s) proposed, hereby agree, if this proposal is approved, that we will provide all equipment, furnish all material (except as may otherwise be noted above), and perform all services necessary for the work above specified, and we will accept as full payment therefor the prices shown above.

By reason of this proposed change 96 days extension of time will be allowed. Total new contract amount through this Change Order remains the same.

Contractor/Consultant: A-N West Inc. Consulting Engineers, 7600 N. 15th Street, Suite 200, Phoenix, AZ. 85020-4331

By: *Gregory A. Schulle*
Title: Vice President
Date: 3/28/97

Recommended by: *EJ Ralich*
Date: 3/22/97

Approved by: *Stanley G. G... [Signature]*
Chief Engineer and General Manager
Date: 4-2-97

1.4.1 (17)

A-N WEST, INC.

Consulting Engineers

7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
Phone:(602)861-2200; FAX (602)943-1989

FAX COVER SHEET

DATE: 4/4/97

ATTENTION: Mr Raja Shah

ORGANIZATION: FCDMC

RE: Eastern Canal FIS FCD No. 96-10

JOB NO. ANW# 7158-04

FROM: Greg Schuelke

REMARKS: _____

Raja ; We request a reproducible
of the current FEMA FIS maps
for the Eastern Canal - Bosellne Rd to
Gilbert. The panel nos. are 2185,
2195 and 2215 of 4530. These
exhibits will ultimately be needed to
show possible ^{the} revised flood plain.

NUMBER OF PAGES (INCLUDING COVER SHEET) 1

FOR PROBLEMS REGARDING THIS FAX - CONTACT KAY, SHEILA OR SUZIE.

4/7/97

G.S. ^{called} Peter Knudson, City of Mesa 644-2514

Fax 644-3392

Re: @ Eastern Canal FES

Storm Drains along canal
Apache Blvd. north

4/9/97

Peter Knudson called back

He gave the FCD copies of ^{off of} their
storm drain master plans at start

of project. He asked if we could check
with Rajh at FCD. ~~to~~ If we still
needed ~~the~~ selected areas give him a
call back.

5/8/97 : Eastern Canal FIS,

Rajh Shah of FCD called G.S

He had talked with Peter Knudson, C.O.M

Meeting set for Tumm. Fri 5/7/97 @ 11:00 AM

5TH Floor

Main Str. at Center

20 E. Main Street

City of Mesa.

A-N WEST, INC.

Consulting Engineers

7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
Phone: (602) 861-2200; FAX (602) 943-1989

FAX COVER SHEET

DATE: 5/23/97

ATTENTION: Mr Robert Davies Fax 279-1411

ORGANIZATION: Baker Engineers

RE: Eastern Canal FIS FCD No 96-10

JOB NO. _____

FROM: Greg Schuelke

REMARKS: _____

Robert, The following additional data
is desired for preparing the Technical
Data Notebook and FIS Report.

- 1.) Affidavits of Publication
- 2.) Date of Contract Negotiations with
FCD for FIS report

NUMBER OF PAGES (INCLUDING COVER SHEET) 1

FOR PROBLEMS REGARDING THIS FAX - CONTACT KAY, SHEILA OR SUZIE.

1.4.1 (21)

A-N WEST INC.

Consulting Engineers

May 28, 1997

Mr. Rajh Shah
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Re: FCD No. 96-10
Eastern Canal FIS
A-N West No. 7158-04

Dear Mr. Shah:

We herewith transmit the following data for your review and comment:

- 1) One draft Flood Insurance Study Report (T.D.N. 8.0) with Flood Profiles
- 2) Floodplain Work Maps, Report Exhibit 3, (8 sheets)

The draft FIS report references the earlier May 1, 1997 letter report and May 9, 1997 meeting discussing the fact that a detailed riverine analysis along the canal was not possible and that an updated Approximate Zone A delineation was to be performed.

The floodplain mapping and AUTOCADD drawing file, shows the Profile 1 and 2 floodplains as well as the effective and updated Approximate Zone A floodplains.

We are proceeding to submit the floodplain mapping to Aerial Mapping Company for them to initiate HIS translation.

For purposes of HIS translation and documentation, we understand that the FCD wishes to have both the attempted detail analysis (Profiles 1 and 2) as well as the updated Approximate Zone A.

If the City of Mesa wishes to pursue updating the Approximate Zone A delineation, a floodplain mapping exhibit showing the effective and updated Approximate Zone A floodplain only would be anticipated. Please advise us if the City wishes to pursue revising the Approximate Zone A and if this exhibit is needed.

Should you have any questions, please call.

Sincerely,

A-N West, Inc.


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

GS/dh

cc: Mr. Peter Knudson, City of Mesa, w/enclosures

A-N WEST INC.

Consulting Engineers

May 28, 1997

Mr. Rajh Shah
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Re: FCD No. 94-26
UEMF FIS
A-N West No. 7158-03

Dear Mr. Shah:

We herewith transmit the following data for your review and comment:

- 1) Floodplain Work Maps, Report Exhibit 3, (2 sheets)

The floodplain mapping and AUTOCADD drawing file, shows the detailed floodplains as well as the updated Approximate Zone A floodplains. The updated Approximate Zone A was added per our meeting of May 9, 1997, in which concern for inadequate canal berm free board and other issues prompted the City to request the updated Approximate Zone A delineation for possible FEMA submittal.

We are proceeding to submit the floodplain mapping to Aerial Mapping Company for them to initiate HIS translation.

For purposes of HIS translation and documentation, we understand that the FCD wishes to have both the detail analysis as well as the updated Approximate Zone A.

If the City of Mesa wishes to pursue updating the Approximate Zone A delineation, a floodplain mapping exhibit showing the updated Approximate Zone A floodplain only would be anticipated. Please advise us if the City wishes to pursue revising the Approximate Zone A and if this exhibit is needed.

Should you have any questions, please call.

Sincerely,

A-N West, Inc.



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

GS/dh

cc: Mr. Peter Knudson, City of Mesa, w/enclosures

A-N WEST, INC.

Consulting Engineers

7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
Phone:(602)861-2200; FAX (602)943-1989

FAX COVER SHEET

DATE: 5/29/97

ATTENTION: Mr Robert Davies FAX 279-1411

ORGANIZATION: Baker Engineers

RE: Eastern Canal FIS FCD No. 96-10

JOB NO. _____

FROM: Greg Schueke

REMARKS: Robert, per our telex of today
attached are the ERM's used in our
draft FIS report and on our work
floodplain mapping.

We await your info on NAVD 88 conversion
to add to this Exhibit 2

NUMBER OF PAGES (INCLUDING COVER SHEET) 2
FOR PROBLEMS REGARDING THIS FAX - CONTACT KAY, SHEILA OR SUZIE.

1.4.1 (24)

A-N WEST, INC.

Consulting Engineers

7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
Phone: (602)861-2200; FAX (602)943-1989

FAX COVER SHEET

DATE: 5/29/97

ATTENTION: Mr Rajh Shah
ORGANIZATION: FCDMC

RE: Eastern Canal and UEMF FCD #96-10 and 94-26
JOB NO. _____

FROM: Greg Schmelke

REMARKS: Copy of Transmitted Letter to Aerial Mapping Co.

NUMBER OF PAGES (INCLUDING COVER SHEET) 2
FOR PROBLEMS REGARDING THIS FAX - CONTACT KAY, SHEILA OR SUZIE.

1.4.1 (25)

A-N WEST INC.

Consulting Engineers

May 28, 1997

Mr. Richard Cook
Aerial Mapping Co.
3141 West Clarendon Ave.
Phoenix, Arizona 85017

Re: FCD 96-10 and 94-26
Eastern Canal FIS
and UEMF FIS Revision
A-N West Nos. 7158-04 and 7158-03

Dear Mr. Cook:

We herewith transmit the following:

- 1) Eastern Canal FIS - Bluelines and AUTOCADD Digital Drawing Files of the Draft Floodplain Mapping (8 sheets), showing the effective and updated Approximate A floodplain delineations and the Profile 1 and 2 preliminary analysis floodplains as well as cross-section locations; I.D. Nos. and letters and hydraulic base line.
- 2) UEMF FIS - Bluelines and AUTOCADD Digital Drawing Files of UEMF FIS Floodplain. This exhibit has had the legend revised and Approximate Zone A floodplain added and Zone AE changed to Zone A per recent city request. We have highlighted the changes in yellow to aid in your translation of these revisions as we understand you have translated the rest of this data.

Please begin the FIS translation of this data as soon as possible. Our current schedule involves finishing these projects by June 30, 1997. Should you have any questions, please contact us.

Sincerely,

A-N West, Inc.



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

GS/dh

cc: Mr. Rajh Shah, FCDMC

Baker

1313 East Osborn Road, Suite 150, Phoenix, Arizona 85014

FAX

Date: MAY 29, 1997
 Number of pages including cover sheet: 12

To: GREG SCHUELKE

 Phone: _____
 Fax phone: ~~703~~ 943-1989

From: BOB DAVIES

 Phone: 602/279-1234
 Fax phone: 602/279-1411

REMARKS: Urgent For your review Reply ASAP Please comment

AS WE DISCUSSED.

BOB.

cc: WBM/GJK/JCH/CIH/CF

1.4.1 (27)

Post-It® Fax Note	7671	Date	5-28-97	# of pages	4
To	Bob Davier	From			
Co./Dept.		Co.	PEG		
Phone #		Phone #			
Fax #		Fax #			

DU2317 *****

DU2317 DESIGNATION - A 518 ✓

DU2317 PID - DU2317

DU2317 STATE/COUNTY- AZ/MARICOPA

DU2317 USGS QUAD - MESA (1983)

DU2317

DU2317 HORZ DATUM - NAD 83

DU2317 VERT DATUM - NAVD 88

DU2317

DU2317 POSITION - 33 24 56. (N) 111 45 38. (W) SCALED

DU2317 83 minus 27 - +00. +02. NAVCON

DU2317

DU2317 HEIGHT - 388.720 (meters) 1275.32 (feet) ADJUSTED

DU2317 BU minus 29 - +0.534 (+/- 2 cm) VERTCON

DU2317 DY minus 80 - -0.460 COMPUTED

DU2317 (NOTE - For assistance in applying shifts see file readmg.dat.)

DU2317 *****

DU2317

DU2317 GEOID HEIGHT- -29.56 GEOID93

DU2317 MODELED GRAV- 979,442.8 NAVD88

DU2317

DU2317 VERT ORDER - FIRST CLASS 2

DU2317

DU2317

DU2317 The horizontal coordinates were scaled from a topographic map and have

DU2317 an estimated accuracy of +/- 6 seconds.

DU2317

DU2317 The orthometric height was determined by differential leveling

DU2317 and adjusted by the National Geodetic Survey in November 1993.

DU2317

DU2317 The dynamic height is computed by dividing the NAVD 88

DU2317 geopotential number by the normal gravity value computed on the

DU2317 Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

DU2317 degrees latitude (G = 980.6199 gals.).

DU2317

DU2317 The geoid height was determined by GEOID93.

DU2317

DU2317 The modeled gravity was interpolated from observed gravity values.

DU2317

DU2317:

	North	East	Estimated Accuracy
DU2317; SPC AZ C	267,850.	228,010.	(+/- 180 meters Scaled)

DU2317

DU2317 STATION MARK IS A METAL ROD

DU2317 WITH SETTING- STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)

DU2317 THE MARK IS STAMPED: A 518 1992

DU2317 STABILITY: A - MOST RELIABLE AND EXPECTED TO HOLD

DU2317+STABILITY: POSITION/ELEVATION WELL

DU2317_SATELLITE: THE SITE LOCATION HAS REPORTED AS SUITABLE FOR

DU2317+SATELLITE: SATELLITE OBSERVATIONS - 1992

DU2317_ROD/PIPE-DEPTH: 5.5 meters

DU2317

DU2317 HISTORY - Year Condition Recov. BY

DU2317 HISTORY - 1992 STATION MONUMENTED NATIONAL GEODETIC SURVEY

DU2317

1.41 (28)

FEB-16-98 13:06 FROM: USGS RMHC PLANNING UNIT ID:

PAGE 4

DU2317

STATION DESCRIPTION

DU2317

DU2317 DESCRIBED BY NATIONAL GEODETIC SURVEY 1992

DU2317 7.5 KM (4.65 MI) EASTERLY ALONG U.S. HIGHWAY 60 (MAIN STREET) FROM
DU2317 THE JUNCTION OF STATE HIGHWAY 87 (COUNTRY CLUB DRIVE) IN MESA. 10.0 M
DU2317 (32.8 FT) NORTH OF AND LEVEL WITH THE CENTER OF THE WESTBOUND LANES
DU2317 OF THE HIGHWAY, 9.2 M (30.2 FT) WEST OF THE CENTER OF CYPRESS ESTATES
DU2317 MOBILE HOME PARK ENTRANCE ROAD, 1.2 M (3.9 FT) NORTH OF THE SOUTH END
DU2317 OF A BRICK WALL, 0.5 M (1.6 FT) WEST OF THE WALL, AND 0.3 M (1.0 FT)
DU2317 SOUTH OF A WITNESS POST. NOTE--ACCESS TO THE DATUM POINT IS THROUGH
DU2317 A 5-INCH LOGO CAP.

1.4.1 (29)

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DU2319 *****
DU2319 DESIGNATION - C 518 ✓
DU2319 PID - DU2319
DU2319 STATE/COUNTY - AZ/MARICOPA
DU2319 USGS QUAD - MESA (1783)
DU2319
DU2319 HORIZ DATUM - NAD 83
DU2319 VERT DATUM - NAVD 88
DU2319
DU2319 POSITION - 33 24 56. (N) 111 47 02. (W) SCALED
DU2319 88 minus 27 - +00. +03. NADCON
DU2319
DU2319 HEIGHT - 382.634 (meters) 1255.36 (feet) ADJUSTED
DU2319 88 minus 29 - +0.542 (+/- 2 cm) VERTCON
DU2319 DY minus 88 - -0.453 COMPUTED
DU2319 (NOTE - For assistance in applying shifts see file readme.dat)
DU2319 *****
DU2319
DU2319 GEOID HEIGHT - -29.59 GEOID93
DU2319 MODELED GRAV - 979.443.5 NAVD88
DU2319
DU2319 VERT ORDER - FIRST CLASS 2
DU2319
DU2319 The horizontal coordinates were scaled from a topographic map and have
DU2319 an estimated accuracy of +/- 6 seconds.
DU2319
DU2319 The orthometric height was determined by differential leveling
DU2319 and adjusted by the National Geodetic Survey in November 1993.
DU2319
DU2319 The dynamic height is computed by dividing the NAVD 88
DU2319 geopotential number by the normal gravity value computed on the
DU2319 Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
DU2319 degrees latitude (g = 980.6199 ms-2).
DU2319
DU2319 The geoid height was determined by GEOID93.
DU2319
DU2319 The modeled gravity was interpolated from observed gravity values.
DU2319
DU2319: North East Estimated Accuracy
DU2319: SPC AZ C - 267,040. 225,710. (+/- 100 meters Scaled)
DU2319
DU2319 STATION MARK IS A VERTICAL CONTROL DISK
DU2319 WITH SETTING: SFT IN THE ABUTMENT OR PIER OF A LARGE BRIDGE
DU2319 THE MARK IS STAMPED: C 518 1992
DU2319 STABILITY: II = PROBABLY HOLD POSITION/ELEVATION WELL
DU2319 SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DU2319 SATELLITE: SATELLITE OBSERVATIONS 1992
DU2319
DU2319 HISTORY - Year Condition Recov. By
DU2319 HISTORY - 1992 STATION MONUMENTED NATIONAL GEODETIC SURVEY
DU2319
  
```

1.4.1 (30)

FEB-16-98 13:08 FROM: USGS RMHC PLANNING UNIT ID:

PAGE 8

DU2319
DU2319

STATION DESCRIPTION

DU2319'DESCRIBED BY NATIONAL GEODETIC SURVEY 1992
DU2319'5.2 KM (3.25 MI) EASTERLY ALONG U.S. HIGHWAY 60 (MAIN STREET) FROM
DU2319'THE JUNCTION OF STATE HIGHWAY 87 (COUNTRY CLUB DRIVE) IN MESA. IN TOP
DU2319'OF AND 0.2 M (0.7 FT) SOUTHEAST OF THE NORTHWEST END OF THE NORTHEAST
DU2319'CONCRETE ABUTMENT OF THE HIGHWAY BRIDGE SPANNING THE CONSOLIDATED
DU2319'CANAL, 2.1 M (6.9 FT) NORTH OF THE NORTH CURB OF THE HIGHWAY, 0.4 M
DU2319'(1.3 FT) NORTH OF THE BRIDGE RAILING, AND 0.3 M (1.0 FT) ABOVE THE
DU2319'LEVEL OF THE HIGHWAY.

1.4.1 (31)

A-N WEST INC.

Consulting Engineers

June 2, 1997

Mr. Rajh Shah
FCDMC
2801 West Durango Street
Phoenix, Arizona 85028

Re: Eastern Canal FIS
FCD 96-10
A-N West No. 7158-04

Dear Mr. Shah:

We herewith transmit one copy of the draft final Technical Data Notebook (TDN) for the referenced project as well as a copy of survey notes for the project provided by you earlier.

Referring to our Scope of Work, Deliverable, Section 5.1:

Section 5.1.1 - The TDN does not include affidavits of publication. Per telephone conversation with Mr. Bob Davies of Baker Engineering on May 29, 1997, there has not been a public notice to date and public notice is not anticipated per city direction.

Section 5.1.2 - A-N West transmitted one blueline copy of the floodplain mapping on May 28, 1997 to FCD and the City.

Section 5.1.4 - FEMA Forms. Please advise us if this project is proposed to be submitted to FEMA. If so, can you provide the current FEMA forms for A-N West to fill out?

Section 5.1.5 - Survey notes. We are returning the copy of survey notes received from you earlier. Per the scope, these notes are indicated as provided under separate cover. We have included in the TDN supplemental field survey notes by Project Engineering of the canal bridges and subsequent survey notes by A-N West of the adjacent drainage structures.

Section 5.1.6 - Current FIRM panels with proposed delineation. At present, our floodplain mapping includes the effective approximate zone 'A' delineation obtained from the FCD. Please advise us if the updated zone 'A' delineation needs to be shown on the 1,000 scale effective mapping. If so, we will need a reproducible copy of this exhibit.

We have provided a divider for Section 4.2 for insertion of the Field Reconnaissance and (N) Value Estimation Report submitted earlier. The TDN notes cross-section plots as, under separate cover, which were also submitted earlier.

104.1(32)

Mr. Rajh Shah
Eastern Canal FIS

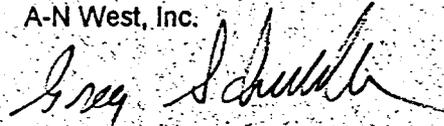
June 2, 1997
Page 2

Other than the questions raised regarding Section 5.1.4 and Section 5.1.6, we believe we have addressed the scopes Section 5.1 submittal requirements and we await your review, comment and approval before proceeding to provide the additional final submittal data, under Section 5.2 of the Scope's Deliverables section.

Should you have any questions, please call.

Sincerely,

A-N West, Inc.



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

cc: Mr. Peter Knudson, City of Mesa - w/TDN only

1041 (33)
A-N WEST INC.

A-N WEST INC.

Consulting Engineers

January 7, 1998

Mr. Robert Davies, P.E.
Michael Baker, Jr., Inc.
1313 East Osborn Road, Suite 150
Phoenix, Arizona 85014

Re: Eastern Canal FIS
FCD No. 96-10
A-N West No. 7158-04

Dear Mr. Davies:

Pursuant to our conference telephone call of 12/17/97 with Mr. Pedro Calza, FCDMC, we herewith transmit the following:

1. Three (3) copies of the T.D.N. Cover Sheet, Revised 12/31/97.
2. Three (3) copies of the T.D.N. Abstract/Table of Contents.
3. Three (3) copies of the T.D.N. No. 8, Draft FIS Report.
4. Three (3) copies of the T.D.N. No. 2.5, Draft Floodplain Mapping (8 sheets).
5. Three (3) copies of the T.D.N. No. 9.0, FEMA Request Forms (2 pages).

Per our conference call, we understand Mr. Calza requested revisions to the Technical Data Notebook (T.D.N.) and Draft FIS Report, and mapping to remove the references to the Profiles 1 and 2 hydraulic analysis. This request was because these profiles were not 100-year flood event profiles but preliminary analysis, which resulted in confusion with the proposed updated approximate 100-year floodplain.

As a result, the following revisions were made:

- a. The T.D.N. Abstract discussion of Hydrology and Hydraulics was revised to refer to this as preliminary analysis.
- b. The T.D.N. Table of Contents was revised to remove as Not Applicable, N/A reference to final computer runs and diskettes, T.D.N. 4.7 and 4.8.
- c. The T.D.N. 9.0, FEMA Request Forms, were referenced in Section 9.0.

d. The Draft FIS Report was revised to:

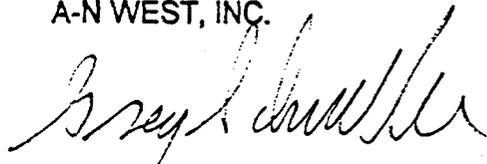
1. Remove the Summary of Discharge Table.
2. Remove the Summary of Roughness Coefficients Table
3. Remove the Flood Profiles, Exhibit 1.
4. Revise the text to reference only that preliminary hydrology/hydraulics were performed per special problems report (letter report on May 1, 1997) which determined that a detailed riverine study was not possible and that an updated approximate Zone A would be pursued.
5. The only applicable FEMA Request Form deemed appropriate for the proposed updated approximate Zone A was Form 1. Since detailed hydrology and hydraulics in support of a detailed 100-year floodplain were not possible, these forms were not included.

The enclosed material sections are proposed to replace respective sections in the T.D.N.'s that you already have to make this update. The HEC-2 input/output and diskette material, Sections 4.7 and 4.8, should also be removed.

If you have questions or need further information, please call.

Sincerely,

A-N WEST, INC.



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

GS/km

cc: Mr. Pedro Calza, FCDMC (without enclosures)

**SCOPE OF WORK
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOODPLAIN DELINEATION FOR EASTERN CANAL**

GENERAL

The project consists of approximately 5.5 river miles of floodplain delineation for the Eastern Canal from Baseline Road to Hermosa Vista Drive, as shown on Exhibit A. The necessary topographic data and watershed hydrology will be provided by the Flood Control District (FCD). The consultant will develop the floodplain and floodway delineations using primarily the HEC-1 computer model and the HEC-2 computer model if appropriate. The consultant must use sound engineering judgement in the development of the hydraulic models. The results of the models must be analyzed carefully and refinements made to the input parameters in order to obtain the most realistic results. All work must meet Arizona Department of Water Resources (ADWR) and Federal Emergency Management Agency (FEMA) requirements for floodplain delineations. The results of this study must be reviewed and accepted by FEMA and the City of Mesa prior to the finalization of this contract. All work under this Scope will be completed within 120 calendar days from the date of Notice to Proceed, including 14 days for District reviews.

TASK 1 - COORDINATION

- 1.1 The consultant will submit a project schedule showing coordination meetings and completion dates for each of the tasks in the scope within 7 days of Notice To Proceed. The consultant shall update this project schedule when appropriate.
- 1.2 The consultant shall participate in regular coordination meetings (at least every 2 weeks) with the District's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The consultant is responsible for the minutes of any meetings. Whenever possible, coordination and milestone meetings should be combined.
- 1.3 The consultant shall submit monthly progress reports at least 5 days before submittal of monthly invoices. The report shall be brief and should be no longer than two typed pages. At a minimum, the monthly report shall contain the following:
 - a. A description of the work accomplished by task during the reporting month.
 - b. Percent (%) completed for the month and percent (%) cumulative completed for each task.
 - c. A brief description of the work to be accomplished the following month.
 - d. A description of any problems encountered.
- 1.4 The consultant shall meet with officials from the City of Mesa. The purpose of this meeting is to identify local flooding problems and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and corporate limits.
- 1.5 The District will plan and conduct one public meeting in conjunction with this study. The meeting will be to inform the public and obtain public comment on the study results, and shall take place prior to the submittal of the final report to FEMA. The consultant will be responsible for the preparation of the graphic displays for these meetings. One representative from the consultant will attend the meeting. The consultant will respond to the public's comments and make revisions to the study if necessary.
- 1.6 Consultant/District Performance Evaluations will be performed. A formal evaluation will be performed at the completion of the project upon receipt of all deliverables.

TASK 2 - DATA COLLECTION

- 2.1 The consultant will collect and review pertinent data from the District and other outside sources. Data to be collected will include previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.
- 2.2 A written report summarizing the data collected will be submitted to the District for information purposes. A preliminary draft of this report is due within 30 days of Notice to Proceed.

TASK 3 - FLOODPLAIN DELINEATION

- 3.1 Floodplain delineations must be obtained using the U.S. Army Corps of Engineers HEC-2 Water Surface Profiles computer model, version 4.6.2, May 1991, and methodology acceptable to FEMA. This model will simulate the effects of floodplain geomorphology, flow changes, bridges, culverts, hydraulic roughness factors, effective flow limitations, split-flows, and other considerations. The consultant will prepare the study using the guidelines established in FEMA Document 37, Flood Insurance Study Guidelines and Specification for Study Contractors, March 1991, and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, January 1990.
- 3.2 The delineation work shall meet requirements for floodplain and floodway delineations as prescribed by FEMA and the Arizona Department of Water Resources.
- 3.3 The delineation study shall be based on the final results of the hydrologic study as directed by the District.
- 3.4 The consultant is to make refinements to the HEC-2 model based on review of the model results by the District, ADWR, FEMA, and the Technical Evaluation Contractor. The consultant shall review the HEC-2 model results for reasonableness. Adjustments to the input parameters for obtaining the most realistic results is normal to the scope.
- 3.5 Floodways are to be determined using equal conveyance encroachment method 4 to start with, but only encroachment method 1 will be used in the final analysis. The floodway encroachment is to be as near the one foot maximum rise in elevation as possible.
- 3.6 The consultant must obtain District approval at each of the following steps:
 - a. Field reconnaissance report and estimation of Manning's "n" values.
 - b. Proposed location and alignment of the cross sections and channel centerline.
 - c. Floodplain (natural) delineation.
 - d. Floodway delineation using equal conveyance encroachment.
 - e. Floodway delineation using encroachment method 1.
 - f. Final Hydraulics Report.
- 3.7 Field Reconnaissance
 - 3.7.1 The consultant will conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank stations; observation of possible overflow areas; inspection of levees or other flood control structures; and measurement of bridge dimensions.

3.7.2 Mannings "n" values are to be determined using the methodology in the USGS report, Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, April 1991. Copies of the report are available through the District.

3.7.3 A draft report on the field reconnaissance will be submitted to the District for review and approval prior to beginning the HEC-2 modeling. The report will present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The report will also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values will be displayed on reduced scale mapping and included in the Final Report.

3.8 Cross Sections

3.8.1 The location and alignment of cross sections and channel centerline will be submitted for the District's review and approval prior to digitizing the cross section data. Cross section stationing will be from left to right looking downstream with the thalweg as station 10,000. Cross sections will be spaced approximately every 200 feet, unless geographic or structural constraints dictate otherwise, and will extend the full width of the area inundated by 100-year flood waters. Identification of cross sections will be in river miles, increasing upstream. The stationing will tie into the specified river mile of the existing FEMA studies. Cross section orientation may need to be altered after running of HEC-2 model to ensure that sections are perpendicular to flow per FEMA criteria.

3.8.2 All cross sections will be plotted using a pen, laser, or electrostatic plotter. The cross section plots will show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information. All plots are to be accompanied by a legend. These plots are to be available at all reviews.

3.8.3 Cross section plots are limited to one plot at the following three stages of work: (a.) a plot of digitized "GR", STCHL, STCHR, centerline (station 10,000) to be used as a check of input data and for working sections during compilation of the floodplain model; (b.) a plot of the cross section for the completed floodplain run which shows the floodplain water surface elevation, ineffective flow areas, "n" factor, and encroachments to be used as working sections for development of the floodway model; (c.) a plot of the final floodway model cross sections which will show Type 1 encroachments and encroached water surface, in addition to data covered in items (a.) and (b.). These cross sections, generated under (c.), will be submitted as part of the Final Report.

3.9 Bridges and culverts must be modeled in compliance with HEC-2 modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-2 modeling results for bridges, culverts, and other hydraulic structures must be checked by using an independent method approved by the District to analyze these structures.

3.10 For floodplains identified as ponding areas, it is preferable to analyze the area by using the HEC-2 model, which will provide the District with water surface elevations. If appropriate, the consultant shall identify in the ponded floodplains a floodway. The purpose of this floodway is to allow the pond to seek a constant stage throughout the areal extent of the ponds, versus the creation of two independent ponds.

- 3.11 Flood zones must be determined according to FEMA criteria and clearly labelled on the final drawings.
- 3.12 The total area of the floodplain and floodway must be determined for each reach in square miles and acres.
- 3.13 The findings of the floodplain/floodway delineation study will be presented in Section 4 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The report will be organized as specified by the District standards, following SSA 1-90 format.

TASK 4 - HIS DATA

Digital data will be prepared in conformance with the District's HIS Data Delivery Specifications, Revision 1.1, for the following themes:

- a. Floodplain FCD Zone
- b. Floodplain FCD Water Surface Elevation

TASK 5 - DELIVERABLES

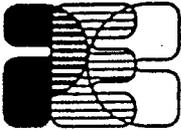
The consultant will incorporate the hydrologic data provided by FCD to complete the Technical Data Notebook. Following deliverables will be submitted by the consultant:

- 5.1 FEMA Submittal: The consultant will submit the following items to the District for review by FEMA and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:
 - 5.1.1 Original Affidavits of Publication
 - 5.1.2 Two (2) complete sets of blue-line topographic base maps with the floodplain/floodway delineations shown. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.
 - 5.1.3 Two (2) complete copies of the Technical Data Notebook, including HEC-1 (will be provided by the FCD) and HEC-2 input/output files on diskettes. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The notebook will be organized as specified by the District, following SSA 1-90 format.
 - 5.1.4 Two (2) sets of completed FEMA forms will be submitted in a notebook separate from the Final Report. (Supplied by Baker Engineering for Hydrology)
 - 5.1.5 Three (3) sets of complete survey notes will be submitted in a notebook separate from the Final Report. (Supplied by Baker Engineering)
 - 5.1.6 Two (2) copies of the current FIRM panels showing the proposed delineation.
- 5.2 Final Submittal: The following products are considered deliverables for the final submittal to the District after FEMA approval is issued:
 - 5.2.1 One (1) complete set of non-erasable topographic mylars of the work study drawings. Sheets shall be 24" X 36" in size and numbered to correspond to the delineation maps.

- 5.2.2 One (1) complete sets of mylars and four (4) complete sets of sealed blueline topographic base maps with the floodplain/floodway delineations shown. All drawings will be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.
- 5.2.3 Floodplain/floodway boundaries in conformance with the District's HIS Specifications.
- 5.2.4 Four (4) complete copies of the Technical Data Notebook including HEC-1 (Supplied by FCD) and HEC-2 input/output files on diskettes. The Technical Data Notebook will be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The notebook will be organized as specified by the District, following SSA 1-90 format. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, modifications to the delineation maps, the HEC-2 model, and/or the Final Report.

FOR: GREG SCHUELKE, P.E.

TRANSMITTAL



PROJECT ENGINEERING
CONSULTANTS, LTD.
ENGINEERS □ PLANNERS □ SURVEYORS

TO: Baker Eng	DATE: 1-16-97
1313 E Osburn # 150	JOB NO. Mesa ADMS
	RE: Culverts on Eastern Canal
ATTN: Bob Davies	

THE FOLLOWING ITEMS ARE TRANSMITTED:

Herewith Under Separate Cover

2 Copies of Field notes
of Culvert measurements + Inverts
along the Eastern Canal

THE ABOVE ITEMS ARE SUBMITTED:

- | | | |
|---|--|--|
| <input type="checkbox"/> Per Your Request | <input checked="" type="checkbox"/> For Approval | <input type="checkbox"/> Resubmit For Approval |
| <input type="checkbox"/> For Review | <input checked="" type="checkbox"/> For Your Use | <input type="checkbox"/> For Bid |
| <input type="checkbox"/> For Recording | <input type="checkbox"/> For Your Signature | <input type="checkbox"/> For Your Records |

REMARKS:

Please give me a call if you need anything else.

COPY TO: _____

Signed Karl Mortensen

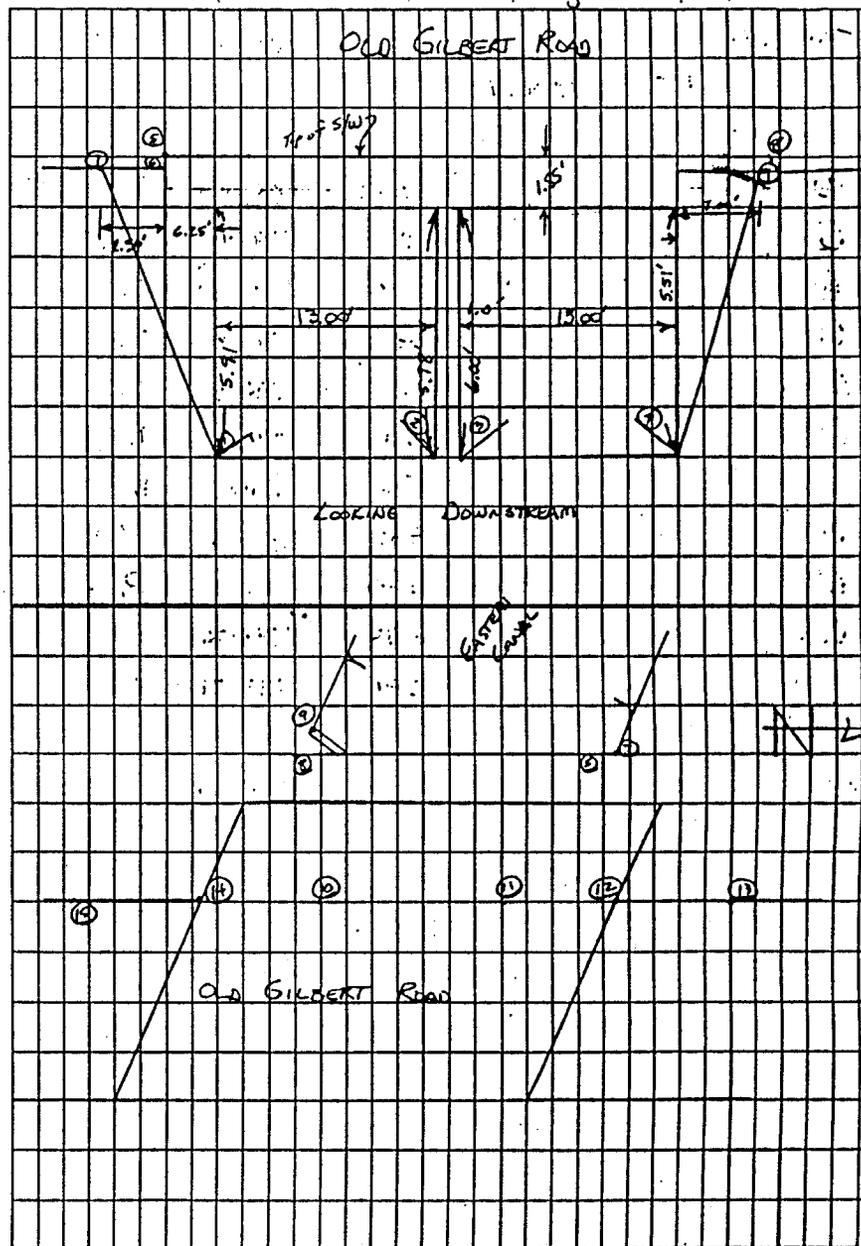
2.3 (1)

STA	BS+	H.I.	FS-	Elev	Pt #
TBM #100				1295.401	B.C.
	4.68	1300.08			
①			12.45	1287.63	Invert @ Toe
②			12.67	1287.41	Invert
③			12.65	1287.43	Invert
④			12.12	1287.96	Invert @ Toe
⑤			4.78	1295.30	T/W
⑥			5.50	1294.58	PE
⑦			5.50	1294.58	Top of Bank
⑧			4.63	1295.45	T/W
⑨			5.50	1294.58	Top of Bank @ Wingwall
⑩			5.26	1294.82	M
⑪			5.34	1294.74	M
⑫			5.29	1294.79	M @ E.C.
⑬			5.56	1294.92	M @ E.P.
⑭			5.26	1294.82	M @ E.C.
⑮			6.11	1293.97	E.P.
TBM 00			4.68	1295.40	✓

2.3
1.2

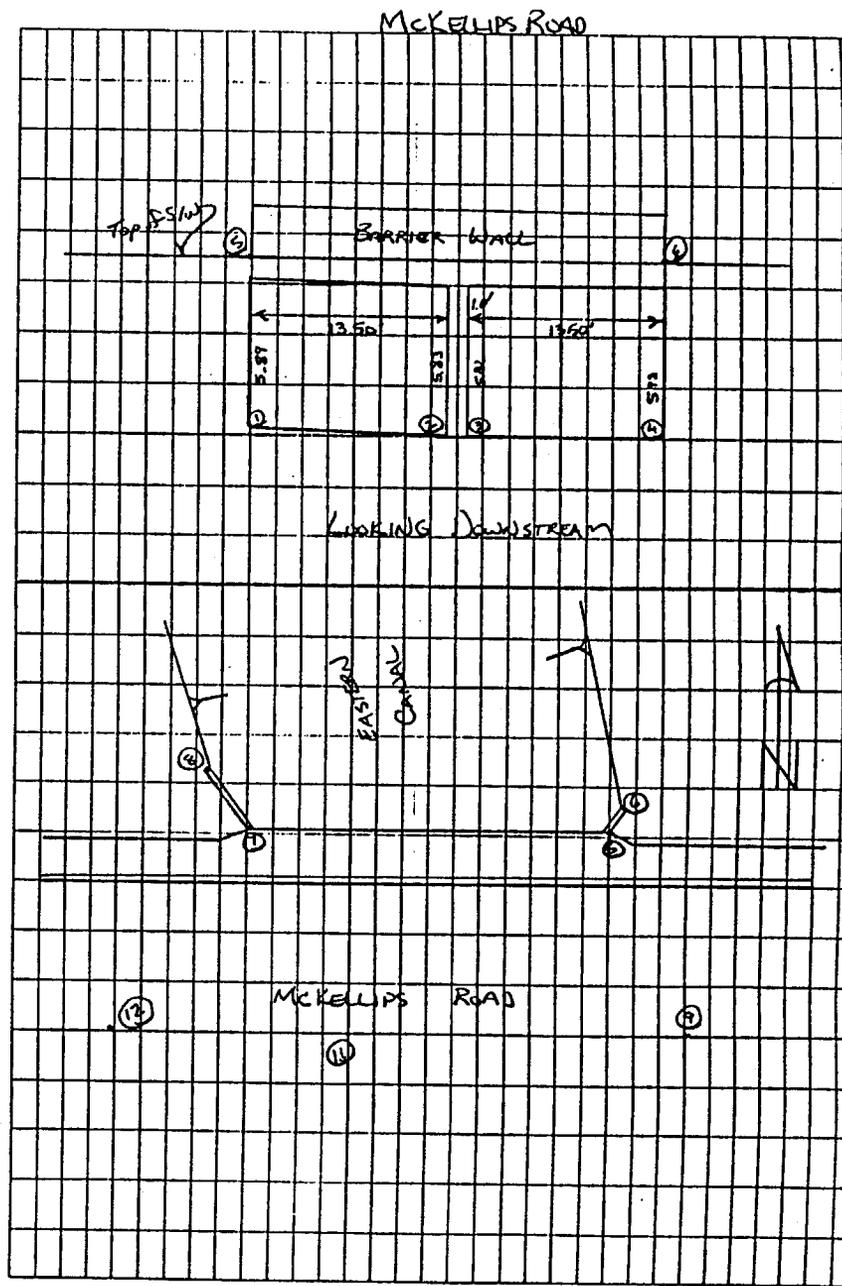
1-8-97
Clear, Calm, Cold 45°F

M Gardiner
 T Mortenson
 B Berghian



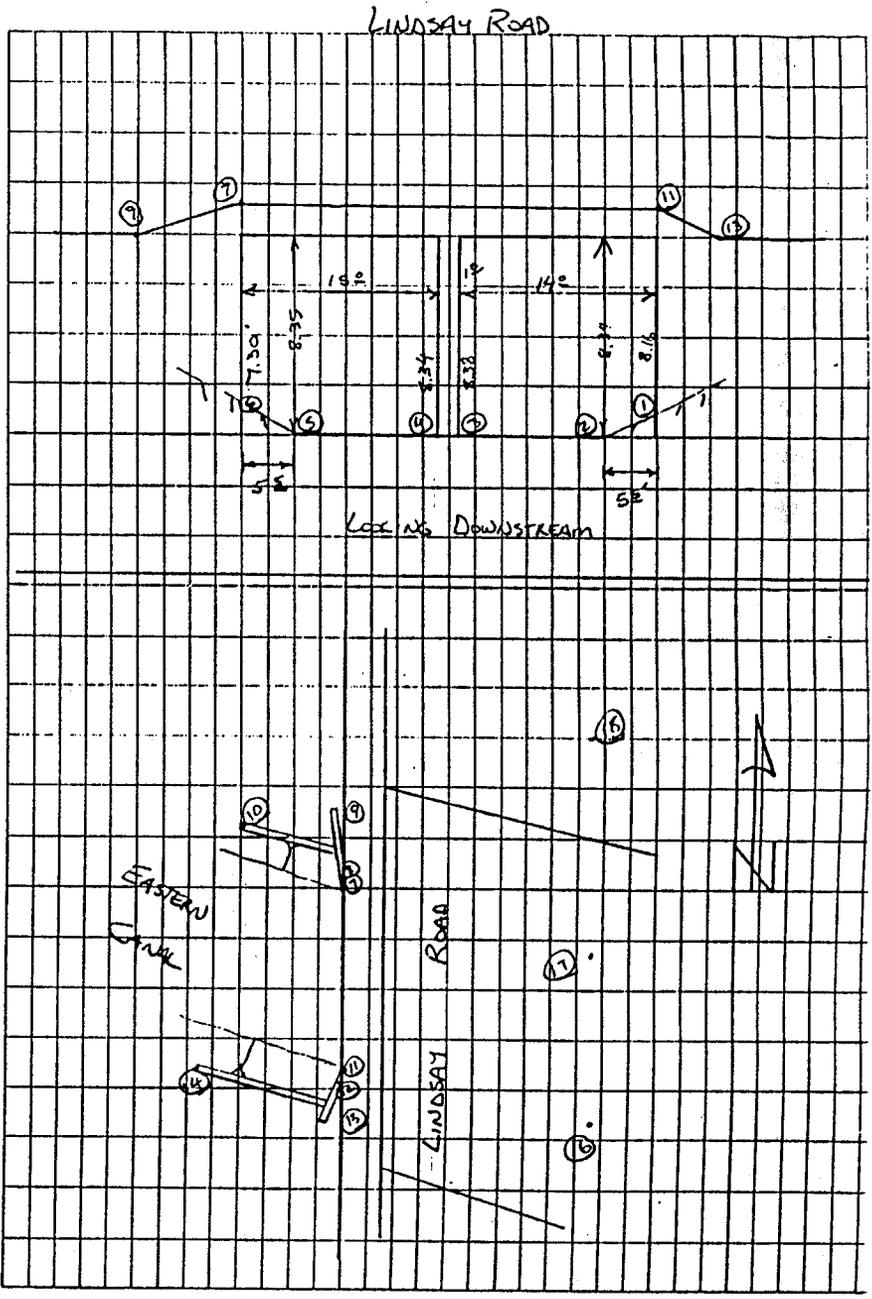
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM 102				1293.867	SRP B.C.
	5.30	1299.17			
①			12.44	1286.73	Invert @ Wingwall
②			12.72	1286.45	Invert
③			12.73	1286.44	Invert
④			12.88	1286.29	Invert @ Wingwall
⑤			4.85	1294.32	T/W @ Wall
⑥			4.82	1294.35	Top of Wingwall
⑦			5.15	1294.02	T/W @ Wall
⑧			5.16	1294.01	Top of Wingwall
⑨			5.40	1293.77	Pvmt
⑩			5.49	1293.68	Pvmt
⑪			5.43	1293.74	Pvmt
⑫			5.46	1293.71	Pvmt
TBM 102			5.30	1293.87	✓

2.3 (3)



STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #134				1293.377	SRP B.C.
	4.14	1297.52			
①			12.19	1285.33	In @ Wingwall
②			12.44	1285.08	In @ Toe
③			12.33	1285.11	Invert
④			12.46	1285.06	Invert
⑤			12.43	1285.09	In @ Toe
⑥			11.42	1286.10	In @ Wingwall
⑦			3.80	1293.72	Top of S/W
⑧			4.15	1293.37	Top of Wingwall
⑨			4.33	1293.19	Top of S/W
⑩			4.01	1293.52	Top of Wingwall
⑪			3.38	1294.14	Top of S/W
⑫			4.17	1293.35	Top of Wingwall
⑬			4.15	1293.37	Top of S/W
⑭			5.22	1292.30	Top of Wingwall
⑮			3.95	1293.57	Punt
⑯			3.92	1293.60	Punt
⑰			4.00	1293.52	Punt
⑱			3.99	1293.53	Punt
TBM #134			4.14	1293.38	✓

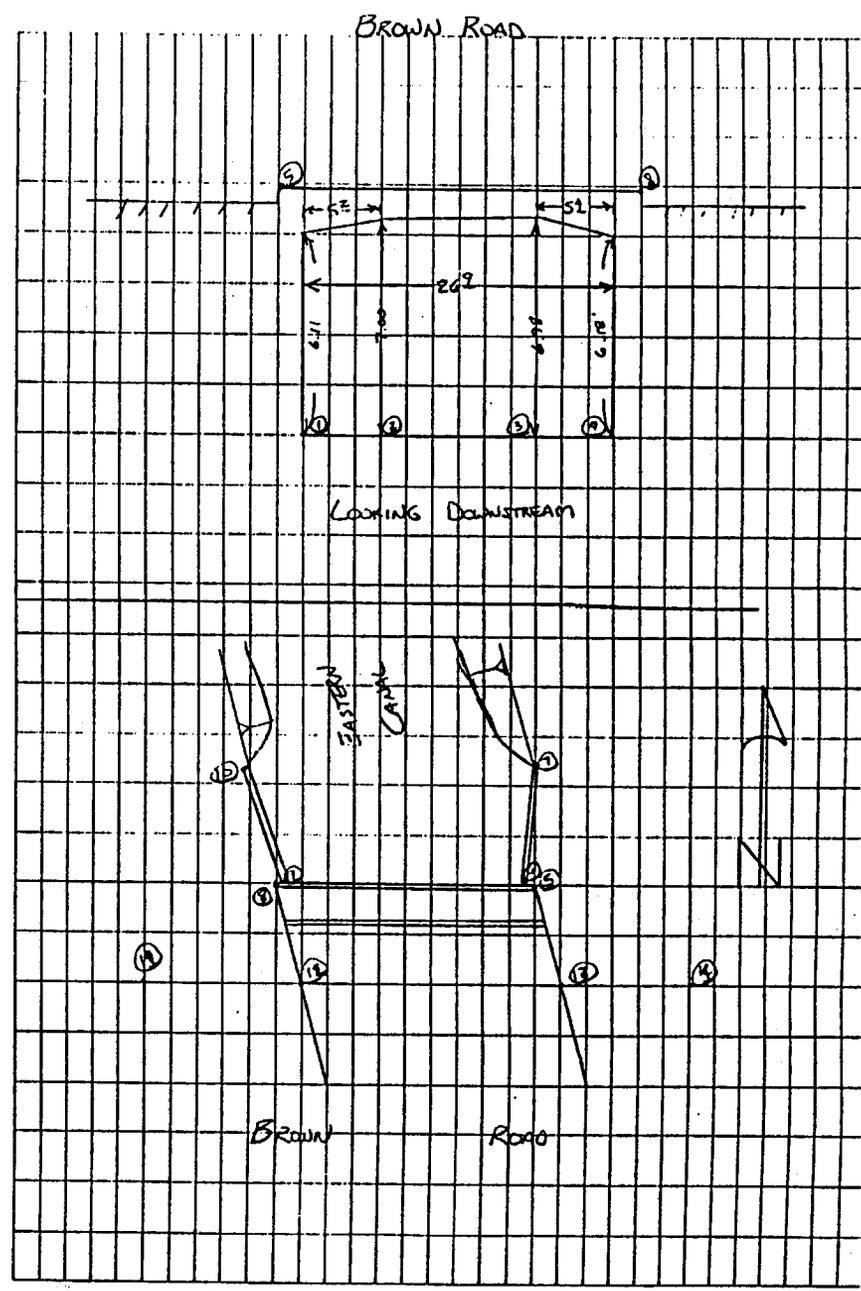
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⑲

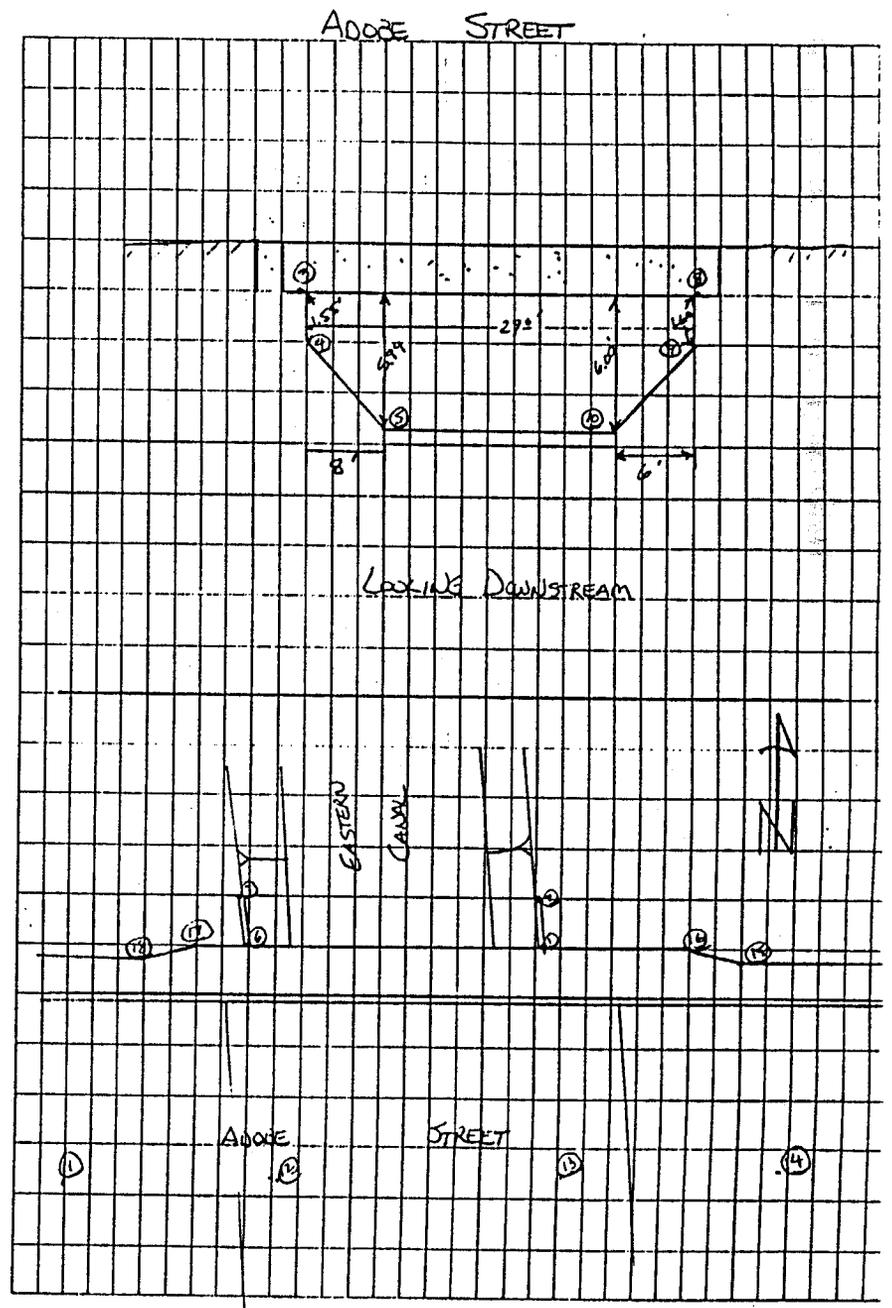
STA	BS+	H.I.	FS-	ELV	REMARKS
TBM #136				1292.346	MCHD BC
	5.10	1297.45			
①			12.87	1284.68	Inv @ Wingwall
②			13.15	1284.22	Invert
③			13.05	1284.40	Invert
④			13.00	1284.45	Invert @ Wingwall
⑤			4.01	1293.44	Top of Conc
⑥			5.13	1292.32	Top of Wingwall
⑦			5.60	1291.85	Top of Wingwall
⑧			4.39	1293.06	Top of Conc
⑨			5.10	1292.35	Top of Wingwall
⑩			5.69	1291.76	Top of Wingwall
⑪			4.73	1292.72	Pint
⑫			4.74	1292.71	Pint
⑬			4.60	1292.85	Pint
⑭			4.64	1292.81	Pint
TBM #136			5.10	1292.35	✓

2.3(5)



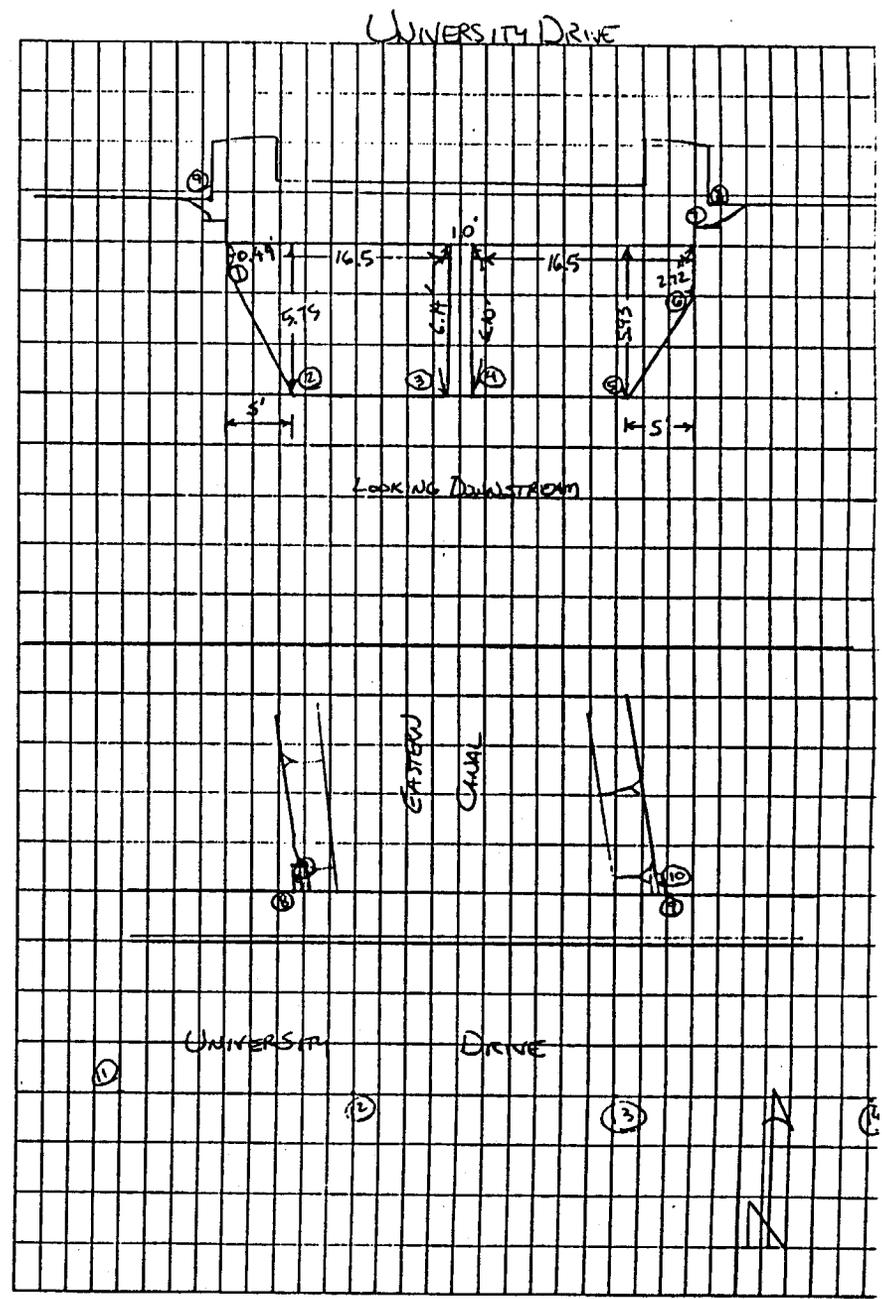
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM#152				1291.050	SRP B.C.
	4.05	1295.10			
①			3.95	1291.15	Top of Wingwall
②			4.27	1290.83	Top of Wingwall
③			5.83	1289.27	Top of Abutment
④			7.38	1287.72	Top of Back of Abutment
⑤			11.53	1283.57	Top of Slope
⑥			4.07	1291.03	Top of Wingwall
⑦			4.32	1290.78	Top of Wingwall
⑧			5.81	1289.29	Top of Abutment
⑨			7.41	1287.69	Top of Back of Abutment
⑩			11.66	1283.44	Top of Slope
⑪			3.92	1291.18	Pint
⑫			3.53	1291.57	Pint
⑬			3.55	1291.55	Pint
⑭			3.83	1291.27	Pint
⑮			3.36	1291.74	B/W
⑯			3.93	1291.17	B/W
⑰			4.05	1291.05	B/W
⑱			3.55	1291.55	B/W
TBM#152			4.04	1291.06	✓

2.3 (6)



Sta	BS+	H.I.	FS-	ELEV	REMARKS
TBM ^{#15}				1288.367	SRP BC
	6.01	1294.38			
①			6.59	1287.79	Top of Slope
②			11.86	1282.92	Toe of Slope
③			12.24	1282.14	Invert
④			12.30	1282.08	Invert
⑤			12.12	1282.26	Toe of Slope
⑥			9.00	1285.38	Top of Slope
⑦			5.37	1289.01	Abutment
⑧			4.78	1289.60	B/W
⑨			4.67	1289.71	B/W
⑩			5.22	1289.16	Abutment
⑪			5.07	1289.31	Pint
⑫			4.87	1289.51	Pint
⑬			4.84	1289.54	Pint
⑭			4.87	1289.51	Pint
TBM ^{#15}			6.01	1288.37	✓

23(-)



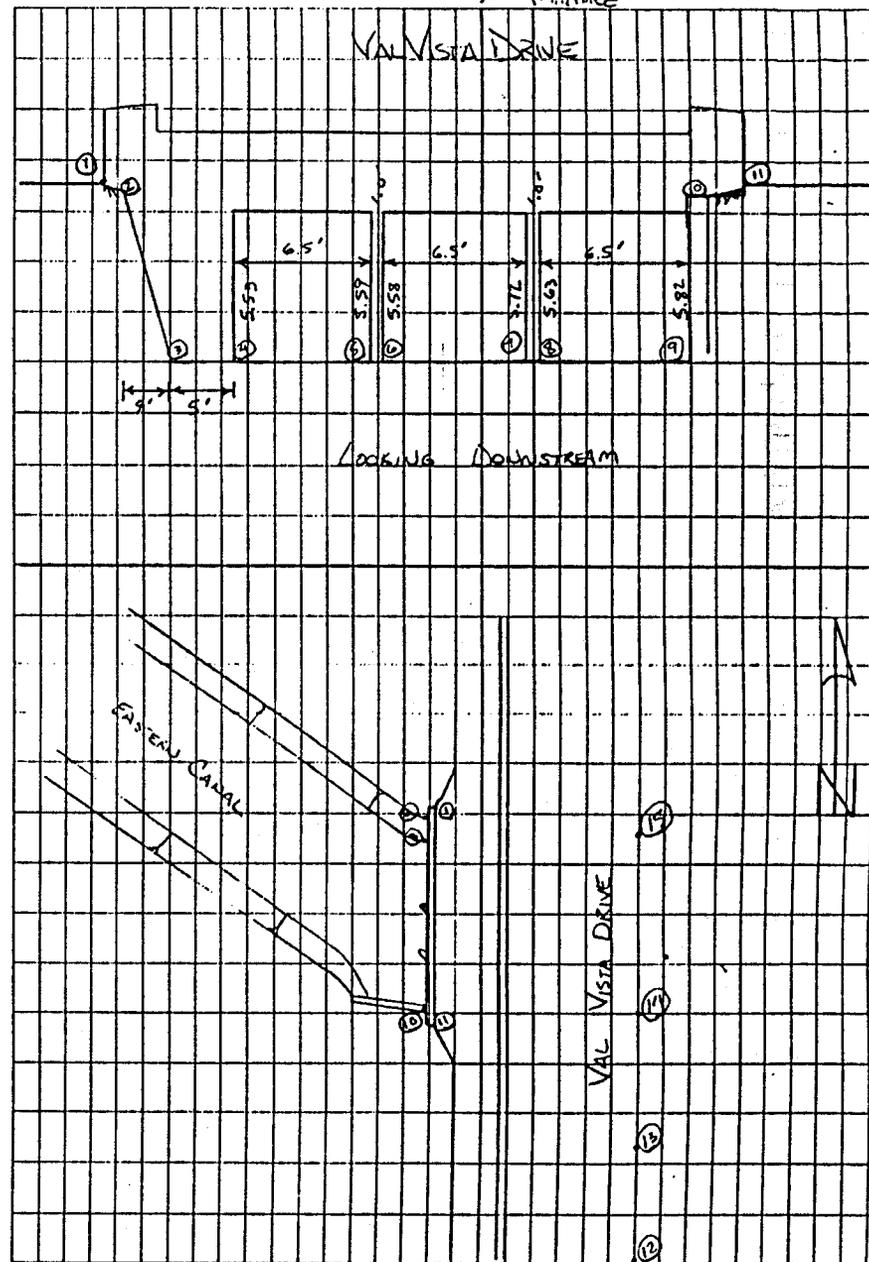
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #182				1289.328	4" Concrete
	4.79	1294.12			
①			4.69	1289.43	B/W
②			5.60	1288.52	Top of Bank
③			12.11	1282.01	Top of Slope
④			12.19	1281.93	Inv.
⑤			12.23	1281.89	Inv.
⑥			12.18	1281.94	Inv.
⑦			12.19	1281.93	Inv.
⑧			12.14	1281.98	Inv.
⑨			12.16	1281.96	Inv.
⑩			5.37	1288.75	Top of Wingwall
⑪			4.71	1289.41	B/W
⑫			4.87	1289.25	Pmnt
⑬			4.85	1281.27	Pmnt
⑭			4.80	1289.32	Pmnt
⑮			4.78	1289.34	Pmnt
TBM #182			4.78	1289.34	✓

2.3 (8)

1-10-97
Clear, Cub, Cold SWF

Garth
Mortensen
Berghian
Mintzer

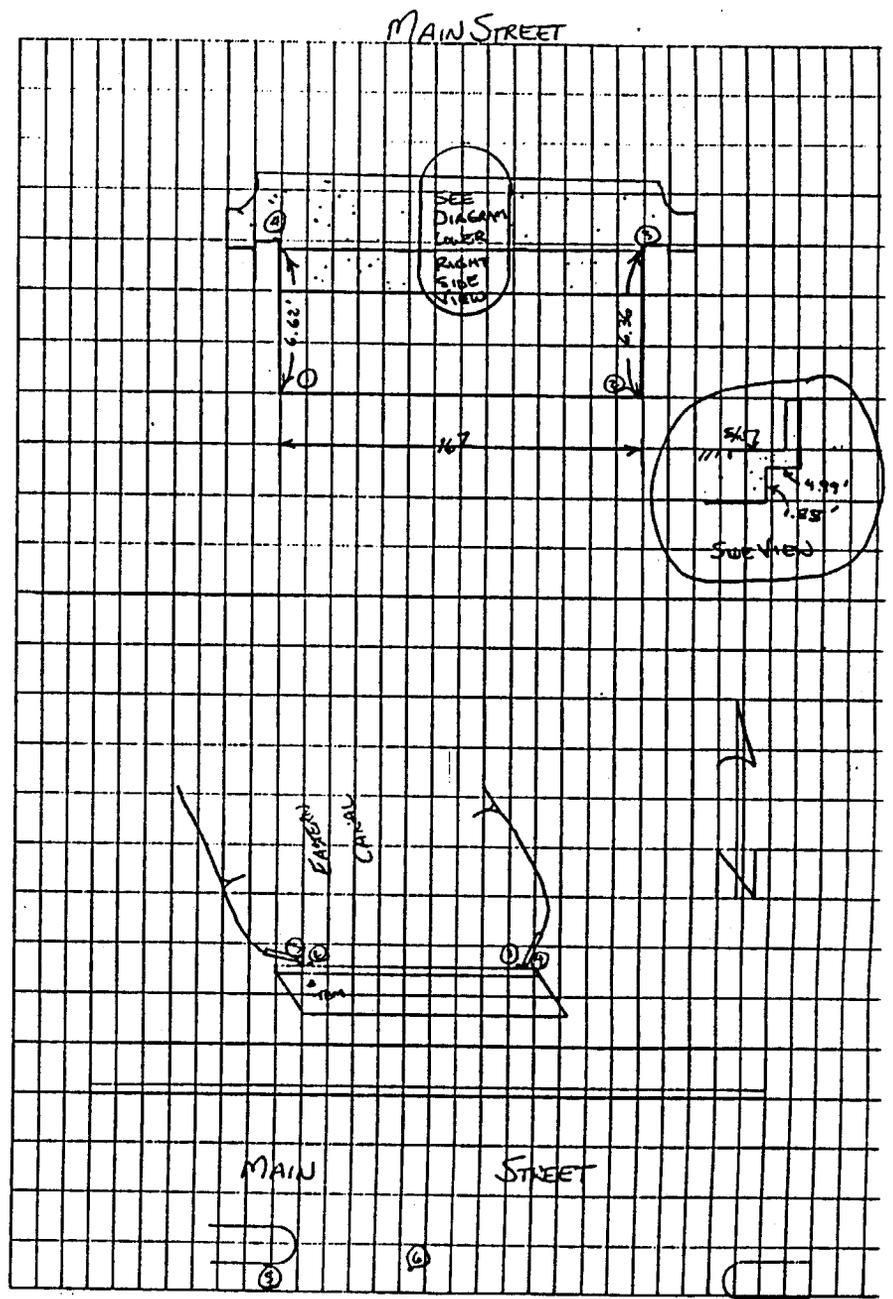
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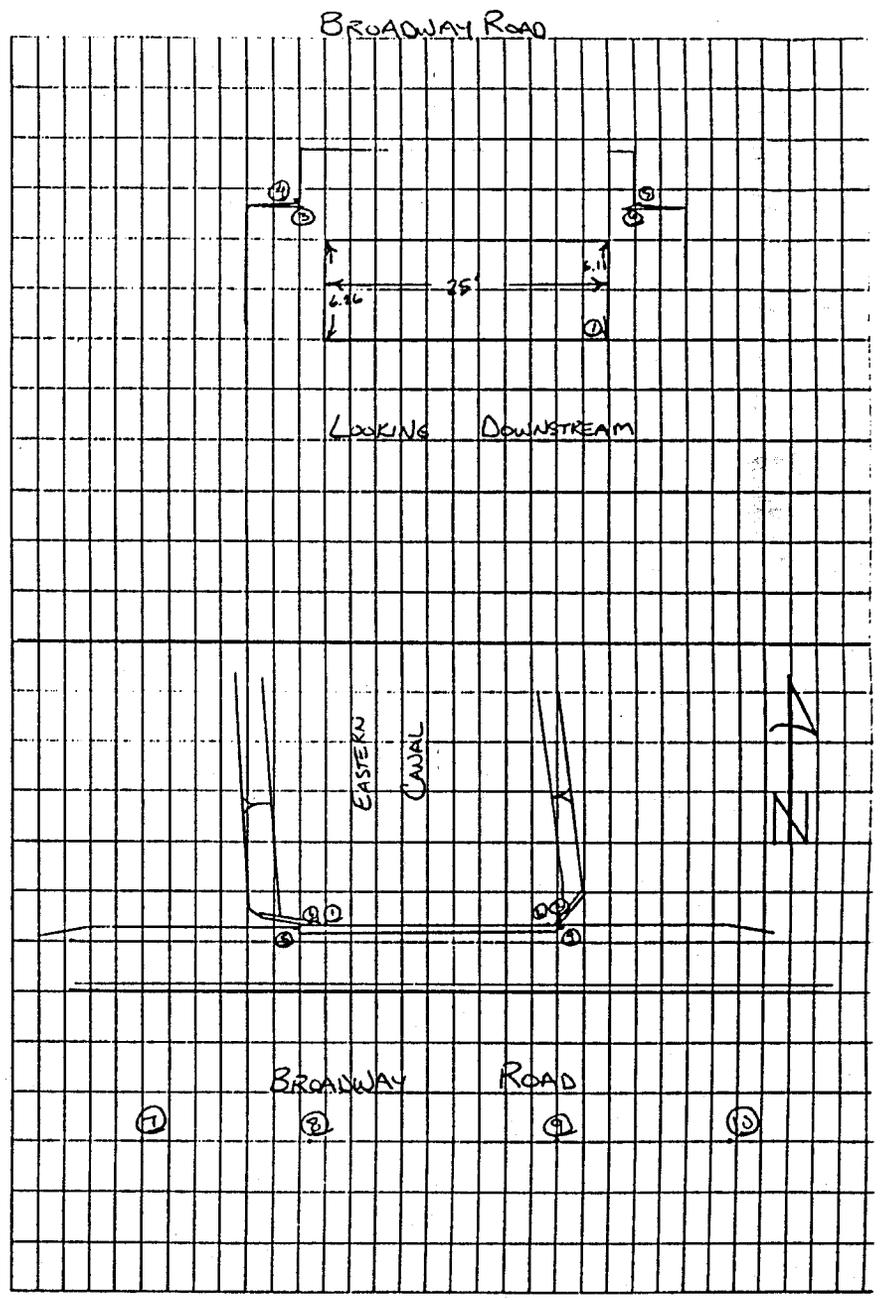
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STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #183				1288.548	AND BC.
	5.57	1294.12			
①			12.33	1281.79	Invert
②			12.36	1281.76	Invert
③			5.58	1288.54	Top of Wingwall
④			5.41	1288.71	Top of Wingwall
⑤			6.39	1287.73	Pint
⑥			6.15	1287.97	Pint
⑦			6.06	1288.06	Pint
⑧			5.78	1288.34	Pint
TBM #183			5.56	1288.56	✓

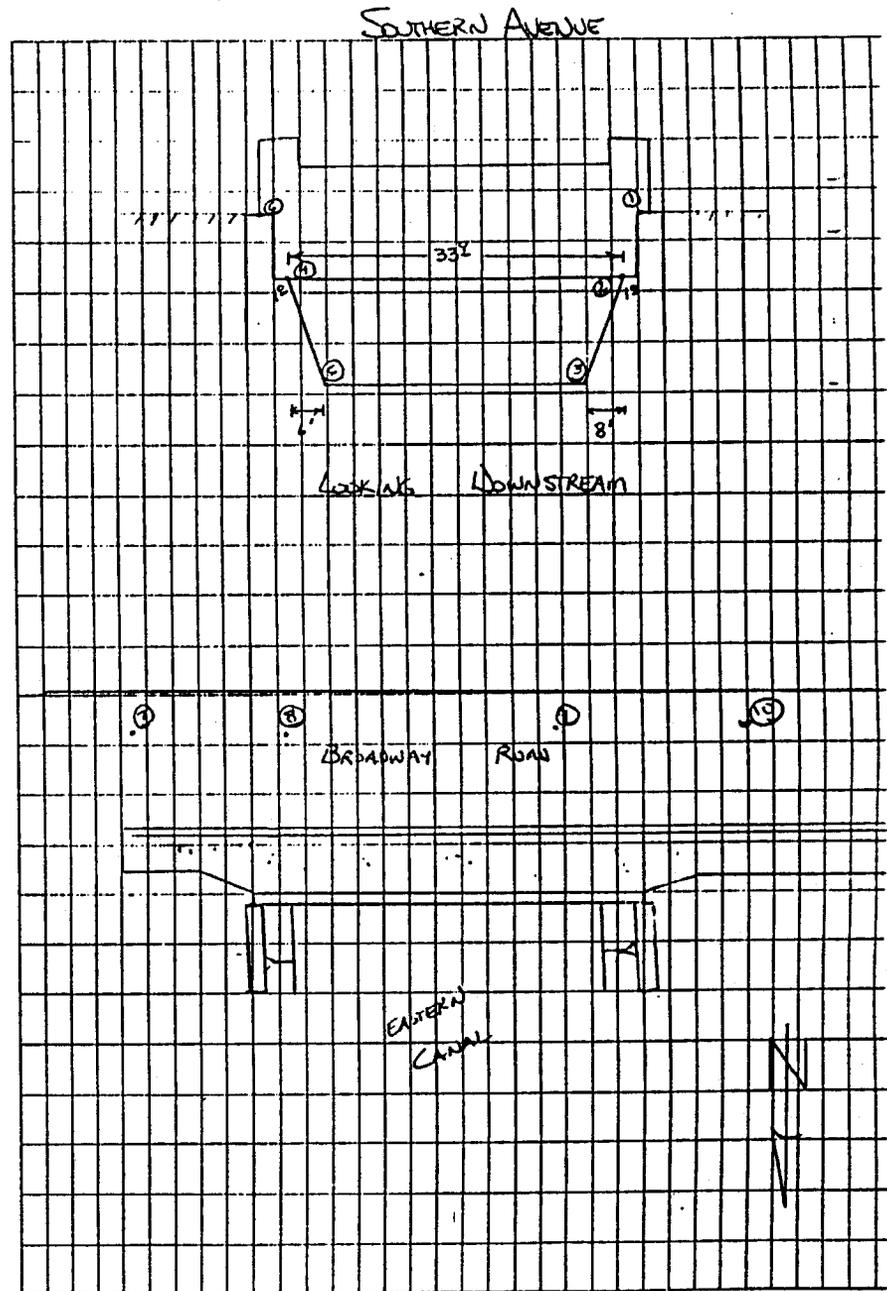
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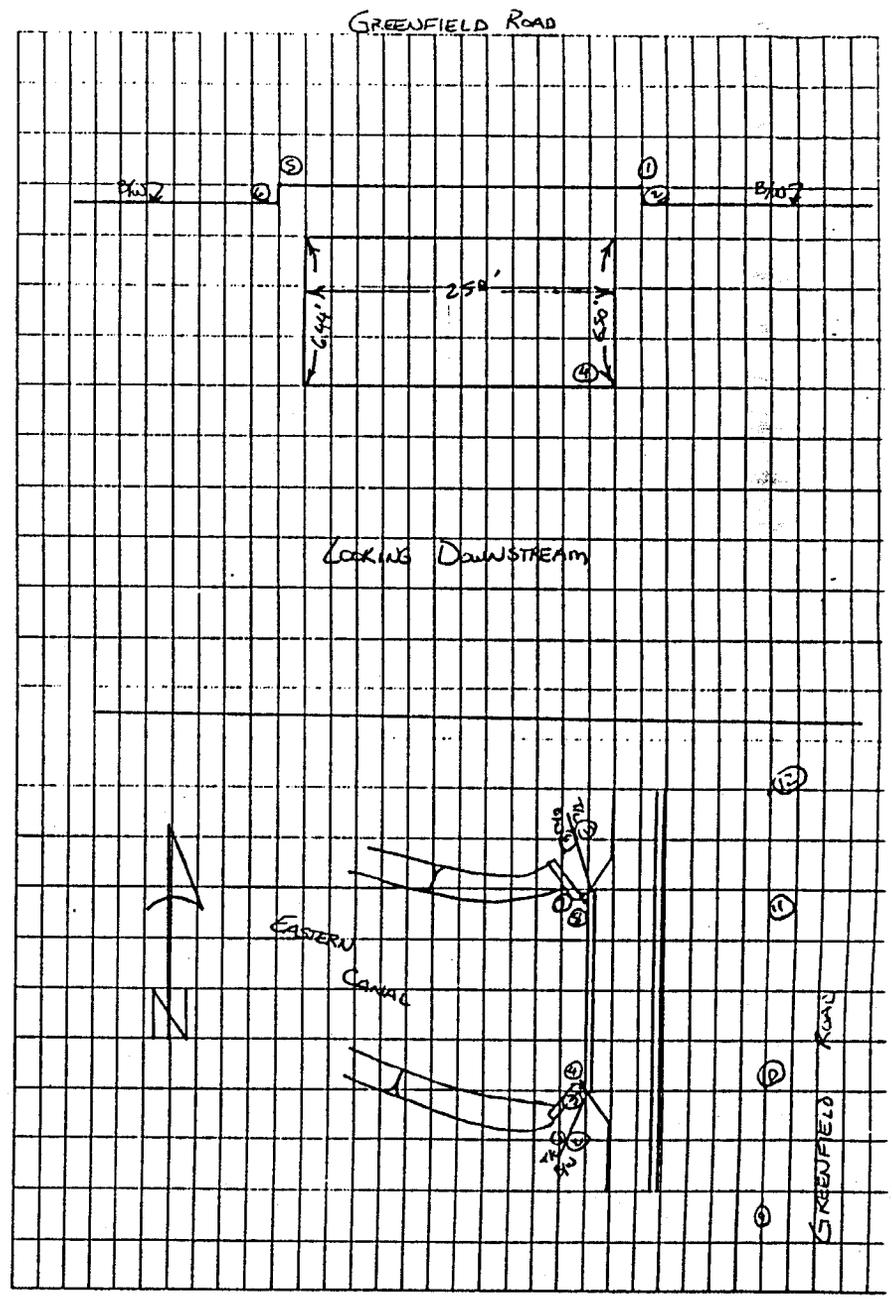
STA	BS+	H.I.	ES-	ELEV	REMARKS
TBM#190				1288.477	"4" in CONC
	4.60	1293.08			
①			12.30	1280.78	Invert
②			12.24	1280.84	Invert
③			4.60	1288.48	Top of Wingwall
④			4.31	1288.71	B/W
⑤			4.30	1288.78	B/W
⑥			4.60	1288.48	Top of Wingwall
⑦			4.30	1288.78	Pvmt
⑧			4.51	1288.57	Pvmt
⑨			4.50	1288.58	Pvmt
⑩			4.51	1288.57	Pvmt
2.3 (10)					
TBM#190			4.60	1288.48	✓



STA	BS	H.I.	FS	ELEV	REMARKS
TBM #216				1285.828	SIP BC.
	5.87	1291.70			
①			4.49	1287.21	Top of Wingwall
②			7.75	1283.95	Top of Abutment
③			12.90	1278.80	Toe of Slope
④			7.65	1284.05	Top of Abutment
⑤			12.63	1279.07	Toe of Slope
⑥			4.36	1287.34	Top of Wingwall
⑦			4.92	1286.78	Pint
⑧			4.70	1287.00	Pint
⑨			4.93	1286.77	Pint
⑩			5.06	1286.64	Pint
2.3 (11) TBM #216			5.87	1285.83	✓



STA	BS	H.I.	FS	ELEV.	REMARKS
TBM#75				1279.408	Rebar
	9.51	1288.92			
①			3.60	1285.32	T/C
②			3.76	1284.96	B/W
③			4.60	1284.32	Top of Wingwall
④			12.56	1276.36	Invert
⑤			3.55	1285.37	T/C
⑥			3.96	1284.96	B/W
⑦			4.54	1284.38	Top of Wingwall
⑧			12.53	1276.39	In
⑨			4.27	1284.65	Pmnt
⑩			4.20	1284.72	Pmnt
⑪			4.13	1284.79	Pmnt
⑫			4.11	1284.81	Pmnt
2.3 (12)					
TBM#75			9.52	1279.40	✓

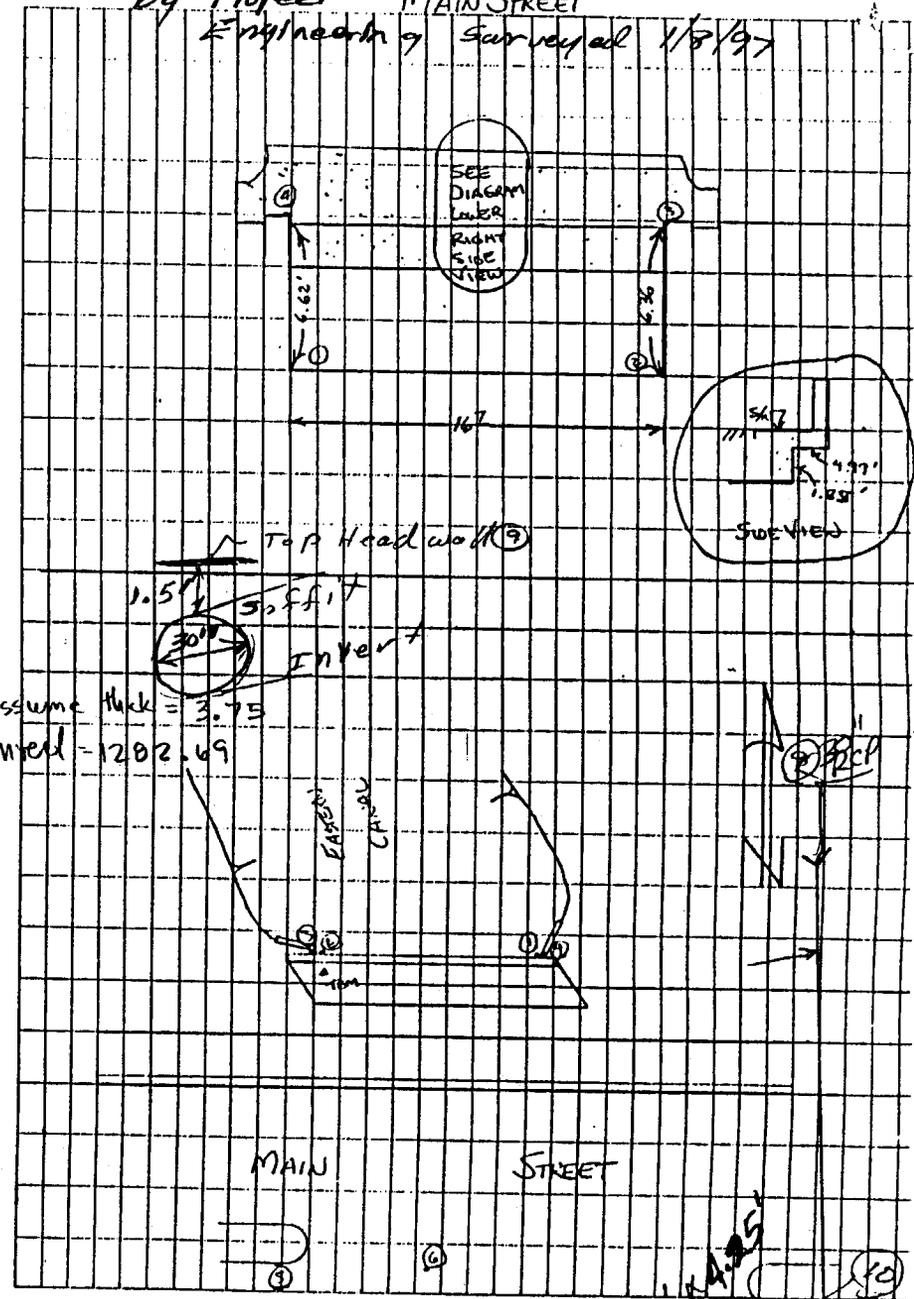


3/13/97 Greg S. and Eddie of A-N West

Using Field Notes of Canal Bridges
by Project MAIN STREET
Engineering Surveyed 1/8/97

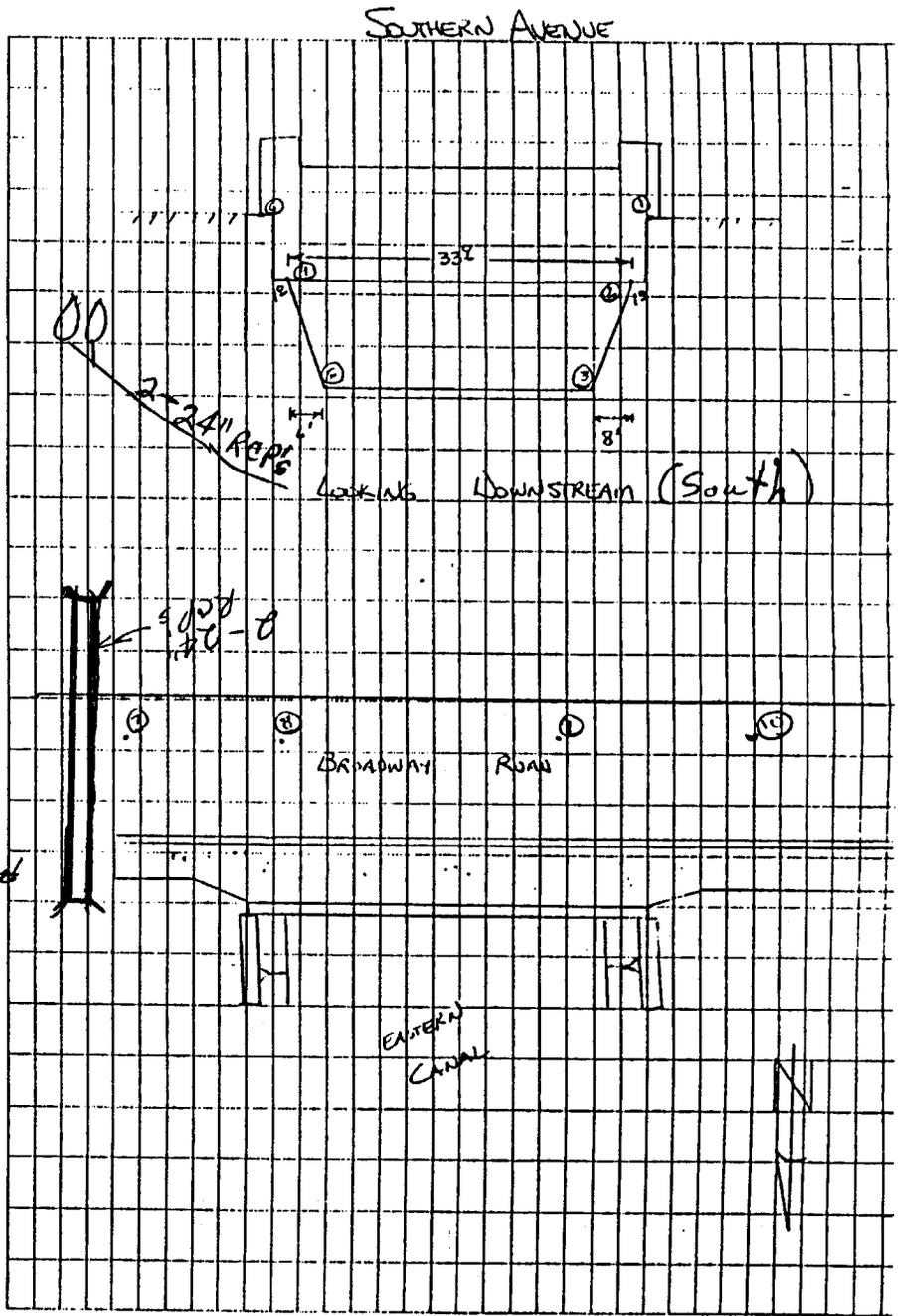
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #183	4.38	1292.93		1288.548	AND BC.
	5.57	1294.12			
①			12.33	1281.77	Invert
②			12.36	1281.76	Invert
③			5.58	1288.94	Top of Wingwall
④			5.41	1288.71	Top of Wingwall
⑤			6.39	1287.73	Pint
⑥			6.15	1287.97	Pint
⑦			6.06	1288.06	Pint
⑧			5.78	1288.34	Pint
TBM #183			5.56	1288.56	✓
⑨			5.93	1287.00	Inlet T. Hd. wall 1.5' T.H. to 5.08ft
⑩			10.66	1282.27	I.E. outlet 10.5' x 4.26' RCB.

2.3 (14)



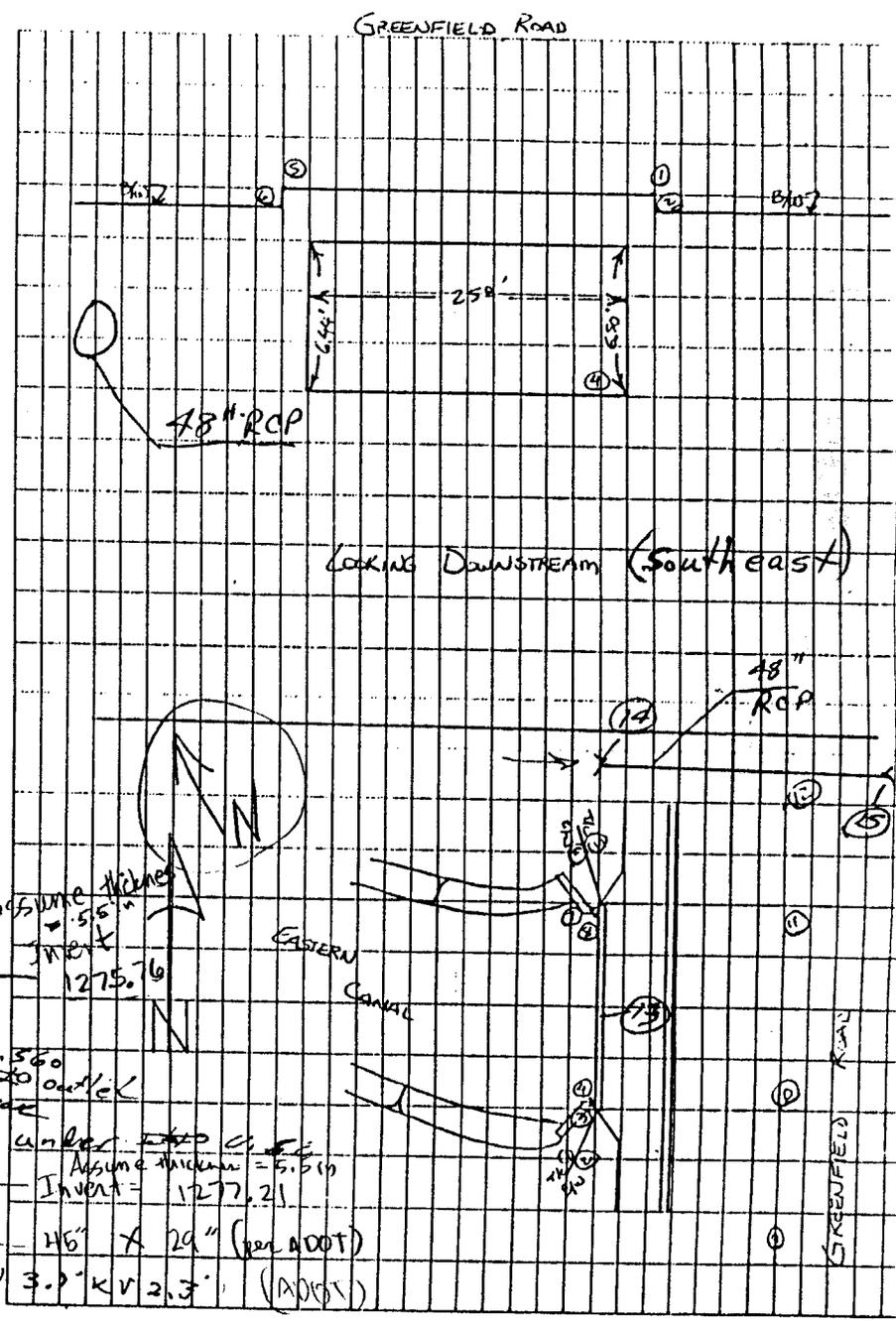
10' x 4.26' RCB

STA	BSr	H.I.	FS-	ELEV	REMARKS
TBM#216				1285.828	SRP BC.
	5.87	1291.70			
①			4.49	1287.21	Top of Wingwall
②			7.75	1283.75	Top of Abutment
③			12.90	1278.80	Toe of Slope
④			7.65	1284.05	Top of Abutment
⑤			12.63	1279.07	Toe of Slope
⑥	9.03	1291.37	4.36	1287.34	Top of Wingwall
⑦			4.92	1286.78	Punt
⑧			4.70	1287.00	Punt
⑨			4.93	1286.77	Punt
⑩			5.06	1286.64	Punt
2316 ① TBM#216			5.87	1285.83	✓
			10.44	1280.93	Inlet I.I.
			11.29	1280.08	outlet I.I.
			10.1 = 12	79.08	+0.1 for Mch



STA	BS	H.I.	FS	ELEV	REMARKS
TBM#75				1279.408	Rebar
	9.51	1288.92			
①			3.60	1285.32	T/C
②			3.76	1284.96	B/W
③			4.60	1284.32	Top of Wingwall
④			12.56	1276.36	Invert
⑤			3.55	1285.37	T/C
⑥			3.96	1284.96	B/W
⑦	4.86	1289.24	4.54	1284.38	Top of Wingwall
⑧			12.53	1276.39	In
⑨			4.27	1284.65	Pmnt
⑩			4.20	1284.72	Pmnt
⑪			4.13	1284.79	Pmnt
⑫			4.11	1284.81	Pmnt
TBM#75			9.52	1279.40	✓
13			4.66	1284.58	#1262-M MCBC No El.
14	Greenfield		12.62	1276.62	I.E. Inlet 48" Pipe
15			9.02	1280.22	Subst ± outlet RCP
⑬	UG 60		12.23	1277.01	I.E. 48" Pipe
TBM	5.56	1289.18	5.62	1283.62	T. Hdwall same loc as 14
T. BM.	5.23	1289.43	4.98	1284.20	T. Hdwall Inlet 48" pipe
			7.76	1281.67	I.E. Inlet 48" Pipe
	ADOT		12.96	1276.47	Top Pipe

2.3 (17)



2.98
T.P. to
I.E.

I.E. 73.49 (inlet) (Horizontal)

TECHNICAL DATA NOTEBOOK
EASTERN CANAL FIS
SECTION 4.2 FIELD RECONNAISSANCE
AND HYDRAULIC PARAMETER ESTIMATION
FCD NO. 96-10

JANUARY 30, 1997

PREPARED FOR:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 WEST DURANGO STREET
PHOENIX ARIZONA 85009

AND

CITY OF MESA
ENGINEERING DEPARTMENT
55 NORTH CENTER STREET
MESA, ARIZONA 85211-1466



A-N WEST NO. 7158-04

A-N WEST INC.
Consulting Engineers

7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
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**TECHNICAL DATA NOTEBOOK
EASTERN CANAL FIS
SECTION 4.2 FIELD RECONNAISSANCE
AND HYDRAULIC PARAMETER ESTIMATION**

4.2 FIELD RECONNAISSANCE & HYDRAULIC PARAMETER ESTIMATION

4.2.1 Manning's 'n' Values

4.2.1.1 Introduction. On September 6, 1996 and January 14, 1997, A-N West, Inc. made a reconnaissance field trip to the Eastern Canal to photograph and evaluate Manning's 'n' values. The study reach proceeded from the Baseline Road north to Hermosa Vista Drive, along the upstream (east side) of the Eastern canal, a distance of approximately 6.5 miles. The Eastern Canal study reach area is shown on Figures 1 and 2. Figure 1 shows the extent of the study in reference to the surrounding area. Figure 2 shows the location of photograph I.D. numbers and their directions.

4.2.1.2 Methodology. 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. Hyalmarsen 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 streets, Eastern Canal.

Using the USGS document, "Open Channel Hydraulics," field photos and site observations, Manning's 'n' values were estimated at several key locations of the floodplain just east of the Eastern Canal. In some cases, a typical cross section will indicate overbanks with different 'n' values to account for different vegetation. Dr. Chow's text, "Open Channel Hydraulics", was used for special topography like the citrus groves because the USGS document did not cover this vegetation adequately.

It is anticipated that the NH record option of the HEC-2 model will be used to subdivide the distinct 'n' value sub-elements which were noted in the channel and overbank areas.

4.2.2 Expansion and Contraction Coefficients:

Expansion and contraction of flows due to changes in channel cross section were estimated to be somewhat abrupt as flow expands and contracts through the developed area. Therefore, expansion and contraction coefficients of 0.5 and 0.3, respectively, are proposed based on the HEC-2 model user manual's discussion of these parameters. Because of the low velocities along the canal due to the mild longitudinal slope of approximately 0.00032 ft/ft, expansion and contraction losses are not expected to be significant.

4.2.3 Hydraulic Jump/Drop Analysis:

Hydraulic jumps are not anticipated along the study reach. The overall slope along the 6.5 mile study reach is 0.00032 ft/ft, which is very mild.

4.2.4 Inventory of Road Crossings & Drainage Structures:

The following Table 1 shows an inventory of road crossings, drainage structures and sizes along the Eastern Canal study limits.

As noted on Table 1, the culverts under several of the downstream road crossings are expected to be accounted for by either modeling the culverts by special culvert routine or by subtracting the estimate culvert capacity from the discharge being modeled at the road crossing cross-sections, where culverts are located.

TABLE 1

EASTERN CANAL FIS
ROAD CROSSING AND DRAINAGE STRUCTURE SUMMARY

River Mile	Location	Description	Structure Type/Size
16.477	Baseline Road	Major Street with 1± Foot Dip(2)	2-4' RCP's x 130'/Hdwall and Trsh RK(1)
16.938	Greenfield Rd.	Major Street with 0.3± foot Dip(2)	1-4' RCP x 95'/Hdwall(1)
17.160	U.S. 60 Freeway	Freeway with overpass, No Dip(2)	1-4' RCP x 135'/Hdwall and ½ TRSH RK(1)
17.59	Southern Avenue	Major Street with 1.3± foot Dip(2)	2-24" RCP's x 160' with Hdwall (Bell End)(1)
18.680	Broadway Road	Major Street with 0.5± foot Dip(2)	1-6' and 1-4.5' RCP x 1100' with Hdwall and vertical TRSH RK(1)
19.251	Main St. (Apache Blvd)	Major Street, No Dip(2)	Inlet-1-30" RCP x 260' with Hdwall (Bell End)(1). Outlet - 1-8' x 3' RCB±
19.526	Val Vista Dr.	Major Street, with 0.5± foot Dip(2)	1-30" RCP x 1780' with Hdwall and TRSH RK(3)
19.832	University Dr.	Major Street with 0.5± foot Dip(2)	same as pipe at Val Vista Drive(3)
20.402	Adobe Street	Major Street with 3± foot Dip(2)	Approx. 2 foot storm sewer size(3)
20.987	Brown Road	Major Street with 1± foot Dip(2)	Approx. 2 foot storm sewer size(3)
21.529	Lindsay Road	Major Street with 2± foot Dip(2)	Approx. 2 foot storm sewer size(3)
22.230	McKellips Road	Major Street with 1.1± foot Dip(2)	1-24" RCP with Hdwall(3)
22.916	Gilbert Road	Major Street with 2± foot Dip(2)	No Culvert/S.D.

- Notes:
1. Anticipate modeling culverts in HEC-2 model by special culvert option with road profile for weir flow over road or by subtracting the estimated culvert capacity from flow at cross-section locations where culverts are located.
 2. Dip denotes road profile which dips or is depressed below adjacent top of road at the canal to cause flow over road before flow over canal on road.
 3. Where storm drain is noted, it is assumed the hydrology modeling reflects storm drain capacity.
 4. TRSH RK = Trash Rack. Hdwall = Headwall. RCP = Reinforced Concrete Pipe. RCB = Reinforced Concrete Box Culvert.

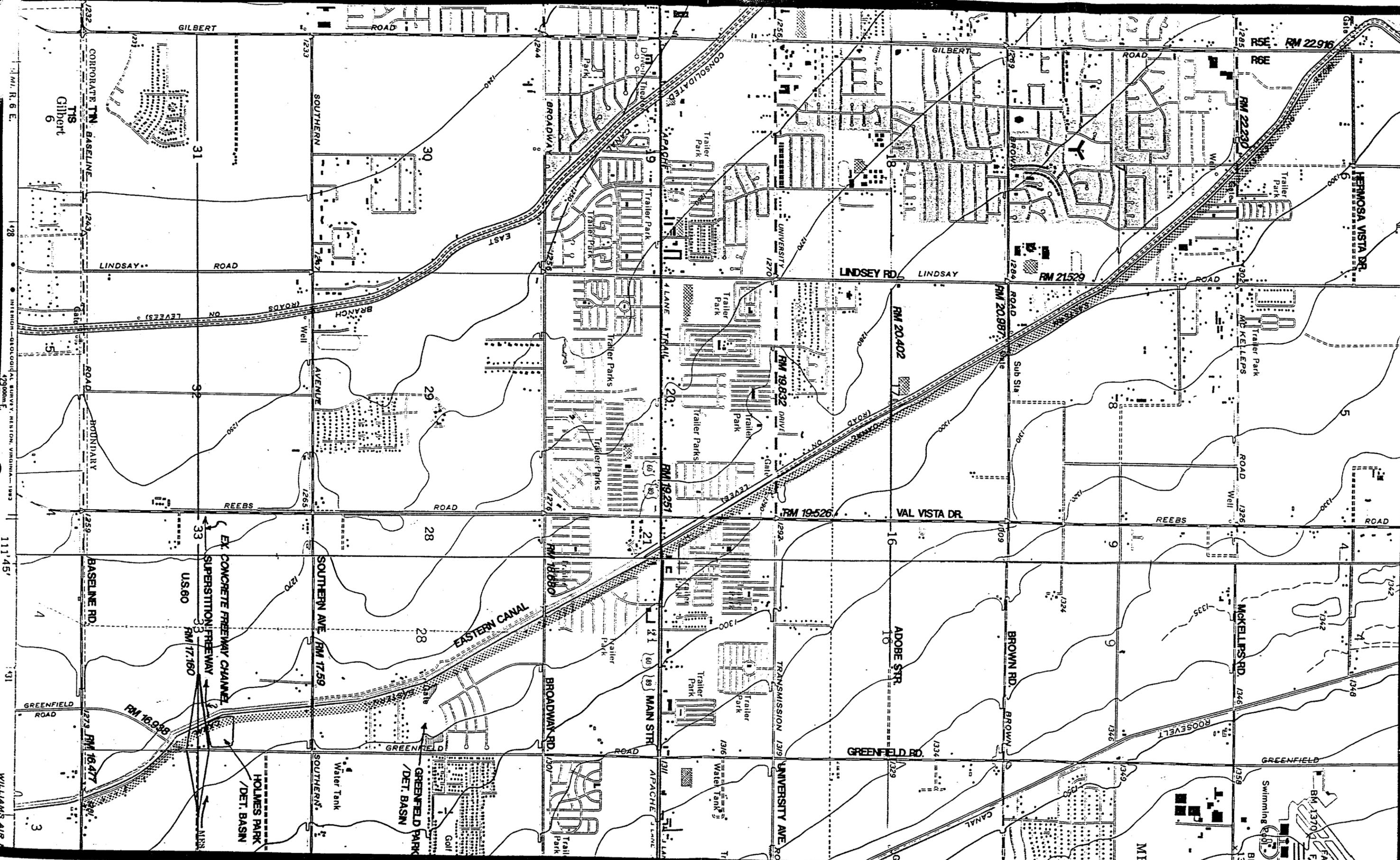
4.2.5 Observation of Possible Overflow Areas: The continuous conveyance capacity along the upslope side of Eastern Canal is limited by a number of factors including:

- a) Very mild average longitudinal slope over 6.5 mile project length of 0.00032 ft/ft.
- b) As shown by Table 1, small culverts and storm drains and minimal or no dip or depressed roadway upslope of the canal to convey flow across the roads.
- c) Mild, natural ground ridges (as shown on project 200 scale, 2 ft. C.I. mapping), which intersect the Eastern Canal, most notably at River Mile 20.268 (700 ft. south of Adobe Street) and River Mile 22.331 (500 ft. north of McKellips Road).

At the U.S. 60 freeway, for example, the 4 foot diameter x 195 foot long RCP has a capacity of approximately 65 CFS (5 fps., velocity) at an assumed 1 foot head loss. Flow over this capacity would overflow into the Eastern Canal and then likely into the freeway drainage channel (flowing westerly along the north side of freeway).

At Main Street, the 30 inch RCP culvert at the upstream side has approximately 25 CFS capacity. With no significant dip or depressed road profile, breakout across the canal on the street bridge would be anticipated for flows over this 25 CFS.

At the two ridges noted at River Mile 20.268 and 22.331, there was a small swale noted during field site visits along the immediate upslope side of the canal. The swales were perhaps 15 feet wide x 0.5 deep from top of adjacent canal bank. Assuming 5 fps velocity, such a swale could convey approximately 40 CFS before overtopping of the adjacent canal bank occurs.



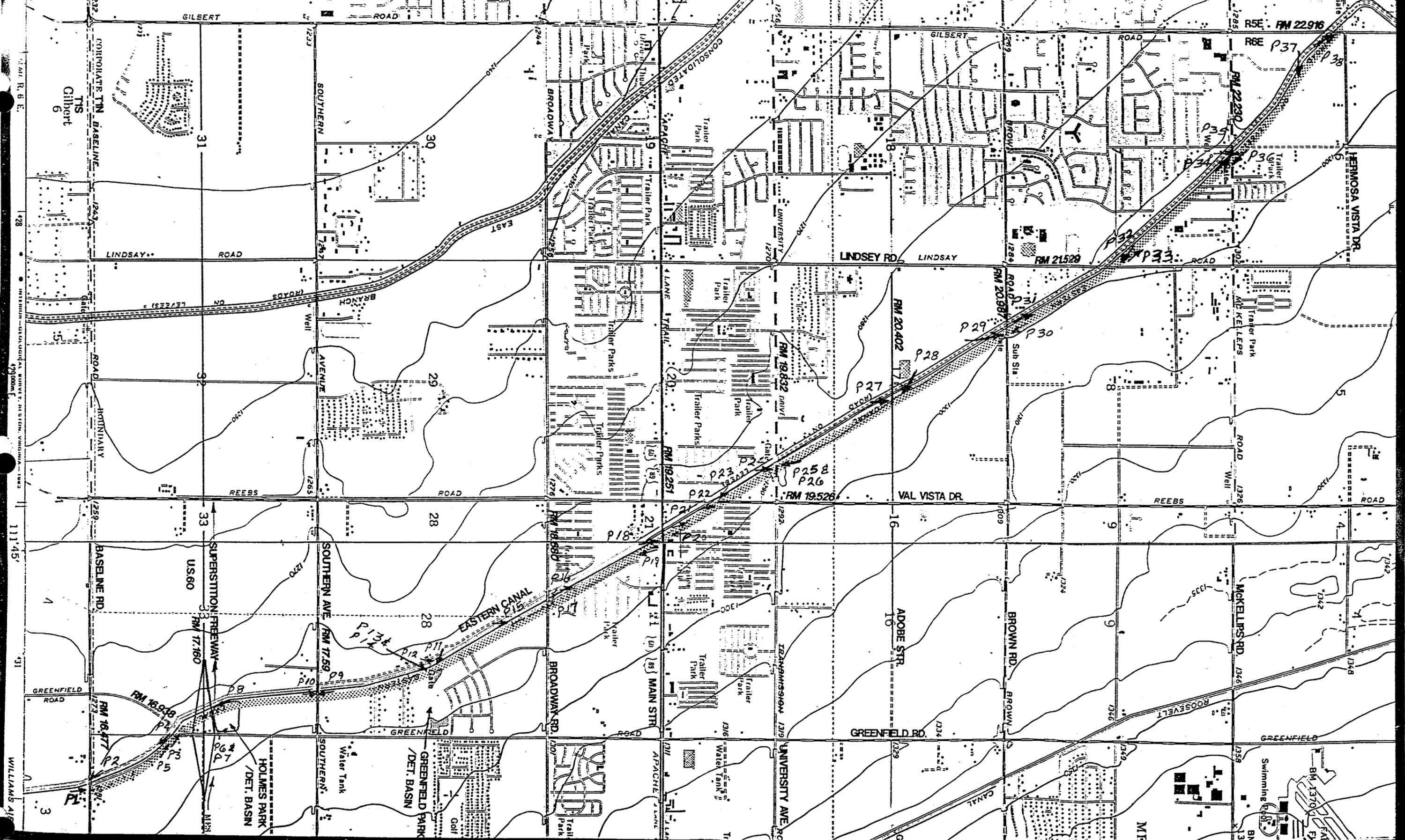
ANW NO.7158-04
 FCDMC NO.96-10

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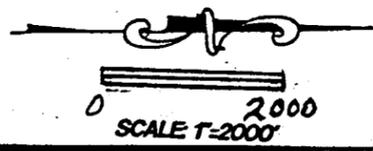
EXPLANATION
 [Hatched Box] STUDY LIMITS
 [Numbered Line] RIVER MILE NO.

LOCATION MAP
 EASTERN CANAL FIS
 FIGURE 1



ANW NO.7158-04
 FCDMC NO.96-10

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 Consulting Engineers



EXPLANATION

- STUDY LIMITS
- SITE PHOTO LD. AND DIRECTION

**SITE VISIT PHOTO LOCATION MAP
 EASTERN CANAL FIS**

FIGURE 2



#1 Upstream at
Baseline Rd.

2 - 48" RCP's
in Inlet and
outlet Headwall,

Inlet Headwall
has Trash Rack
with 30° Angle
From Vertical



2 Downstream
From Baseline
Rd.

$$n_{(LOB)} = 0.03$$

$$n_{(c)} = 0.04$$



#3 Upstream From
Greenfield Rd.

1 - 48" RCP in
Headwall (Inlet
and outlet)

A-1 Field Visit
Photos Along
Eastern Canal



4 Downstream
From Greenfield
Rd.

$$n_{(LOB)} = 0.035$$

$$n_{(c)} = 0.04$$



5 Upstream at
Outlet Headwall
of 1-48" RCP
Under Greenfield
Rd.



6
Downstream at
concrete channel
Flowing west Along
North side U.S. 60
and Detention Basin
Holmes Park From
near Greenfield
Rd.

In Background is
48" RCP, Mitered
End Under Eastern
Canal.

Match p. A-3 Top

A-2

Match P A-2 Bottom



#7
Looking Northwest
From Same Location
As Photo #6 at
Detention Basin /
Holmes Park

Eastern Canal In
Back ground.



#8
Downstream at
Inlet of 48"
RCP Across
U.S. 60 with
Head wall and
Damaged (1/2 Gone)
of Vertical Trash
Rack

Conc. Chann. $n = 0.015$



#9
Downstream at
one 24" RCP
Culvert Under
Southern Ave.
with Headwall
(Bell End).

Earth Chann. $n = 0.03 \pm$

Field Visit
Photos Along
A-3 Eastern Cana



#10

Upstream From
Southern Ave.

$$N_{LOB} = 0.035$$

$$N(c) = 0.035$$



#11

Downstream at
Concrete Channel
Into Green Field
Park / Detention
Basin.

$$N_{LOB} = 0.03$$

$$N_{channel} = 0.015$$



#12

Upstream at ^{concrete} Channel
From Green Field Park /
Detention Basin.

Weighted

$$N_{channel} = 0.024$$

Top Bank to Wall

$$N_{Houses} = \underline{0.25}$$



#13 Upstream at
Greenfield Park /
Detention Basin At
Pump outfall

Match Below Lt.



#14 Same as
#13 Above

Match Above, Lt.



#15 Upstream At
1-6' ϕ RCP (Left)
and 1-4.5' ϕ RCP
(Right) with Headwal.
and Vert. Trash
Racks.

Approx. 950 FT south
of Broadway Rd.



#16 Downstream
at Inlet of
1 - 4.5' ϕ RCP and
1 - 6' ϕ RCP
with Headwall and
Vert. Trash Racks

Approx. 100 Foot
North of Broadway
Rd.



#17 Upstream
From Same Location
as Photo #16
At Concrete
Channel

→ Approx. 5' Deep,
2' Bottom
12' Topwidth
1:1 sideslopes

Wtd. n (Channel - Fence
To Top Bank
= 0.024



#18 Upstream
at Box Culvert
Outlet At Main St
(Apache Blvd.)

Note: The north side
of Road, has 30 inch
RCP Per Photo # 20.

n (conc. chann.) = 0.015

A-6



#19

Downstream From
South side of
Main Street
(Apache Blvd.)
at Concrete
Channel

Bottom 2'±
Top width 10'±
Depth 4'±

$n(\text{conc. chann.}) = 0.015$



#20

Downstream at
30" ϕ RCP in
Headwall (Bell
End) At Main
Street + (Apache Blvd.)

Note: Box Culvert
At outlet End
Per Photo #18



#21

Upstream at
Point of Photo #20
Just Upstream (North
of Main Str.
(Apache Blvd.)

wtd channel $n = .035$
(Top Bank to Large Trees)

A-7



22

Upstream at
Pipe Outlet At
Val Vista Blvd.

2' ϕ \pm RCP In
Headwall

Wtd. Chann. $n = 0.035$
(Top Bank to Large Trees)



23 Down stream
at Val Vista Blvd.
(Back ground) and
Catch Basin (Foregroun
with 15" to 18" Conn-
ector Pipe To
24" ? RCP

$n_{\text{chann.}} = 0.030$
(Top Bank to Fence or
shrubs - width = 25' \pm)



24

Upstream at Univers
Dr. sign Noting
"city of Mesa Storm
Drain In Backgrd.

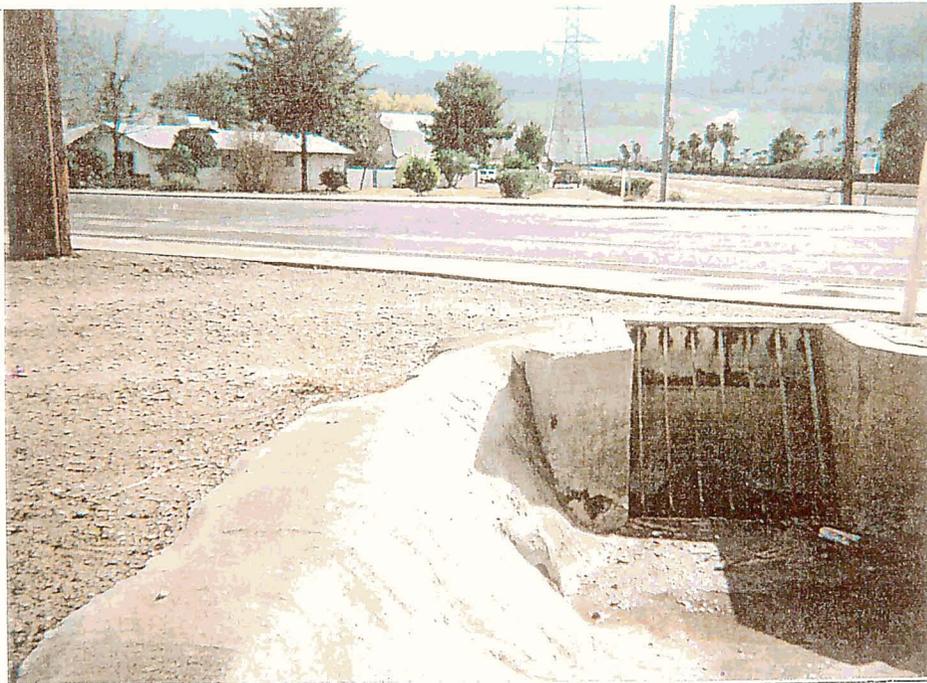
shallow swale
this Location

$n_{\text{chann.}} = 0.030$
(Top Bank To Fence
or Shrubs - width = 25

A-8



#25
Downstream at
University Dr
and 30" RCP
In Drop Inlet
with Headwall
and Trash Rack



#26
closeup of same
30" RCP / Headwall
as Photo #24



#27 Upstream
at Adobe Street
Note: "City of Mesa
Storm Drain" sign
In Background, Rt.



#28 Downstream at
Inlet of 18" RCP
In Head wall w/ Trash
Rack, North^{side} of
Adobe Street.

Pipe Angles to
East

Toward small
Detention Basin
Behind Block wall



#29
Upstream at Brown
Road

Note: "City of Mesa
Storm Drain" sign
to Rt. side



#30
Downstream at
Brown Rd.



31

Upstream
North side of
Brown Road

$n = 0.030$ (open land)



32

Downstream at
Lindsey Rd.

Pipe Headwall to
Left (In Trees)
with 2' ϕ RCP
(Square Edge)



33

Upstream From
North side Lindsey
Road

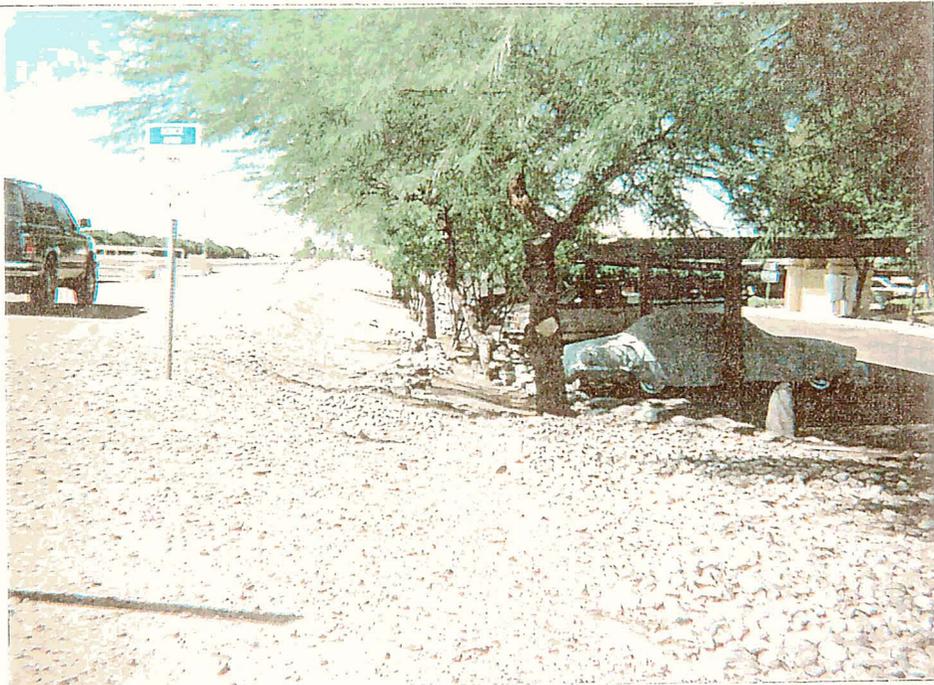
$n(\text{chann}) = 0.035$
(Top Bank to Fence)



34

Upstream at
Outlet of 24" ϕ
RCP Under
McKellips Road

$N(\text{chann.}) = 0.035$
(Top Bank to Fence)



35

Upstream From
McKellips Road
Depressed Parking
In Apartment
Complex with
Retention and
Pump

Note: A 24" RCP
In Headwall Is
In Background



36 Downstream
From North Side
of McKellips Rd.

$N(\text{chann.}) = 0.035$
(Top Bank to Fence)

A-12



37

Downstream at
Park Along Canal
Between McKellips
and Gilbert Rd

$n_{\text{chann}} = 0,030$
(Top Bank to Fence)

$n_{\text{LOB}} = 0,030$
(Park / Det. Basin)



38

Upstream at
Gilbert Rd /
Hermosa Vista Dr

$n = 0,030$ (chann.)
(Top / Bank To Fence)

Appendix A

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.
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 obstruction²:		
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.
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.
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.

n₁

n₂

n₃

See footnotes at end of table.

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
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	-----

¹Straight uniform channel.

²Smoothest channel attainable in indicated material.

$n_b = 0.024$

$n_1 = 0$

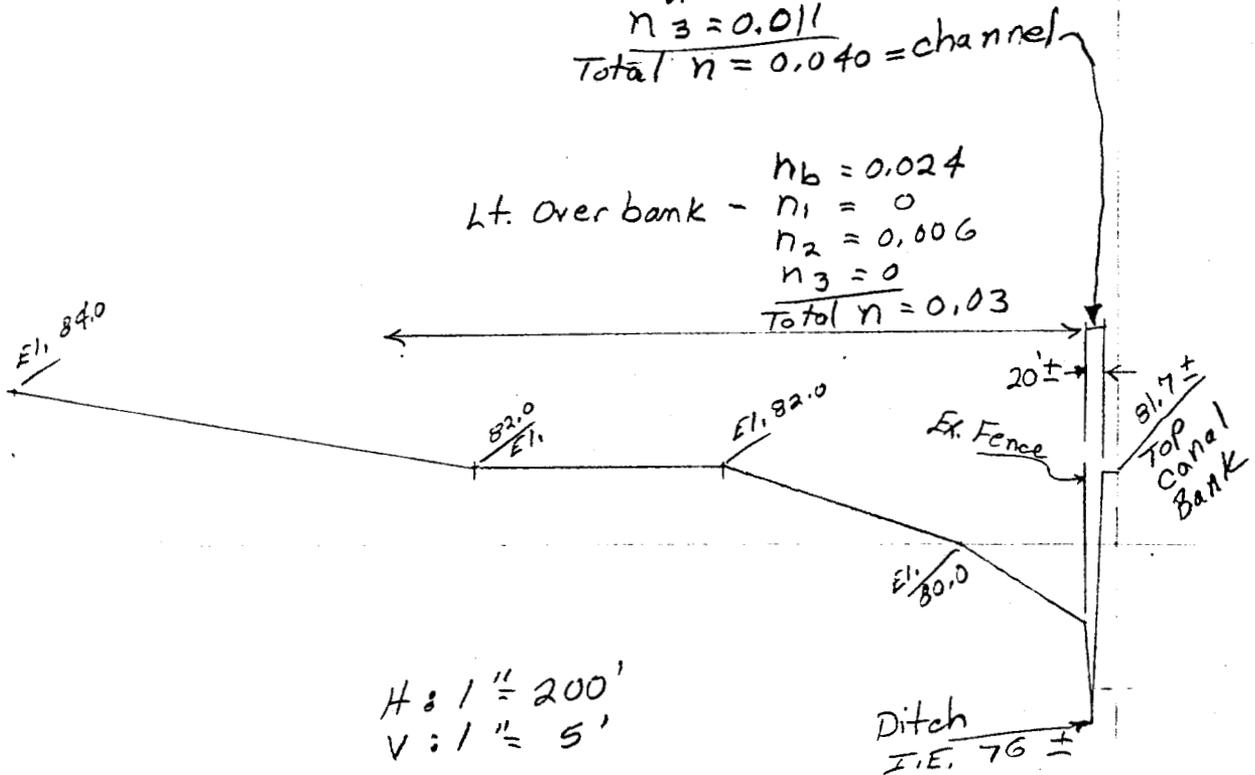
$n_2 = 0.005$

$n_3 = 0.011$

Total $n = 0.040 = \text{channel}$

Lt. Over bank - $n_b = 0.024$
 $n_1 = 0$
 $n_2 = 0.006$
 $n_3 = 0$

Total $n = 0.03$



Section @ R.M. 16.424 - Photo #2
(Looking Downstream)

$n_b = 0.024$

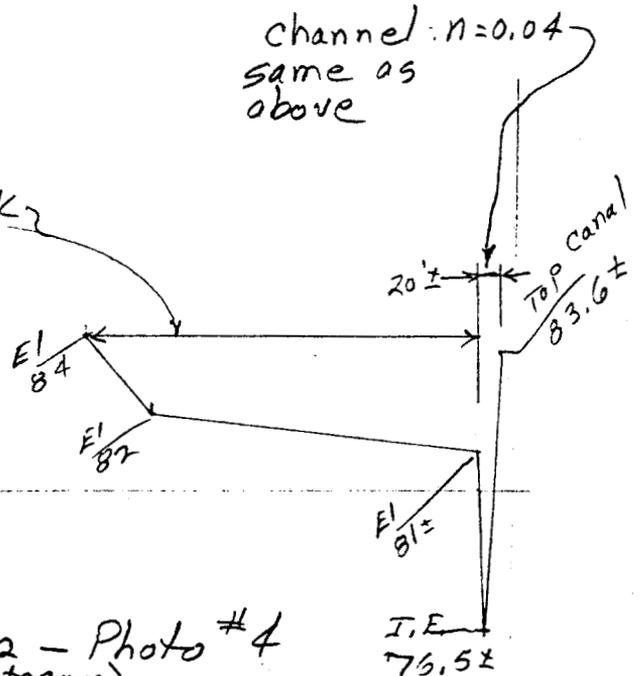
$n_1 = 0$

$n_2 = 0.006$

$n_3 = 0.005$

Total $n = 0.035$, Lt. Overbank

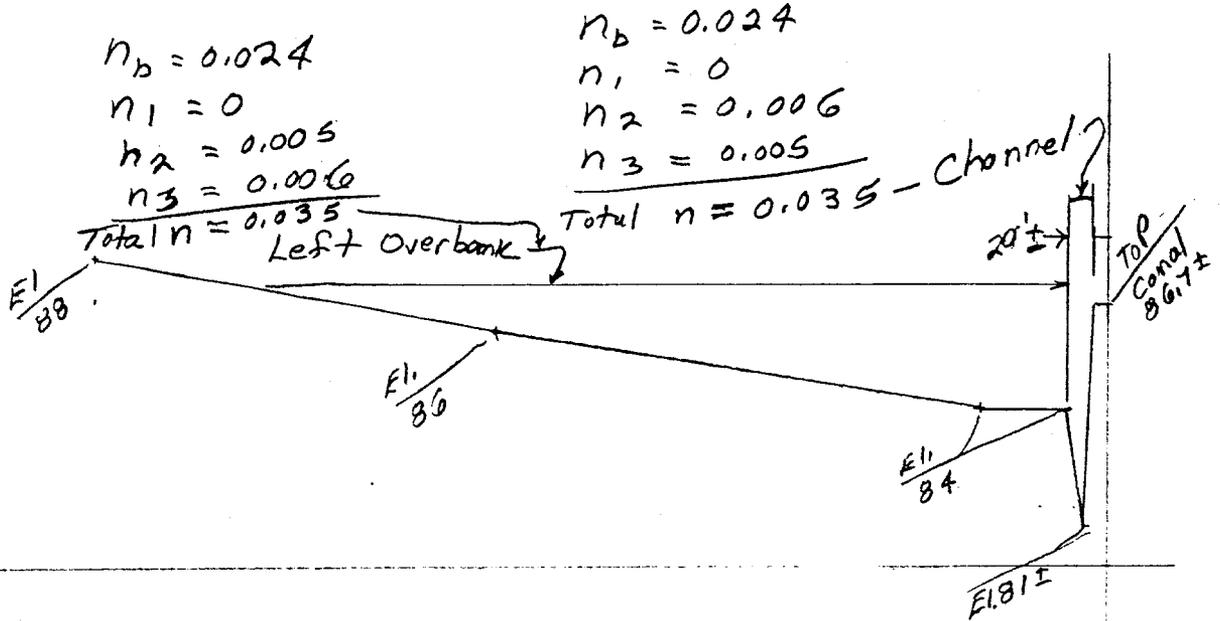
channel: $n = 0.04$
same as above



$H : 1'' = 200'$

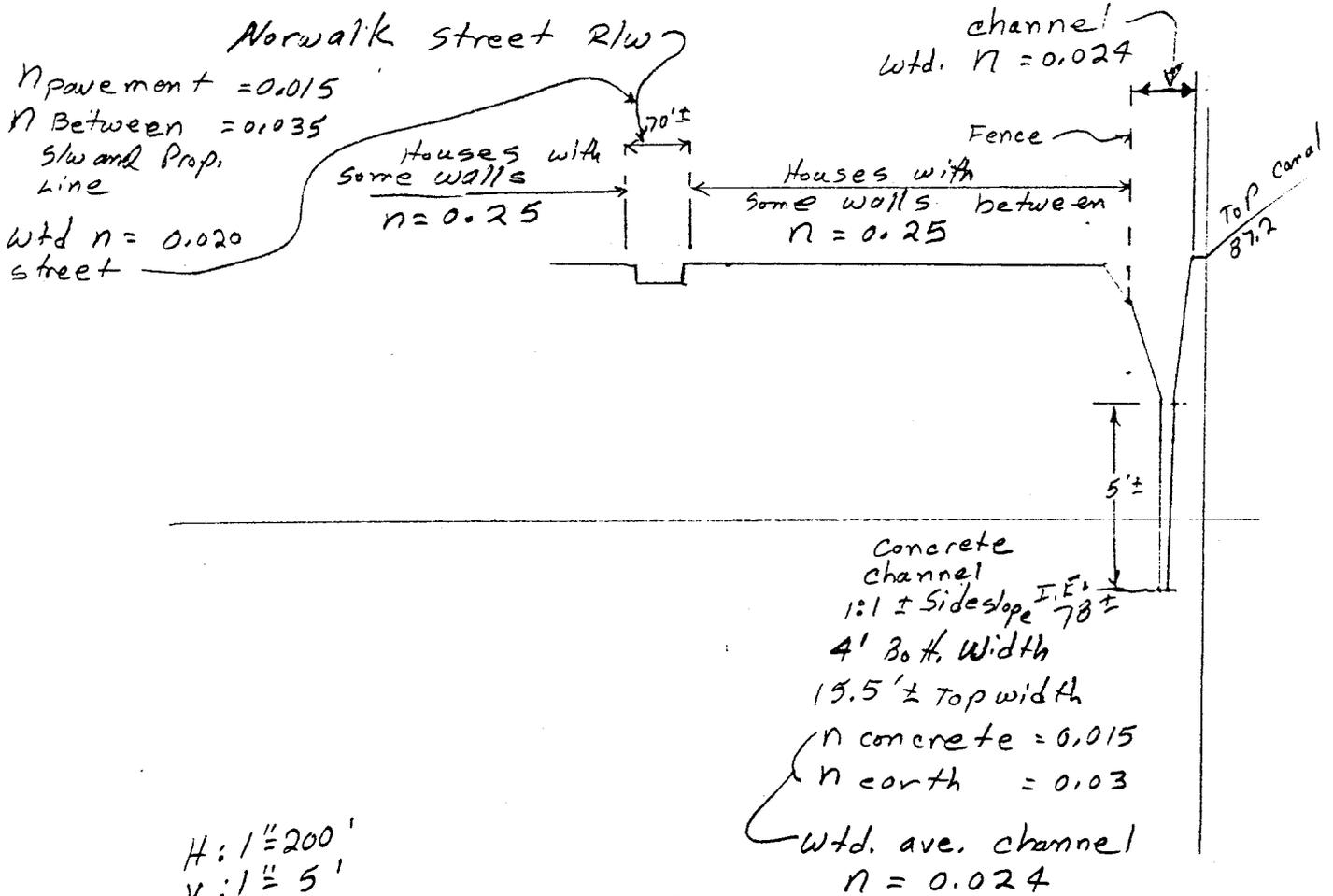
$V : 1'' = 5'$

Section @ R.M. 16.872 - Photo #4
(Looking Downstream)
A-16



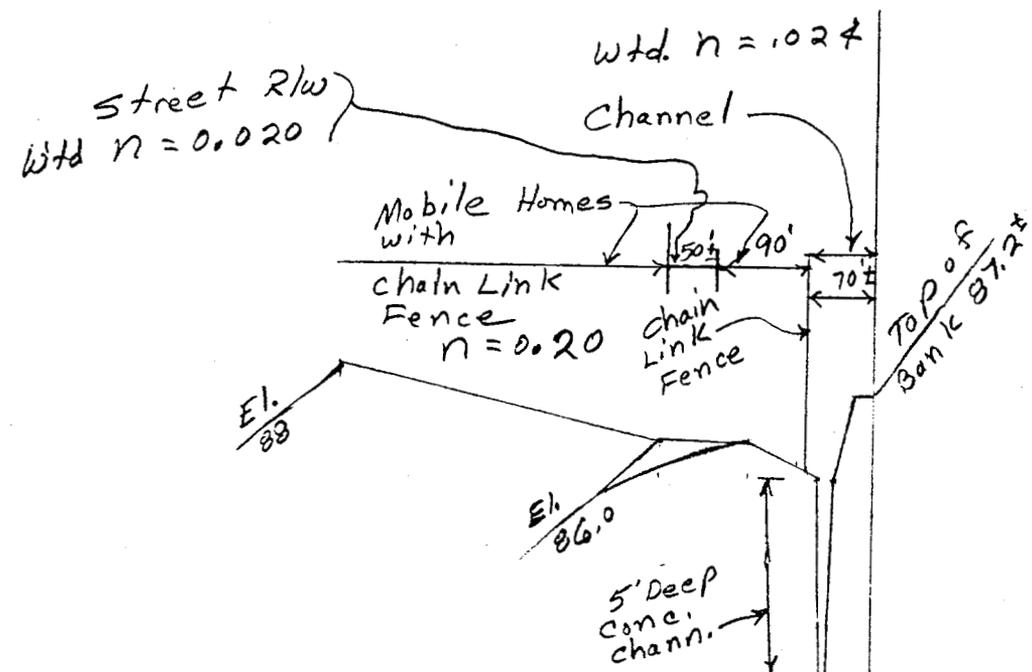
H: $1'' = 200'$
 V: $1'' = 5'$

Section @ RM 17.685 - Photo #10



H: $1'' = 200'$
 V: $1'' = 5'$

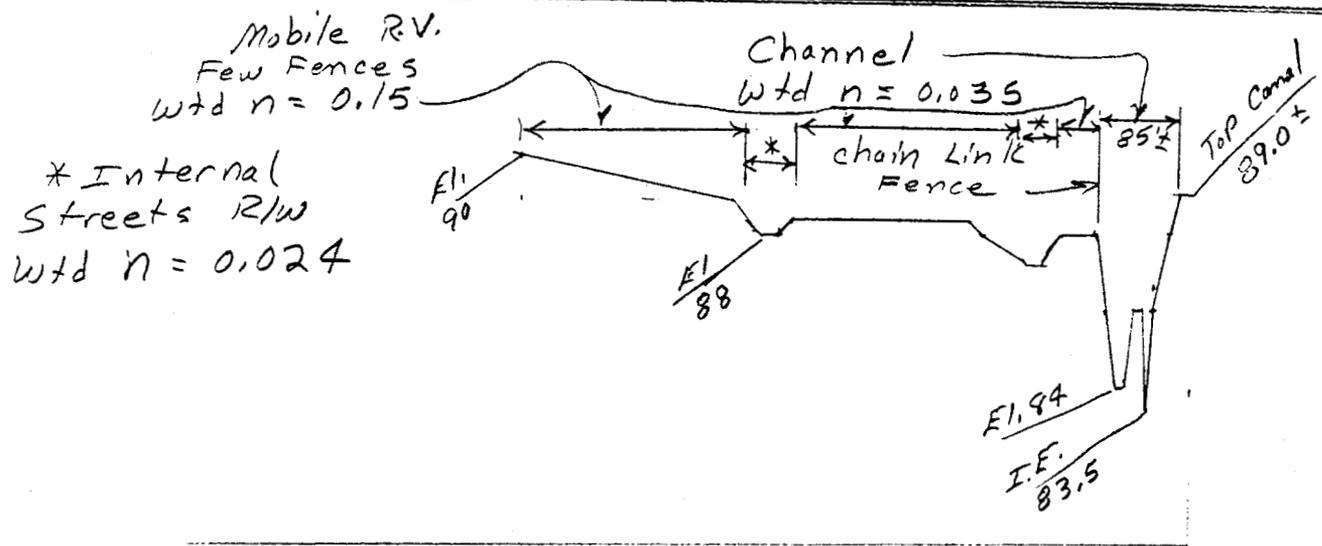
Section @ RM 18.215 - Photo #12



H: 1" = 20'
 V: 1" = 5'

Section @ R.M. 18.865 - Photo. 17

Bottom width 2'±
 1:1 side slopes
 12'± Topwidth



Section @ R.M. 19.455 - Photos 21 and 22

A-N WEST INC.

Consulting Engineers

May 1, 1997

Mr. Rajh Shah
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Re: FCD No. 96-10
Eastern Canal FIS
A-N West No. 7158-04

Dear Mr. Shah:

We herewith transmit the following preliminary data for your review and comment;

- 1) Two sets of blueines of preliminary plan view of Eastern Canal (6 sheets)
- 2) Two sets of preliminary cross-sections plots (17 sheets)
- 3) Two 3 1/2" disks of preliminary HEC-2 model input/output
- 4) One hard copy HEC-2 input/output
- 5) Table 1, Updated Road Crossing and Drainage Structure Summary
- 6) Table 2, Estimated Culvert Capacity
- 7) Table 3, Preliminary Summary WSEL Comparison; 100-year discharges with estimated discharge related to Profile 1 (flow at top of east top berm) and Profile 2 (flow at 0.5 foot above east top berm)
- 8) Preliminary culvert hydraulic calculations by HEC-5 at Baseline Road, Greenfield, U.S. 60, U.S. 60 culvert under Eastern Canal, Southern Avenue, Broadway Road and Main Street
- 9) ADOT as-built plan of culvert along U.S. 60 under Eastern Canal

Our preliminary culvert analysis by HEC-5 manual method and review of top of canal banks upstream of the culverts indicated that estimated 100-year discharges along the canal greatly exceed the combined capacity of the road dip section (if available) and culvert capacity. In earlier telephone conversations between A-N West and FCDMC regarding the lack of capacity along the canal to convey even a fraction of the computed 100-year discharges, it was suggested that some rating curve analysis be performed initially.

Our preliminary HEC-2 model analysis includes two profiles at this time. The Profile 1 discharges were chosen by trial to obtain a water surface profile which was near the east top of bank of the canal. Top of canal banks are not at a continuous grade and fluctuate in elevation. It was therefore necessary to choose low top of banks for various reaches of the canal from which various discharges were tried until a water surface elevation (WSEL) approximately matched the east top of the canal bank.

Profile 2 was chosen as the discharge which resulted in WSEL's approximately 0.5 foot above the low east top of canal berms. The 0.5 foot above top of east canal berm was chosen as what is anticipated to be the maximum ponding height upstream of the canal. At this ponding height, by weir equation with $C=2.8$, there would be one (1) CFS weiring over the canal per foot length of weir flow, which would likely pass the 100-year flows over the canal.

4.5 (1)

Table 3 summarizes the preliminary HEC-2 model results. Column 1 shows the preliminary peak 100-year discharges computed along the Eastern Canal. Column 2 shows the HEC-2 cross-section I.D. number in River Miles, which correlates to the plan view, cross-section plots and HEC-2 model.

Columns 3 and 4 are the respective preliminary Profile 1 and 2 discharges modelled in HEC-2.

Columns 5 and 6 are the respective resultant Water Surface Elevations (WSEL's) for the Profile 1 and 2 discharges.

Columns 7 and 8 are the respective upslope (east) and downslope (west) top of canal berm elevations.

We have underlined the upslope top of berm elevations where preliminary Profile 1 WSEL's are close to matching, indicating areas of potential overtopping and breakout for the Profile 1 reach discharge.

We have marked a preliminary floodplain on the plan view exhibit for this Profile 1 HEC-2 model and noted potential breakout areas.

Table 2 and attached culvert calculations show potential maximum culvert capacity with no tailwater (Column 4, Table 2), Profile, HEC-2 Profile 1 culvert capacity (Column 6, Table 2) and a check of HEC-2 model results by HEC-5 (Column 11, Table 2).

The 45' (span) x 29' (rise) x 196 foot long HEC-2 culvert under the Eastern Canal along the ADOT channel on north side of U.S. 60 has a capacity of approximately 102 CFS at top of east canal bank. This discharge may not have been accounted for in the hydrology. A copy of the ADOT as-built plan for this culvert is enclosed with HEC-5 capacity analysis.

We are forwarding a copy of this data to the City of Mesa. We have enclosed an extra copy for your transmittal to the hydrology consultant for their use in possible refinement of the hydrology.

We propose to continue to refine the profile of the canal with associated east and west top of canal banks, culvert and low top of road elevations which will aid in demonstrating the canal over topping problems and lack of capacity along the canal.

It would seem that a detailed floodplain analysis involving a Zone AE along the canal would not be possible due to the numerous overtopping areas.

A more refined approximate Zone A floodplain revision to the current approximate Zone A may be an alternate goal of this study to consider.

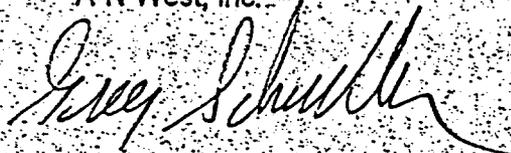
Mr. Rajh Shah
A-N West No. 7158-04

May 1, 1997
Page 3

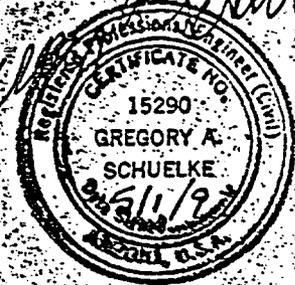
Should you have any questions, please call.

Sincerely,

A-N West, Inc.



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



GS/dh

cc: Mr. Peter Knudson, City of Mesa

enclosures

4.5 (3)

A-N WEST INC.

TABLE 1

EASTERN CANAL FIS
 UPDATED ROAD CROSSING AND DRAINAGE STRUCTURE SUMMARY

River Mile	Location	Description	Structure Type/Size
16.477	Baseline Road	Major Street with 0.5Foot Dip(2)	2-4' RCP's x 130'/Hdwall and Trsh RK(1)
16.938	Greenfield Rd.	Major Street with no Dip(2)	1-4' RCP x 95'/Hdwall(1)
17.160	U.S. 60 Culvert Under Canal	Culvert along channel under canal	1-45" x 29" x 196' long HECP, mitered inlet (5)
17.160	U.S. 60 Culvert Along Canal	Freeway with overpass, No Dip (2)	1-4' RCP x 730'/Hdwall and ½ TRSH RK) (1)
17.59	Southern Avenue	Major Street with 1.2± foot Dip(2)	2-24" RCP's x 160' with Hdwall (Bell End)(1)
18.680	Broadway Road	Major Street with 0.6± foot Dip(2)	1-6' and 1-4.5' RCP x 1100' with Hdwall and vertical TRSH RK(1)
19.251	Main St. (Apache Blvd)	Major Street, No Dip(2)	Inlet-1-30" RCP x 260' with Hdwall (Bell End)(1). Outlet - 1-10' x 4.25' RCB
19.526	Val Vista Dr.	Major Street, with 1.7± foot Dip(2)	1-30" RCP x 1780' with Hdwall and TRSH RK(3)
19.832	University Dr.	Major Street with 0.5± foot Dip(2)	same as pipe at Val Vista Drive(3)
20.402	Adobe Street	Major Street with 3.3± foot Dip(2)	Approx. 2 foot storm sewer size(3)
20.987	Brown Road	Major Street with 2± foot Dip(2)	Approx. 2 foot storm sewer size(3)
21.529	Lindsay Road	Major Street with 2.3± foot Dip(2)	Approx. 2 foot storm sewer size(3)
22.230	McKellips Road	Major Street with 0.9± foot Dip(2)	1-24" RCP with Hdwall(3)
22.916	Gilbert Road	Major Street with 2.5± foot Dip(2)	No Culvert/S.D.

- Notes:
1. Anticipate modeling culverts in HEC-2 model by special culvert option with road profile for weir flow over road or by subtracting the estimated culvert capacity from flow at cross-section locations where culverts are located.
 2. Dip denotes road profile which dips or is depressed below adjacent top of road at the canal to cause flow over road before flow over canal on road. Note: flow upstream may be overflowing canal before flow over road occurs.
 3. Where storm drain is noted, it is assumed the hydrology modeling reflects storm drain capacity.
 4. TRSH RK = Trash Rack. Hdwall = Headwall. RCP = Reinforced Concrete Pipe. RCB = Reinforced Concrete Box Culvert.
 5. This 45" span x 29" rise Horizontal Elliptical Concrete Pipe (HECP) conveys flow in concrete channel along north side.

Eastern Canal FIS HEC-2 Profile Run Output Summary Table 3

HEC-1 Q 100 cfs	Sec. No.	Estimate Capacity cfs		WSEL		Upslope	Downslope	Remarks
		Profile 1	Profile 2	Profile 1	Profile 2	Top of Bank	Top of Bank	
897		190	215	79.84	79.94	83.1	82	Baseline Road Culvert Q 200 WSE 82.2 Baseline Road Culvert, Low Top of Road 83.6
				79.97	80.07	84.1	82.6	
				81.71	82.41	83.6		
				81.9	82.41	81.9	82.4	
				81.98	82.44	82.3	82.8	
869		60	75	82.48	82.63	82.9	82.3	Greenfield Road Culvert, Low Top of Road = 85.0 Greenfield Road Culvert U.S. 60 Culvert U.S. 60 Culvert Holmes Park Detention Basin Holmes Park Detention Basin
				82.6	82.73	82.8	82.5	
				82.67	82.8	82.6	82.6	
				82.69	82.82	<u>82.6</u>	82.4	
				82.68	82.81	85.1	84.1	
1206		45	50	83.35	83.86	85.1	84.1	Southern Avenue Culvert, Low Top of Road = 85.5 Southern Avenue Culvert
				83.35	83.86	83.4	83	
				84.26	84.98	84.7	83.3	
				84.26	84.98	84.7	82.9	
				84.26	84.98	<u>84.3</u>	83	
1081				84.26	84.98	84.8	83	Greenfield Park Detention Basin Greenfield Park Detention Basin
				84.27	84.98	84.4	83	
				84.28	84.99	<u>84.2</u>	83.4	
				84.28	84.99	84.5	83.5	
				84.28	84.99	84.5	83.5	
1097		32	190	84.29	85	85.5	84.7	Greenfield Park Detention Basin Greenfield Park Detention Basin
				85.58	85.89	87	86.6	
				85.58	85.9	87	86.2	
				85.58	85.91	87	86.8	
				85.58	85.92	87	86.1	
1108				85.58	85.94	87	86.3	Greenfield Park Detention Basin Greenfield Park Detention Basin
				85.58	85.95	87	87.1	
				85.58	85.97	87	87.1	
				85.58	86	85.8	86.7	
				85.59	86.04	<u>85.6</u>	86.9	
1487		162	170	85.59	86.09	86.4	87.1	Greenfield Park Detention Basin Greenfield Park Detention Basin
				85.59	86.09	86.9	87	
				85.59	86.09	86.9	86.9	
				85.59	86.09	86.8	87	
				85.59	86.09	86.9	86.9	
1342				85.93	86.36	86.8	87.1	Greenfield Park Detention Basin Greenfield Park Detention Basin
				85.94	86.37	86.9	86.9	
				85.95	86.38	87	86.8	

4.5(6)

Eastern Canal FIS HEC-2 Profile Run Output Summary Table 3

	18.428			85.95	86.38	87	86.7
1326	18.487			85.96	86.38	87.2	86.7
1293	18.721			86.97	87.5	87.1	87.3
	18.766	23	23	86.98	87.5	87.3	<u>87.1</u>
	18.821			86.98	87.5	<u>87</u>	87.3
	18.861			86.98	87.5	87.5	87.3
	18.908			86.98	87.5	87.8	87.4
1032	18.965			86.98	87.5	88.2	87.5
	18.999			86.98	87.5	88.1	87.8
	19.088			86.98	87.5	87.9	88
	19.151			86.98	87.5	88	87.9
1004	19.186			86.98	87.5	88.2	87.9
	19.262			87.98	88.5	<u>88</u>	88.5
	19.294	260	430	87.98	88.49	88.7	88.5
	19.339			88.04	88.58	88.7	88.6
	19.381			88.08	88.63	88.6	89
	19.43			88.14	88.72	88.8	88.8
726	19.473			88.21	88.8	89.5	89.1
	19.502			88.29	88.29		
	19.623			88.42	88.93	88.7	89.3
	19.67			88.45	88.97	<u>88.5</u>	88.9
	19.716			88.48	88.99	<u>88.5</u>	88.9
	19.764			88.7	89.19	88.7	88.8
767	19.808	1	1	88.85	89.29		
	19.83			88.85	89.29	89.3	89.1
	19.871			88.85	89.29	88.5	88.8
	19.924			88.85	89.29	88.5	88.4
	19.971			88.85	89.29	<u>88.7</u>	88.7
	20.015			88.85	89.29	<u>88.5</u>	88.6
	20.051			88.85	89.29	<u>88.2</u>	88.9
	20.082			88.85	89.29	<u>88.7</u>	89.1
	20.139			88.85	89.29	<u>88.7</u>	89.2
	20.179			88.85	89.29	89.2	89.4
781	20.244			88.85	89.29	89.4	90.3
	20.289			88.85	89.29	89.3	89.8
	20.324			88.85	89.29	89.1	90
	20.379			88.85	89.29		
	20.393	35	85	88.85	89.29	89.26	90.5
	20.432			88.85	89.29	89.2	90.5
	20.465			88.85	89.29	89	90.7
	20.515			89	89.43	89.3	90.7

Broadway Road Culvert, Low Top of Road = 88.0
 Broadway Road Culvert, Low Top of Road = 88.0

Main Street Culvert, Low Top of Road = 90.0
 Main Street Culvert, Low Top of Road = 90.0

Val Vista Road, Low Top of Road = 87.3

University Drive
 Low Top of Road 88.7

Overtops Bank
 Overtops Bank

Ridge

Adobe Street, Low Top of Road = 88.2

4.5(7)

Eastern Canal FIS HEC-2 Profile Run Output Summary Table 3

	20.559			89.06	89.53	<u>89.2</u>	90.7
692	20.608			89.12	89.59	89.4	90.8
	20.651			89.17	89.65	<u>89.2</u>	90.8
	20.676			89.22	89.71	89.5	90.8
	20.727			89.26	89.76	89.6	90.6
	20.768			89.27	89.78	<u>89.3</u>	91
703	20.815			89.29	89.8	<u>89.3</u>	90.4
	20.87			89.31	89.84	89.4	90.4
	20.912			89.45	89.97	89.7	90.3
	20.963	130	330	90.93	91.13		
	20.974			91.08	91.33		
	21.02			91.08	91.34	91.3	91.5
	21.088			91.08	91.34	91.5	91.1
	21.137			91.08	91.34	91.4	91.1
	21.196			91.09	91.38	91.4	91.2
	21.256			91.14	91.53	91.8	91.3
637	21.315			91.23	91.74	91.3	91.7
	21.375			91.29	91.8	<u>91.3</u>	91.7
	21.432			91.3	91.81	91.5	91.6
	21.463			91.31	91.82	91.8	92.8
	21.492	1	1	91.34	91.87	90.6	91.5
	21.603			91.35	91.87	<u>90.6</u>	91.5
216	21.665			91.35	91.87	91	92.3
	21.716			91.35	91.87	<u>91.3</u>	92.3
	21.774			91.35	91.87	<u>91.3</u>	91.7
	21.819			91.35	91.87	91.5	91.8
	21.859			91.35	91.87	91.5	91.5
	21.914			91.35	91.87	<u>91.2</u>	91.1
218	21.963			91.35	91.87	<u>91.1</u>	91.4
	22.014			91.35	91.87	91.9	92
	22.063			91.35	91.87	91.6	91.8
	22.112			91.35	91.87	92	92
240	22.208	100	275	92.92	93.08		
	22.236			93.03	93.26	94.2	94.1
	22.283			93.66	93.88	94.6	95.3
	22.304			93.94	94.33	94.3	95.2
	22.35			93.98	94.43	94.2	94.6
	22.401			93.99	94.46	94.2	94.6
	22.444			94	94.49	<u>94</u>	95.3
333	22.488			94.01	94.52	<u>94</u>	95.2
	22.541	215	305	94.02	94.53	94.7	95.3

Brown Road, Low Top of Road = 90.5

Lindsay Road, Low Top of Road = 91.2 (Overtops Bank)

McKellips Road, Low Top of Road = 92.8

Ridge

4.5(8)

Eastern Canal FIS HEC-2 Profile Run Output Summary Table 3

	22.571	94.02	94.53	94.7	95.2
	22.609	94.02	94.53	94.2	95.2
	22.636	94.01	94.53	94.2	94.8
	22.695	94.1	94.6	<u>94.1</u>	94.5
273	22.744	94.12	91.87	94.2	94.6
	22.798	94.15	94.65	94.5	94.8
	22.849	94.18	94.68	94.8	94.6
	22.932	94.24	94.71	94.5	94.8
	22.976	94.24	94.71	94.5	95.8

4.5(9)

PROJECT: Engleern Canal
Baseline Rd, Culvert

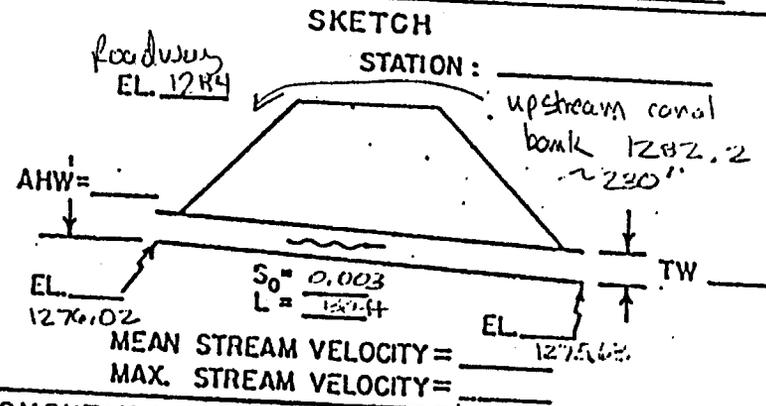
DESIGNER: E.P.
 DATE: 4/2/97 Rev. 4/29/97

HYDROLOGIC AND CHANNEL INFORMATION

2 4' RCPs with Trash rack
 30° from vertical
 D = 4 ft.

$Q_1 =$ _____ $TW_1 =$ _____
 $Q_2 =$ _____ $TW_2 =$ _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
 Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})



CULVERT DESCRIPTION (ENTRANCE TYPE)	Q "	SIZE	HEADWATER COMPUTATION										CONTROLLING H ₁	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL						HW = H + h ₀ - LS ₀					
			HW/D	HW	K ₀	H	d _c	$\frac{d_c + D}{2}$	TW	h ₀	LS ₀	HW				
Grp edge - HW	110	48"	1.5	6.18	0.5	3.3	3.2	3.6		3.6	0.39	6.51	6.51			OUTLET CONTROL
	105	48"	1.5	6.18	0.5	3.0	3.2	3.6		3.6	0.39	6.21	6.21			" "
→	100	48"	1.5	6.18	0.5	2.8	3.2	3.6		3.6	0.39	6.01	6.18			INLET CONTROL
	80	48"	1.4	5.69	0.5	1.82	-	-	4.34	4.34	0.39	5.77	5.77			OUTLET CONTROL

SUMMARY & RECOMMENDATIONS:

Multiply X 2 = 200 cfs. Trash rack effect on entrance loss assumed negligible.
 HEC 2 results X 2 = 160 cfs

A.5(10)

HEC 2 RESULTS
 TW = 79.97
 HW = 81.71

Q = 80

PROJECT: Eastern Canal

Greenfield Rd.

DESIGNER: DB

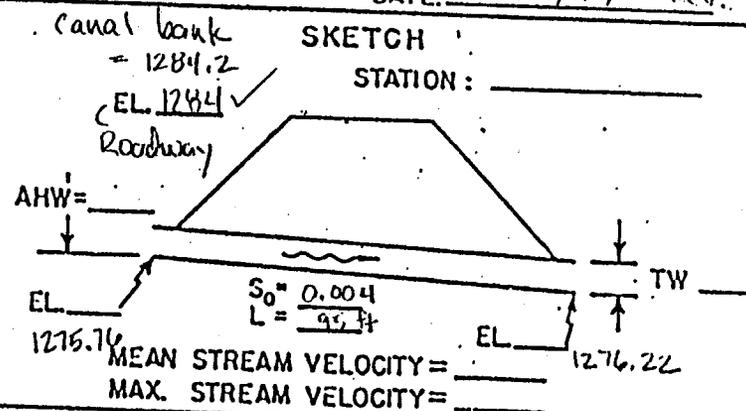
DATE: 4/2/97 Rev. 4/29/97

HYDROLOGIC AND CHANNEL INFORMATION

4' RCP

Q₁ = _____ TW₁ = _____
 Q₂ = _____ TW₂ = _____

(Q₁ = DESIGN DISCHARGE, SAY Q₂₅
 Q₂ = CHECK DISCHARGE, SAY Q₅₀ OR Q₁₀₀)



CULVERT DESCRIPTION (ENTRANCE TYPE)	q	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS		
			INLET CONT.		OUTLET CONTROL HW = H + h ₀ - LS ₀						TW	h ₀					LS ₀	HW
			HW/D	HW	K _e	H	d _c	(d _c +D)/2										
Sqr edge - HW	145	48"	2.06	8.24	0.5	3.8	3.15	3.73	—	3.73	0.46	7.07	8.24			INLET CONT.		
	60	48"	1.90	7.59	0.5	0.67	—	—	6.46	6.46	0.46	6.67	7.59			INLET CONT.		

4.5(11)

HEC 2
 Profile 1
 HW = 83.35
 TW = 82.68

Q = 140

SUMMARY & RECOMMENDATIONS:

Q_{max} = 145 cfs

PROJECT: _____

U.S. 60

DESIGNER: AB

DATE: 4/2/97

HYDROLOGIC AND CHANNEL INFORMATION

48" RCP - Square edge (HW)

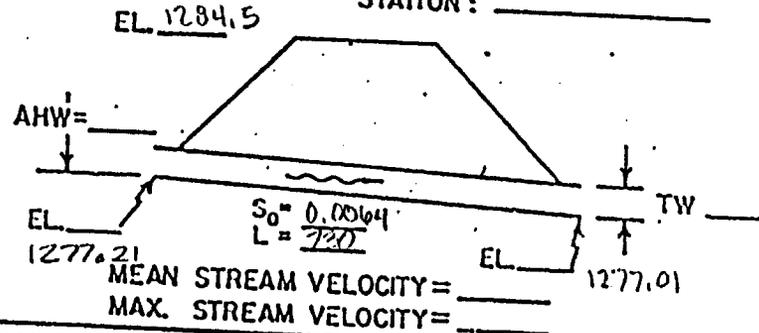
Q₁ = _____
Q₂ = _____

TW₁ = _____
TW₂ = _____

(Q₁ = DESIGN DISCHARGE, SAY Q₂₅
Q₂ = CHECK DISCHARGE, SAY Q₅₀ OR Q₁₀₀)

SKETCH

STATION: _____



CULVERT DESCRIPTION (ENTRANCE TYPE)	Q -	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS	
			INLET CONT.		OUTLET CONTROL						HW = H + h ₀ - LS ₀						
			H/W D	HW	K _e	H	d _c	$\frac{d_c + D}{2}$	TW	h ₀	LS ₀	HW					
Sqr. edge HW	130	4'	1.82	7.29	0.5	7.56	3.1	3.7		3.7	0.2	11.06	11.06			OUTLET CONT	
	125	↓	↓	↓	↓	7.0	3.35	3.68		3.68	0.2	10.48	10.48			" "	
	100	↓	↓	↓	↓	4.5	3.1	3.55		3.55	0.2	7.85	7.85			" "	
	90	↓	↓	↓	↓	3.6	2.8	3.4		3.4	0.2	6.8	7.25			" "	
	95	4	1.82	7.29	0.5	4.0	2.9	3.45		3.45	0.2	7.25	7.29			INLET CONT.	
→	57	4	1.76	7.05	0.5	0.91	-	-		6.34	6.34	0.2	7.05			~ max Q	
																	OUTLET CONT / INLET

SUMMARY & RECOMMENDATIONS:

Q_{max} = 95 cfs

4.5(12)

HEC 2
Profile 1
HW = 84.26
TW = 83.35

- Decrease Q

Increase Q

OUTLET CONT / INLET

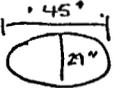
ADOT Culvert

PROJECT: _____

DESIGNER: AB

ADOT Culvert Under Eastern Canal along U.S. 60 N. Side 8/13
 DATE: _____

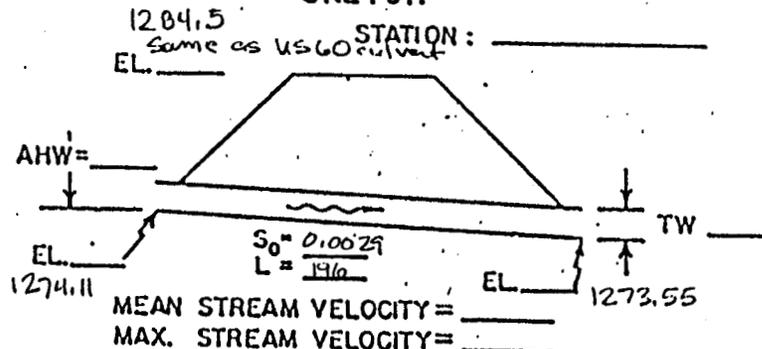
HYDROLOGIC AND CHANNEL INFORMATION

$D = 2.42'$

 29"x45" x 196" Elliptical RCP (Horizontal)
 Equiv. Dia = 36"
 Mitered.

$Q_1 =$ _____ $TW_1 =$ _____
 $Q_2 =$ _____ $TW_2 =$ _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
 Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH



ELEVATIONS ARE NOT BASED ON SAME DATUM AS STATE SURVEY (OTHLR) ± 0.6 ft

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q -	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW = H + h ₀ - LS ₀											
			HW/D	HW	K _c	H	d _c	$\frac{d_c + D}{2}$	TW	h ₀	LS ₀	HW				
Mitered, HW	110	29x45	4.29	10.39	0.5	9.6	2.42	2.42	2.06	2.42	0.56	11.46	11.46			d _c = D outlet control (decrease Q)
	100					7.75	2.42	2.42	1.97	2.42	0.56	9.61	10.39			d _c = D; inlet control (increase Q)
	105					8.75	2.42	2.42	2.02	2.42	0.56	10.61	10.61			d _c = D outlet control (decrease Q)
	102					8.2	2.42	2.42	1.99	2.42	0.56	10.06	10.39			Inlet control ~ Q _{max}

SUMMARY & RECOMMENDATIONS:

TW determined from flowmaster, n = 0.012, trapezoidal channel 2:1 sideslope, 0.00425 watercourse slope

$Q_{max} \approx 102$ cfs.

4.5 (3)

PROJECT: _____

Broadway Rd.

DESIGNER: AB

DATE: 4/2/97 Rev. 4/20/97

HYDROLOGIC AND CHANNEL INFORMATION

(1) 6' Spill Edge HW

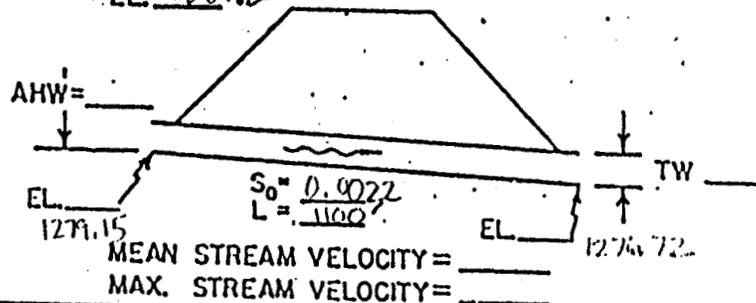
Q₁ = _____ TW₁ = _____
 Q₂ = _____ TW₂ = _____

(Q₁ = DESIGN DISCHARGE, SAY Q₂₅
 Q₂ = CHECK DISCHARGE, SAY Q₅₀ OR Q₁₀₀)

Roadway = 12.88
 canal bank
 EL. 1287.2

SKETCH

STATION: _____



CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW = H + h ₀ - LS ₀											
			HW/D	HW	K _e	H	d _c	$\frac{d_c + D}{2}$	TW	h ₀	LS ₀	HW				
Spill-edge HW	280	6	1.34	8.05	0.5	6.4*	4.7	5.35		5.35	2.42	9.23	9.23			Outlet Control
	250					5.1*	4.3	5.15		5.15	2.42	7.83	8.05			Inlet Control
	260					5.5*	4.4	5.2		5.2	2.42	8.28	8.28			Outlet Control
	255	6	1.34	8.1x	0.5	5.3*	4.35	5.18		5.18	2.42	8.06	8.06			Inlet Control
	112	6	1.30	7.82	0.5	1.01	-	-	9.24	9.24	2.42	7.83	7.83			Outlet Control, Q = 11

SUMMARY & RECOMMENDATIONS:

* By excel spreadsheet.

Q_{max} (6' RCP) = 255 cfs.

Total = 397 cfs

HEC 2 Profile 1; Total = 36 + 18 = 54 cfs.

4.5(15)

HEC 2 Profile 1
 TW = 85.96
 HW = 86.97

Reduce C
 Increase
 Reduce C

PROJECT: _____

Main Street Culvert

DESIGNER: JB

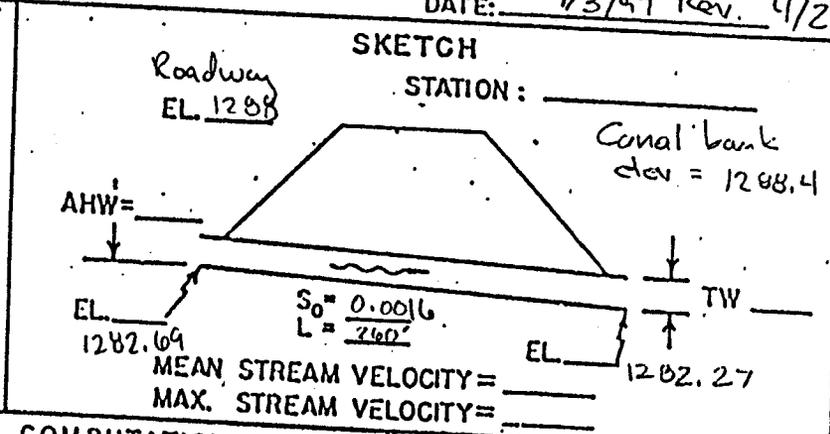
DATE: 4/3/97 Rev. 4/20/97

HYDROLOGIC AND CHANNEL INFORMATION

(1) 30" RCP with another culvert joining to form 8'x3' RCB.

Q₁ = _____ TW₁ = _____
 Q₂ = _____ TW₂ = _____

(Q₁ = DESIGN DISCHARGE, SAY Q₂₅
 Q₂ = CHECK DISCHARGE, SAY Q₅₀ OR Q₁₀₀)



CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS		
			INLET CONT.		OUTLET CONTROL HW = H + h ₀ - LS ₀						TW	h ₀					LS ₀	HW
			HW/D	HW	K _e	H	d _c	$\frac{Q_c + D}{2}$										
groove (HW)	45	2.5	2.12	5.31	0.2	4.3	2.25	2.38										
	40	2.5	2.12	5.31	0.2	3.4	2.2	2.35				2.30	0.42	6.26	6.26			OUTLET CONT. Reduc.
												2.35	0.42	5.33	5.33			INLET CONT. max. Q
	22	2.5	1.72	4.29	0.2	1.0	—	—	5.71	5.71	0.42	6.29	6.29					OUTLET CONT. Q=22

SUMMARY & RECOMMENDATIONS:

Q_{max} = 40 cfs.

4.5(17)

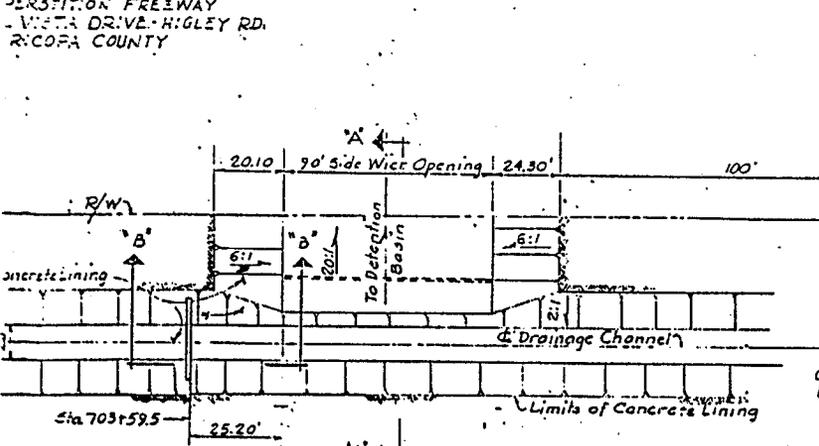
HEC-2
 RESULTS
 TW =
 HW

OUTLET CONT. Reduc.
 INLET CONT. max. Q
 OUTLET CONT. Q=22

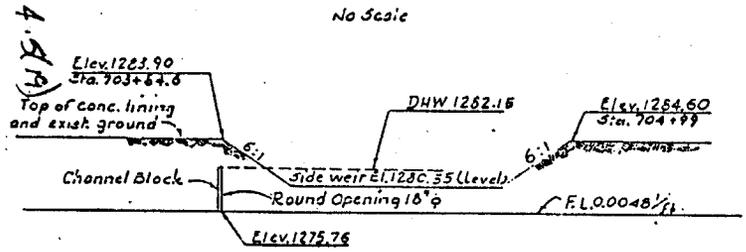
PERSTITION FREEWAY
 - VISTA DRIVE - HIGLEY RD.
 - RICOPA COUNTY

DATE	BY	PROJECT	SCALE
1-11-77	J.R.	BP-028-1-510	5/8" = 1'-0"

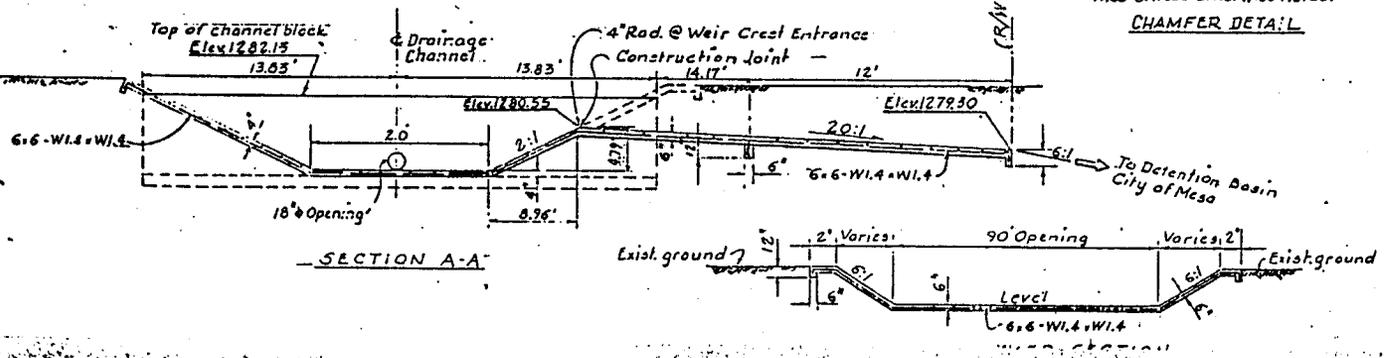
GENERAL NOTES
 Construction - Standard Specifications
 Arizona Highway Department
 Edition of 1982 revised to date.
 Design - AASHTO Standard Specifications
 for Highway Bridges 1977, revised to date.
 Stresses - $f_c = 2500 \text{ psi}$ - Class 2 concrete
 $f_s = 20,000 \text{ psi}$ - Class 40
 reinforcing steel.
 All concrete shall be Class 2, $f_c = 2500 \text{ psi}$.
 Reinforcing steel shall conform to
 ASTM Specification A615, Grade 40.
 Welded wire fabric shall conform to ASTM
 Specification A185.
 All reinforcing steel dimensions shall be
 to center of bars unless noted
 otherwise.
 All reinforcing steel shall have 2" clear
 cover unless noted otherwise.
 Construction joints through lining shall
 be located at an interval of 20 feet
 maximum or as directed by the
 Engineer.
 Allowable soil pressure = 2 Tons/sq. ft.
 Dimensions shall not be scaled from
 drawings.



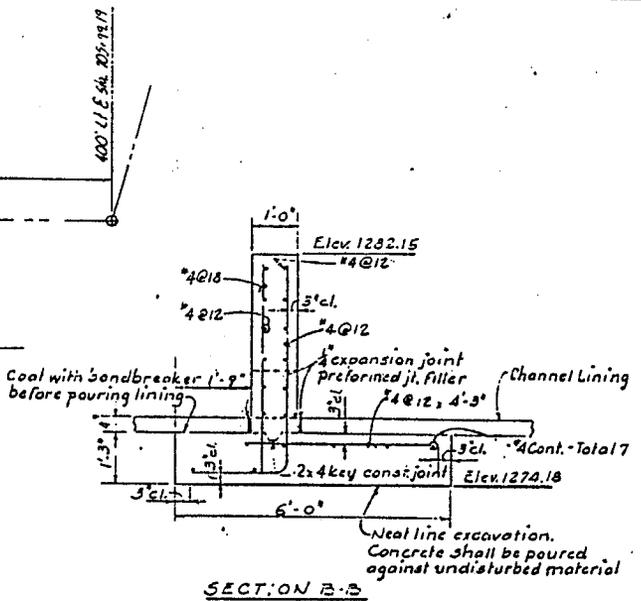
PLAN
 No Scale



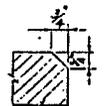
ELEVATION



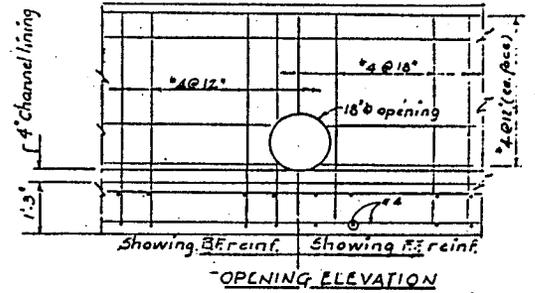
SECTION A-A



SECTION B-B



Chamfer all exposed corners
 thus unless otherwise noted.
CHAMFER DETAIL



OPENING ELEVATION

APPROX. QUANTITIES (for informational purposes only)

	Concrete	Reinforcing Steel	6x6-W14-W14 Wire Fabric	Str. Excav.
Chan Block	14.6 CY	760 lbs.	-	15 CY
Weir	3863 Y.	-	3863 Y.	-

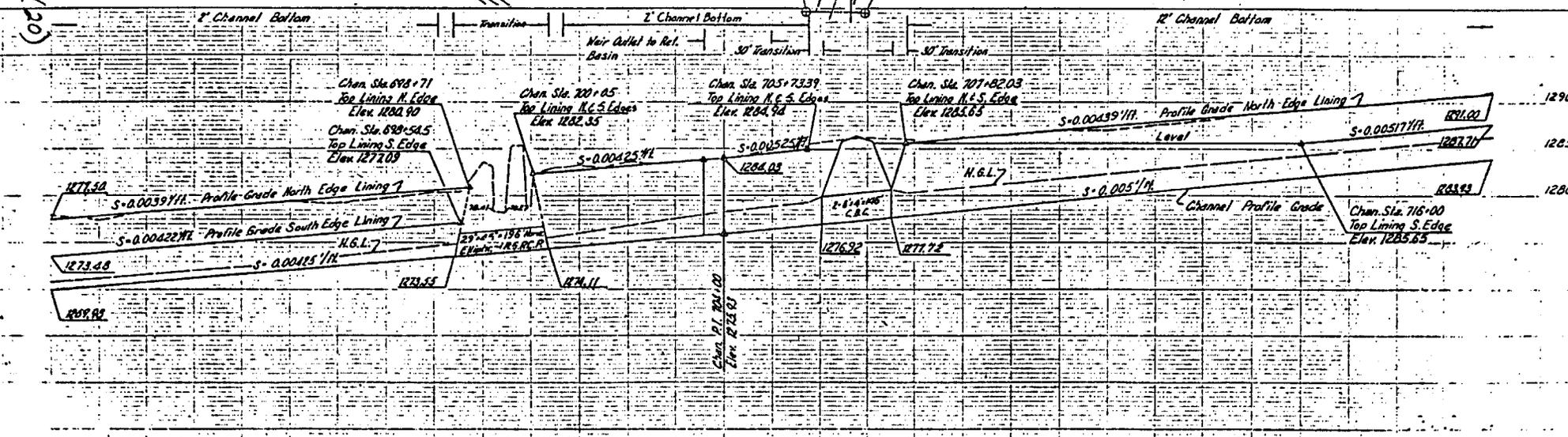
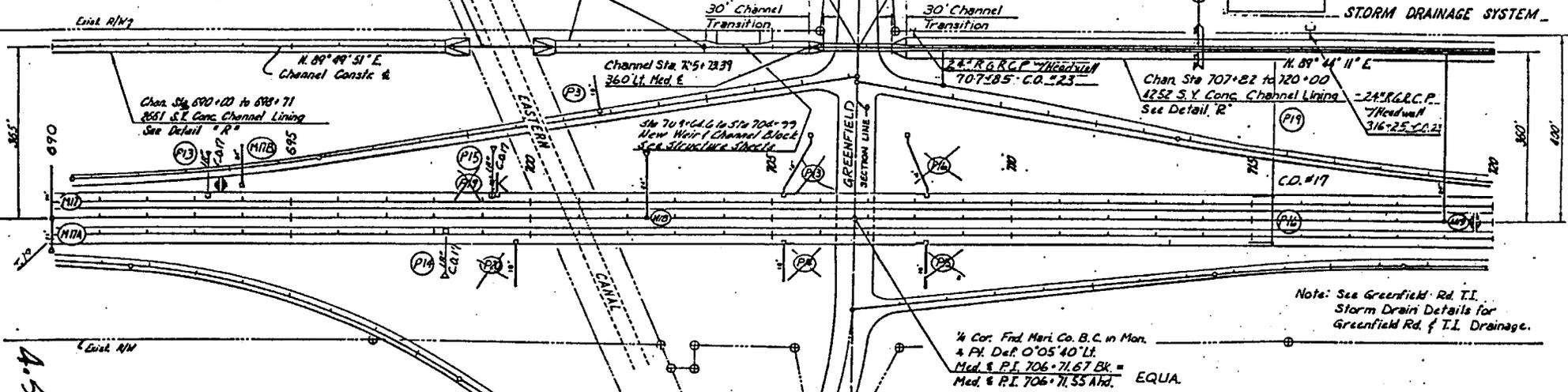
DATE	1-11-77
BY	J.R.
PROJECT	BP-028-1-510
SCALE	5/8" = 1'-0"

ARIZONA DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
 STRUCTURES SECTION
 STA. 703+59.5

PERSTITION FREEWAY
 L VISTA DR. - HIGLEY RD.
 ARIZONA COUNTY

Channel Sta. 698+40 to Sta. 700+55
 New 29°45'19.6" N.E. R.G.R.C.P.
 Channel Sta. 700+05 to 705+73.39
 24.54 S.Y. Conc. Channel Lining
 See Detail "R"
 Channel Sta. 705+73.39 to Sta. 707+82.03
 New 2°-8'4" N.46°-0" C.B.C.
 Sld. CB-2
 Channel Sta. 703+60
 36.5' Lt. Med. E.
 Channel & P.I. 706+76.39 Bk. = EQUA.
 Channel & P.I. 706+79.03 And
 360' Lt. Med. E. Sta. 706+79.03

PROJECT NO.	STATE	PROJECT NO.	SHEET TOTAL	AS BUILT
ARIZ.	RP-028-1-510	05	288	23-75
SCT CONSULTING ENGINEERS, INC.				
DESIGN: R.W.S. DRAWN: J.A.H. CHECKED: J.C.A.				



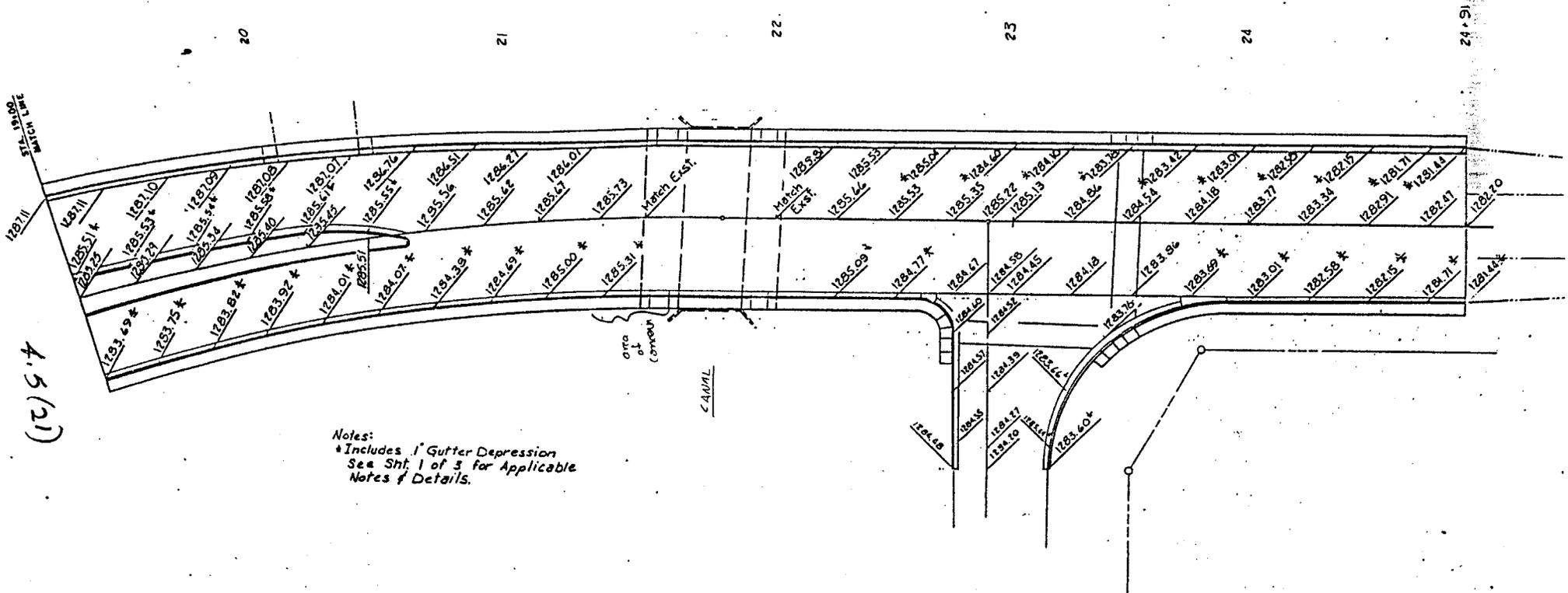
4.5.200

Note: See Greenfield Rd. T.I. Storm Drain Details for Greenfield Rd. f T.I. Drainage.

SUPERSTITION FREEWAY
VAL VISTA DR. - HIGLEY RD.
MARICOPA COUNTY



F.P.M.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	F0281-510	20	23	23-14



Notes:
*Includes 1' Gutter Depression
See Sht. 1 of 3 for Applicable
Notes & Details.

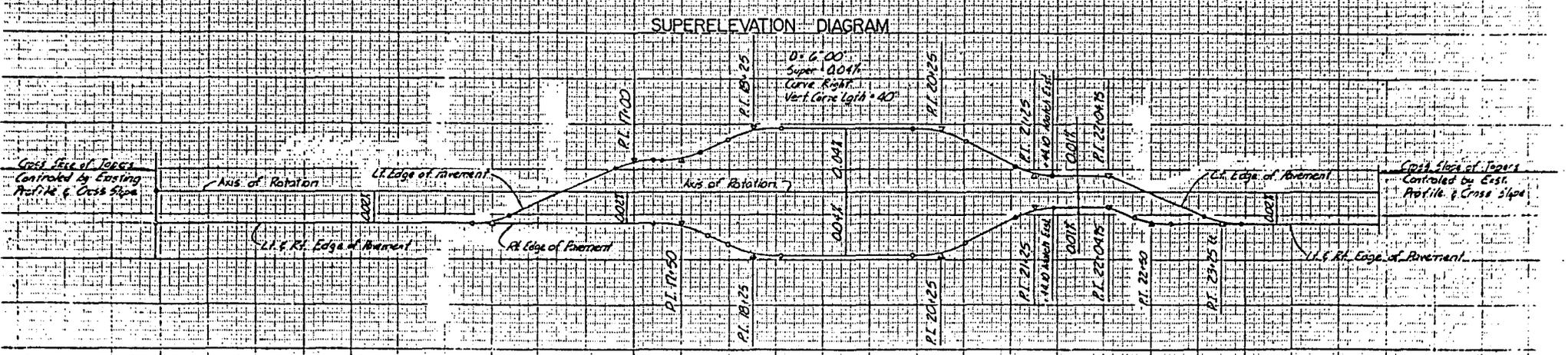
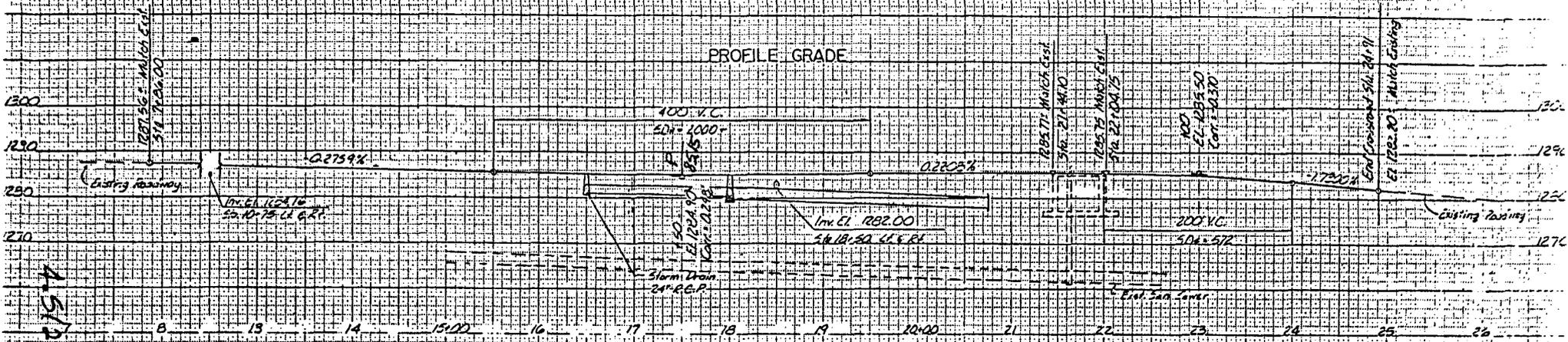
GREENFIELD RD. T.I.
STAKING DIAGRAM

SUPERSTITION FREEWAY
VAL VISTA DR. - HIGLEY RD.
MARICOPA COUNTY

GREENFIELD ROAD



PROJECT NO.	12P-0231-510
SHEET NO.	571
DATE	11/18/00



4.5/123

VAL VISTA DR. - HIGLEY RD.
MARICOPA COUNTY

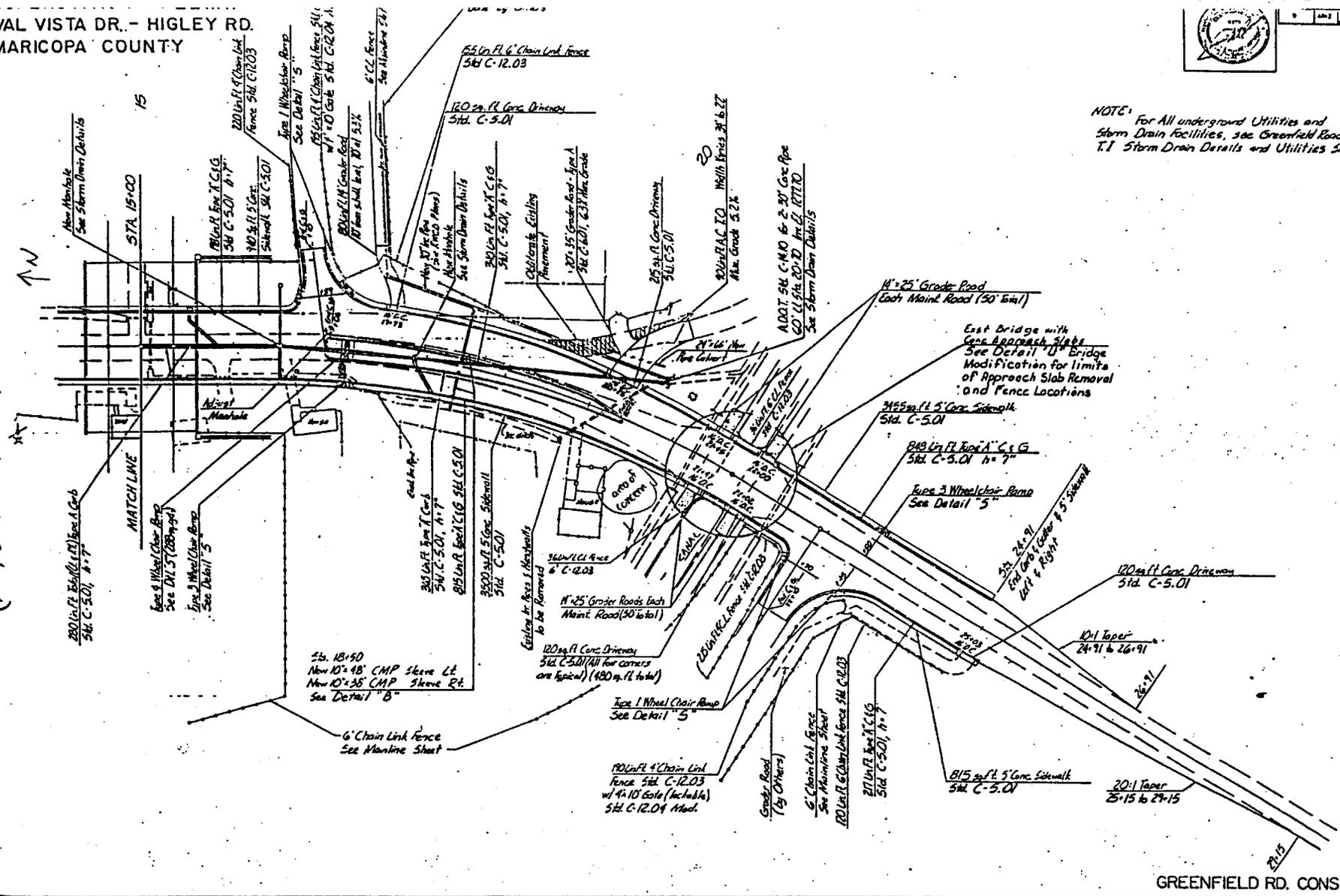


DATE: 02-28-1-1012

NOTE: For All underground Utilities and Storm Drain Facilities, see Greenfield Road T.I. Storm Drain Details and Utilities Sheet.

K. Kee 1/27/10

4.5(24)



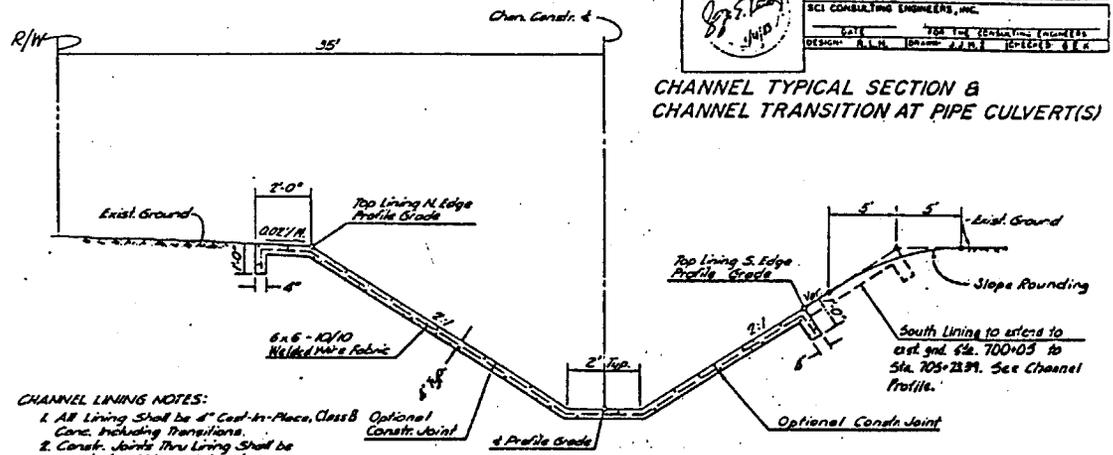
GREENFIELD RD. CONSTRUCTION

BP-028-1-510

PERSTITION FREEWAY
 4 VISTA DR. - HIGLEY RD.
 RICOPA COUNTY

CDMA REGION	STATE	PROJECT NO.	SHEET TOTAL	NO. BUILT
9	ARIZ	BP-028-1-510	26	28
SCL CONSULTING ENGINEERS, INC.				
DATE: 7/24/10				
DESIGN: A.L.H. DRAWN: J.J.H. CHECKED: G.C.				

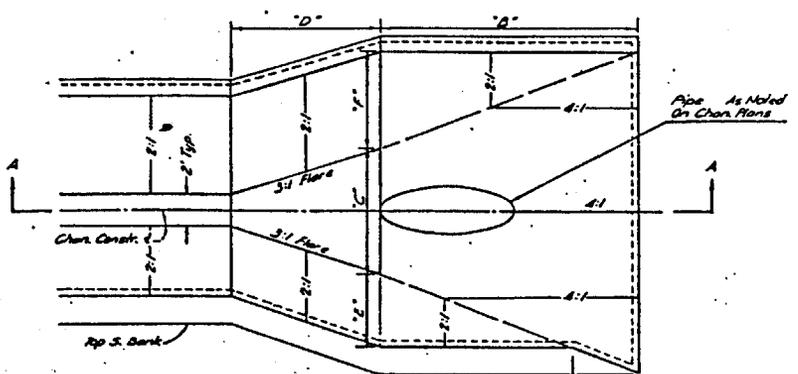
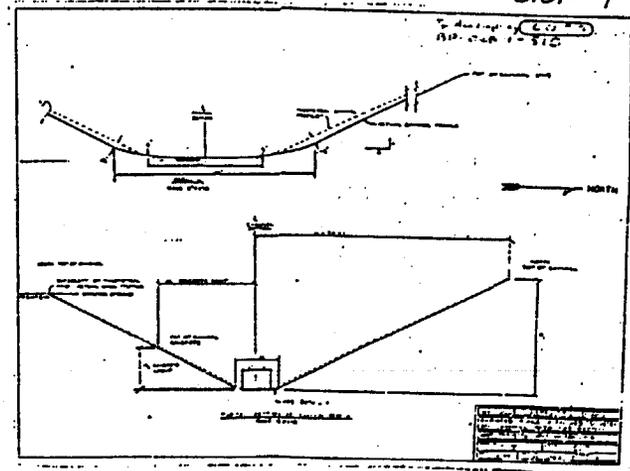
CHANNEL TYPICAL SECTION &
 CHANNEL TRANSITION AT PIPE CULVERT(S)



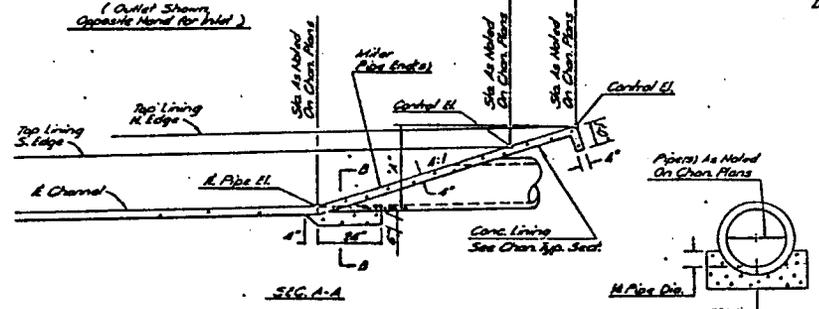
- CHANNEL LINING NOTES:
1. All Lining Shall be 4" Cast-In-Place, Class B Concrete, Including Transitions.
 2. Constr. Joints Thru Lining Shall be Located @ 80' Max. Intervals or As Directed by the Engineer.

CHANNEL TYPICAL SECTION

C.O.#9



PLAN
 (Outlet Shows Opposite Hand For Inlet)



SEC. A-A

SEC. B-B

4.5(26)

CHANNEL TRANSITION DIMENSION SCHEDULE							
		A	B	C	D	E	F
39TH STREET 36" R.R.C.R.	Inlet	5.44'	21.9'	5.0'	4.5'	8.86'	11.18'
	Outlet	5.67'	22.1'	5.0'	4.5'	8.56'	10.78'
EASTERN CANAL 24" x 40" R.R.C.P. Arch	Inlet	2.97'	31.0'	5.0'	4.5'	16.20'	18.20'
	Outlet	2.85'	31.0'	5.0'	4.5'	8.96'	14.46'
	Inlet						
	Outlet						
	Inlet						
	Outlet						

DETAIL OF CHANNEL TRANSITION AT PIPE CULV(S)

File Copy

A-N WEST INC.

Consulting Engineers

May 15, 1997

Mr. Rajh Shah
Flood Control District
of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Re: FCD No. 96-10
Eastern Canal FIS
A-N West No. 7158-04

Dear Mr. Shah:

We herewith transmit the following preliminary data for your review and comment;

- 1) One set of blueines of preliminary plan view of Eastern Canal (6 sheets).
- 2) Table 4 Preliminary Summary WSEL Comparison and updated approximate Zone A Floodplain elevations and widths.

The updated approximate Zone A Floodplain delineation was determined by the method discussed in the May 9, 1997 meeting between FCD, City of Mesa and A-N West. Pursuant to City of Mesa's request, an updated approximate Zone A was determined from the low top of the high canal bank within 200 feet± upstream or downstream of the cross sections. The exhibits show the updated Zone A. Low top of canal banks were determined by comparing each adjacent upstream and downstream cross section canal bank elevations to the specific cross section and selecting the low top of the high canal bank accordingly. The resulting updated Zone A is based on the current topography data.

Table 4 summarizes the preliminary HEC-2 model results previously submitted in our May 1, 1997 letter report, with the addition of columns 9 and 10. Columns 9 and 10 provide elevation and floodplain width data utilized to show updated approximate Zone A on exhibits. In addition, the asterick (*) upslope canal bank aerial topography elevations were replaced with field surveyed data where the surveyed elevation was higher than the aerial topography elevation.

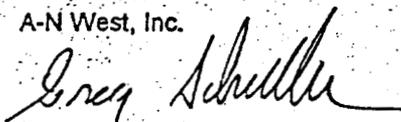
We are forwarding a copy of this data to the City of Mesa.

We propose to continue preparing the plan views showing Profiles 1 and 2, approximate Zone A and updated approximate Zone A (based on low top of high canal bank) with FCDMC format for submittal to FEMA. A technical data notebook in FCD format is also being prepared.

Should you have any questions, please call.

Sincerely,

A-N West, Inc.



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

GS/dh

cc: Peter Knudson, City of Mesa

4.5(27)

Table 4 Eastern Canal FIS HEC-2 Profile Run Output Summary and Updated Approximate Zone A

HEC-1 Q 100 cfs	Sec. No.	Estimated Capacity cfs		WSEL		Upslope	Downslope	Low Top of	Floodplain Width	Remarks	
		Profile 1	Profile 2	Profile 1	Profile 2	Top of Bank	Top of Bank	High Canal Bank Elev.	From Hydraulic Baseline (ft)		
897		190	215	16.422	79.84	79.94	83.1	82	83.1	990	Baseline Road Culvert Q 200 WSE 82.2 Baseline Road Culvert, Low Top of Road 83.6
				16.458	79.97	80.07	84.1	82.6	83.6	1000	
				16.493	81.71	82.41	*83.7		83.6	925	
				16.549	81.9	82.41	81.9	82.4	82.4	620	
				16.606	81.98	82.44	82.3	82.8	82.3	482	
869		60	75	16.662	82.48	82.63	82.9	82.3	82.8	618	Greenfield Road Culvert, Low Top of Road = 85.0 Greenfield Road Culvert U.S. 60 Culvert U.S. 60 Culvert
				16.723	82.6	82.73	82.8	82.5	82.6	440	
				16.772	82.67	82.8	82.6	82.6	82.6	413	
				16.852	82.69	82.82	*83	82.4	82.6	432	
				16.921	82.68	82.81	85.1	84.1	83	427	
1206		45	50	16.939	83.35	83.86	85.1	84.1			Holmes Park Detention Basin Holmes Park Detention Basin
				17.014	83.35	83.86	83.4	83	83.4	414	
				17.16	84.26	84.98	84.7	83.3	83.4	555	
				17.183	84.26	84.98	84.7	82.9	84.3	692	
				17.256	84.26	84.98	84.3	83	84.3	731	
1081				17.277	84.26	84.98	84.8	83	84.3	347	Southern Avenue Culvert, Low Top of Road = 85.5 Southern Avenue Culvert
				17.325	84.27	84.98	84.4	83	84.2	268	
				17.435	84.28	84.99	84.2	83.4	84.2	305	
				17.485	84.28	84.99	*84.7	83.5	84.2	336	
				17.57	84.29	85	*86.1	84.7	84.7	307	
1097				17.608	85.58	85.89	87	86.6	86.1	625	Greenfield Park Detention Basin Greenfield Park Detention Basin
				17.683	85.58	85.9	87	86.2	87	848	
				17.78	85.58	85.91	87	86.8	87	727	
				17.834	85.58	85.92	87	86.1	87	703	
				17.872	85.58	85.94	87	86.3	87	795	
1108				17.934	85.58	85.95	87	87.1	87	742	
				17.984	85.58	85.97	87	87.1	86.7	639	
				18.035	85.58	86	85.8	86.7	86.7	660	
				18.074	85.59	86.04	85.6	86.9	86.7	211	
				18.101	85.59	86.09	86.4	87.1	86.9	763	
1487		162	170	18.15	85.59	86.09	*87.3	87	87.1	855	
				18.197	85.59	86.09	*87.5	86.9	87.3	830	
				18.225	85.59	86.09	*87.3	87	87.3	670	
				18.253	85.59	86.09	*87.3	86.9	87.2	617	
				18.291	85.93	86.36	*87.2	87.1	87.2	600	
1342				18.337	85.94	86.37	*87.4	86.9	87.2	593	
				18.384	85.95	86.38	*87.3	86.8	87.3	785	

4.5 (28)

* East Canal bank elevation based on higher field surveyed value

Table 4 Eastern Canal FIS HEC-2 Profile Run Output Summary and Updated Approximate Zone A

1326	18.428			85.95	86.38	*87.3	86.7	87.3	589	
	18.487			85.96	86.38	*87.6	86.7	87.3	243	Broadway Road Culvert, Low Top of Road = 88.0
	18.574					86.9	87.3	87.3	362	
	18.625					87.3	87.4	87.3	430	
1293	18.721			86.97	87.5	*87.6	87.3	87.4	627	Broadway Road Culvert, Low Top of Road = 88.0
	18.766	23	23	86.98	87.5	*87.6	<u>87.1</u>	87.6	583	
	18.821			86.98	87.5	*87.8	87.3	87.6	585	
	18.861			86.98	87.5	*87.7	87.3	87.7	468	
	18.908			86.98	87.5	*88.1	87.4	87.7	483	
1032	18.965			86.98	87.5	88.2	87.5	88.1	468	
	18.999			87.5	87.5	*88.2	87.8	88.2	544	
	19.044			86.98	87.5	88.2	88.1	88	445	
	19.088			86.98	87.5	87.9	88	88	542	
	19.151			86.98	87.5	88	87.9	88	570	
1004	19.186			86.98	87.5	88.2	87.9	88	411	Main Street Culvert, Low Top of Road = 90.0
	19.262			87.98	88.5	<u>88.7</u>	88.5	88.2	681	Main Street Culvert, Low Top of Road = 90.0
	19.294	260	430	87.98	88.49	88.7	88.5	88.7	629	
	19.339			88.04	88.58	88.7	88.6	88.7	730	
	19.381			88.08	88.63	88.6	89	88.7	832	
	19.43			88.14	88.72	88.8	88.8	88.8	483	
726	19.473			88.21	88.8	89.5	89.1	88.8	600	
	19.502			88.29	88.29			88.9	785	Val Vista Road, Low Top of Road = 87.3
	19.623			88.42	88.93	88.7	89.3	88.9	715	
	19.67			88.45	88.97	<u>88.5</u>	88.9	88.9	438	
	19.716			88.48	88.99	<u>88.5</u>	88.9	88.8	190	
	19.764			88.7	89.19	88.7	88.8	88.8	675	
767	19.808	1	1	88.85	89.29	*89.6		88.8	386	University Drive
	19.83			88.85	89.29	*89.6	89.1	88.8	235	Low Top of Road 88.7
	19.871			88.85	89.29	88.5	88.8	88.5	223	
	19.924			88.85	89.29	88.5	88.4	88.5	53	
	19.971			88.85	89.29	*88.8	88.7	88.5	485	
	20.015			88.85	89.29	*88.7	88.6	88.7	617	Overtops Bank
	20.051			88.85	89.29	<u>88.2</u>	88.9	88.7	520	Overtops Bank
	20.082			88.85	89.29	<u>88.7</u>	89.1	88.9	440	
	20.139			88.85	89.29	<u>88.7</u>	89.2	89.1	490	
	20.179			88.85	89.29	<u>89.2</u>	89.4	89.2	642	
781	20.244			88.85	89.29	89.4	90.3	89.4	450	Ridge
	20.289			88.85	89.29	89.3	89.8	89.8	607	
	20.324			88.85	89.29	89.1	90	89.9	633	
	20.379			88.85	89.29			89.8	618	Adobe Street, Low Top of Road = 88.2
	20.393	35	85	88.85	89.29	89.26	90.5	90	405	

4.5(29)

* East Canal bank elevation based on higher field surveyed value

Table 4 Eastern Canal FIS HEC-2 Profile Run Output Summary and Updated Approximate Zone A

			20.432		88.85	89.29	89.2	90.5	90.5	612	
			20.465		88.85	89.29	89	90.7	90.5	530	
			20.515		89	89.43	89.3	90.7	90.7	295	
			20.559		89.06	89.53	<u>89.2</u>	90.7	90.7	503	
692			20.608		89.12	89.59	89.4	90.8	90.7	433	
			20.651		89.17	89.65	<u>89.2</u>	90.8	90.8	432	
			20.676		89.22	89.71	89.5	90.8	90.6	415	
			20.727		89.26	89.76	89.6	90.6	90.6	486	
			20.768		89.27	89.78	<u>89.3</u>	91	90.4	405	
703			20.815		89.29	89.8	<u>89.3</u>	90.4	90.4	431	
			20.87		89.31	89.84	89.4	90.4	90.3	535	
			20.912		89.45	89.97	89.7	90.3	90.3	435	
	130	330	20.963		90.93	91.13	*92.7		90.3		Brown Road, Low Top of Road = 90.5
			20.974		91.08	91.33			90.3	539	
			21.02		91.08	91.34	91.3	91.5	90.5	537	
			21.088		91.08	91.34	*91.6	91.1	91.4	632	
			21.137		91.08	91.34	91.4	91.1	91.4	467	
			21.196		91.09	91.38	91.4	91.2	91.4	356	
			21.256		91.14	91.53	91.8	91.3	91.4	387	
637			21.315		91.23	91.74	91.3	91.7	91.7	605	
			21.375		91.29	91.8	<u>91.3</u>	91.7	91.6	526	
			21.432		91.3	91.81	91.5	91.6	91.6	478	
			21.463		91.31	91.82	91.8	92.8	91.5	504	
	1	1	21.492		91.34	91.87	90.6	91.5	91.5	532	Indsay Road, Low Top of Road = 91.2 (Overtops Bank
			21.603		91.35	91.87	<u>90.6</u>	91.5	91.5	439	
216			21.665		91.35	91.87	<u>91</u>	92.3	91.5	405	
			21.716		91.35	91.87	<u>91.3</u>	92.3	91.7	345	
			21.774		91.35	91.87	<u>91.3</u>	91.7	91.7	348	
			21.819		91.35	91.87	91.5	91.8	91.5	415	
			21.859		91.35	91.87	91.5	91.5	91.2	407	
			21.914		91.35	91.87	<u>91.2</u>	91.1	91.2	80	
218			21.963		91.35	91.87	<u>91.1</u>	91.4	91.2	483	
			22.014		91.35	91.87	91.9	92	91.4	335	
			22.063		91.35	91.87	91.6	91.8	91.8	378	
			22.112		91.35	91.87	92	92	91.8	335	
240	100	275	22.208		92.92	93.08			94.2	795	McKellips Road, Low Top of Road = 92.8
			22.236		93.03	93.26	94.2	94.1	94.2	646	
			22.283		93.66	93.88	94.6	95.3	94.2	670	
			22.304		93.94	94.33	94.3	95.2	94.6	822	Ridge
			22.35		93.98	94.43	94.2	94.6	94.6	670	
			22.401		93.99	94.46	94.2	94.6	94.6	650	

* East Canal bank elevation based on higher field surveyed value

4.5/30

Table 4 Eastern Canal FIS HEC-2 Profile Run Output Summary and Updated Approximate Zone A

	22.444			94	94.49	<u>94</u>	95.3	94.6	502
333	22.488			94.01	94.52	<u>94</u>	95.2	95.2	860
	22.541	215	305	94.02	94.53	94.7	95.3	95.2	820
	22.571			94.02	94.53	94.7	95.2	95.2	995
	22.609			94.02	94.53	94.2	95.2	94.8	782
	22.636			94.01	94.53	94.2	94.8	94.6	773
	22.695			94.1	94.6	<u>*94.7</u>	94.5	94.6	771
	22.744			94.12	94.63	94.2	94.8	94.6	686
273	22.798			94.15	94.65	94.5	94.8	94.6	820
	22.849			94.18	94.68	94.8	94.6	94.8	852
	22.932			94.24	94.71	94.5	94.8	94.8	788
	22.976			94.24	94.71	94.5	95.8	94.8	565

4.5 (31)

* East Canal bank elevation based on higher field surveyed value

**T.D.N. NO. 8.0
FLOOD INSURANCE STUDY
EASTERN CANAL
CITY OF MESA
MARICOPA COUNTY, ARIZONA**

PREPARED FOR:

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

AND

**CITY OF MESA
ENGINEERING DEPARTMENT
55 NORTH CENTER STREET
MESA, ARIZONA 85211-1466**



**MAY, 1997
REVISED DECEMBER, 1997**

**FCDMC NO. 96-10
A-N WEST, INC., JOB NO. 7158-04**

A-N WEST INC.
Consulting Engineers

7600 North 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 861-2200

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FIGURES

FIGURE 1 - Vicinity Map Follows Page 1

TABLES

TABLE 1 - Updated Road Crossing and Drainage Structure Summary 4

EXHIBITS

EXHIBIT 1 - Flood Profiles	N/A
EXHIBIT 2 - Elevation Reference Mark Descriptions	Follows Exhibit 1
EXHIBIT 3 - Draft Floodplain Work Maps - 200 Scale (8 sheets)	Under Separate Cover

**FLOOD INSURANCE STUDY
EASTERN CANAL
CITY OF MESA, MARICOPA COUNTY, ARIZONA**

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in Maricopa County, Arizona, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound floodplain management.

1.2 Authority and Acknowledgments

The hydrologic analysis for this study was performed by Primatch Engineers and the hydraulic analysis was performed by A-N West, Inc., for the Flood Control District of Maricopa County, under Contract No., FCD 96-10. This study was completed in June, 1997.

1.3 Coordination

The areas to be studied were provided by the Flood Control District of Maricopa County during contract negotiations in _____.

A public notice was published in the Arizona Republic/Phoenix Gazette on _____ and _____ and the Mesa Tribune on _____ to notify all interested parties of the commencement of this study.

The following agencies or companies were contacted by A-N West for the hydraulic analysis to obtain information on the study: Flood Control District of Maricopa County, Arizona Department of Transportation, Salt River Project (SRP), and the City of Mesa.

2.0 AREA STUDIED

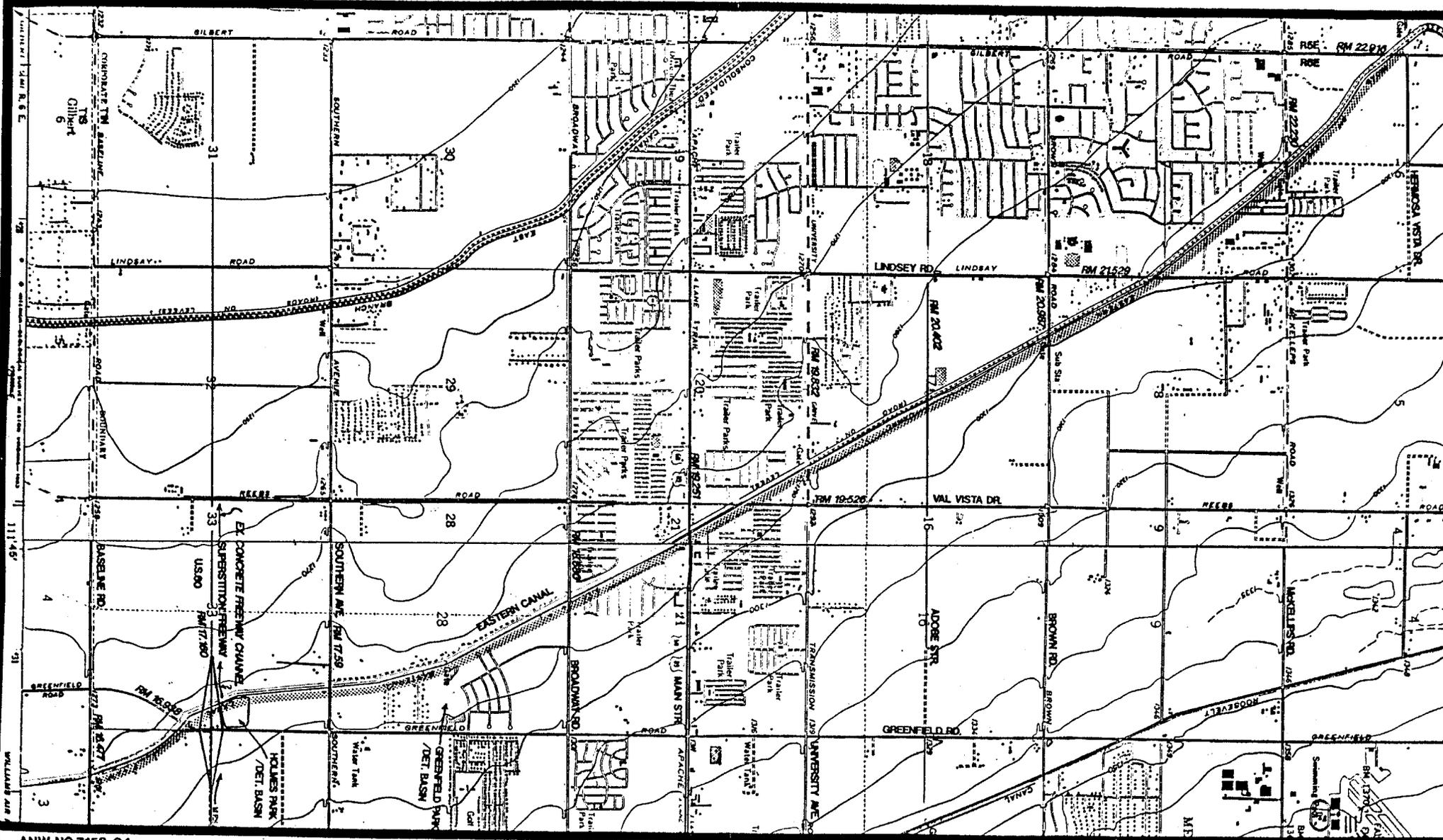
2.1 Scope of Study

The limits of detailed study in these areas of the City of Mesa, Maricopa County, Arizona were determined by the Flood Control District of Maricopa County in association with the City of Mesa and were forwarded to the study contractor during contract negotiations in _____. The detailed study areas included along the upstream side of the Eastern Canal from Baseline Road to Hermosa Vista Drive, a distance of approximately 5.5 miles.

The general study area is shown on the Vicinity Map (Figure 1).

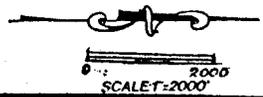
2.2 Community Description

The study area is currently in the City of Mesa corporate limits of Maricopa County, Arizona. The floodplain study area from Baseline Road north 5.5 river miles to Hermosa Vista Drive along the Eastern Canal of concrete lined channel, earthen channel, and earthen swales.



ANW NO.7158-04
 FCDMC NO.96-10

A-N WEST INC.
 Consulting Engineers



EXPLANATION
 STUDY LIMITS
 RM 16.477 RIVER MILE NO.

LOCATION MAP
 EASTERN CANAL FIS
 FIGURE 1

From Baseline Road to Greenfield Road along the canal, the floodplain study area is currently an excavated un-lined channel with residential/horse properties to cultivated crop land east of the Eastern Canal.

From Greenfield Road north along the canal to the U.S. 60 Freeway Interchange is mostly vacant land with Greenfield Road running perpendicular to north at the canal.

North of the U.S. 60 Freeway is the Holmes Park Detention Basin which has a concrete channel along the freeway and culvert of approximately 100 cfs capacity conveying storm water under the Eastern Canal to the west. From Holmes Park Detention Basin north along the canal to Southern Avenue, the channel is earthen and a strip of vacant land containing material stockpiles along with an orchard to the east of the canal.

From Southern Avenue, 750 feet north along the canal, the floodplain study area is an earthen channel with cultivated crop land to the east of the canal. From 750 feet north of Southern Avenue to Greenfield Park Detention Basin, an excavated un-lined channel with residential/horse properties to the east of the canal make up the study area. In the Greenfield Park area, the channel is lined with concrete and the park is landscaped with turf grass and trees.

From Greenfield Park north to Broadway Road the study area is a concrete lined channel with single-family residences to the east and concrete masonry unit (cmu) between the channel and the residential development fence running parallel to the east of the canal.

From Broadway Road to 650 feet north, the study area is an un-lined channel with mobile homes, chain line and cmu fence to the east of the canal. From 650 feet north to 2450 feet north of Broadway Road there is a concrete lined channel with mobile homes and paved roads to the east of the canal. From 2450 feet north to Main Street, the study area is a concrete lined channel and a commercial building with a paved parking lot and a cmu fence, and a vacant parcel of land to the east of the canal.

From Main Street north to Val Vista Drive, the study area is an un-lined channel with a 90 foot wide strip of landscaping with mobile homes and chain link fences to the east of the canal.

From Val Vista Drive north to University Drive, the study area is an un-lined channel with commercial buildings and a paved parking lot with intermittent vacant parcels and residential properties to the east of the canal.

From University Drive north 1200 feet, the study area is an un-lined channel with a vacant parcel east of the canal. From 1200 feet north of University Drive to Adobe Street is an un-lined channel with landscaped detention basin and power line easement with turf grass and trees east of the canal, along with single-family residences with paved streets and an orchard east of the canal.

From Adobe Street north to Brown Road, the floodplain study area is an un-lined channel/swale with a detention basin/pond and single-family residences, cmu fences and paved streets east of the canal.

From Brown Road north 650 feet, the study area is an un-lined swale with citrus harvest box storage and citrus orchard east of the canal. From 650 feet north to Lindsay Road, the study area is an un-lined swale with vacant land to the east of the canal.

From Lindsay Road north 1400 feet, the floodplain study area is an un-lined swale with commercial buildings/school and landscaping to the east of the canal. From 1400 feet north of Lindsay Road to 2200 feet north is an un-lined swale with a landscaped residential apartment complex and cmu fence east of the canal. From 2200 feet north to McKellips Road, the study area is an un-lined swale with mobile homes, intermittent hedges and a former automobile service station with paved parking east of the canal.

From McKellips Road north to Hermosa Vista Drive, the floodplain study area is a residential apartment complex and cmu fence with paved parking with single-family residences, cmu fences and paved streets with a landscaped park/detention basin east of the canal.

The study area lies at an elevation of approximately 1350 feet.

The climate of the study area is typically desert in character with short, mild winters and long, hot summers. Wide diurnal temperature variations are also characteristic. Temperatures generally range between 35 degrees Fahrenheit (°F) and 105° F, with an annual average of 71° F. The prevailing winds are from the east and are usually light, although severe windstorms occur occasionally during the summer thunderstorm season. The annual precipitation for the study area averages approximately 7.4 inches.

There are two separate rainfall seasons. The first occurs during the winter months, from November to March, when the area is subject to storms from the Pacific Ocean. While this is classified as a rainfall season, there can be periods of a month or more, in this or any other season, when practically no precipitation falls. No significant snowfall occurs over the study area. The second rainfall season occurs during July and August when Arizona is subjected to widespread thunderstorms activity. These thunderstorms are extremely variable in intensity and location. The spring and fall months are generally dry, although precipitation in substantial amounts has fallen on occasion during every month of the year.

2.3 Principal Flood Problems

The current Eastern Canal floodplain is approximately 60 percent developed.

2.4 Flood Protection Measures

The East Maricopa Floodway (EMF) which parallels the Eastern Canal - 1½ miles to the east intercepts stormwater from the east. The EMF was built by the Soils Conservation Service, nor the National Resource Conservation Service, with the Flood Control District of Maricopa County (FCDMC) as the local sponsor. The FCDMC owns this facility and is responsible for inspection and maintenance.

This flood insurance study is intended to be utilized in the planning and regulation of future development within the study area to provide for adequate drainage and flood proofing of development.

3.0 ENGINEERING METHODS

3.1 Hydrologic Analysis

The hydrology for the Eastern Canal was performed for this study by Primatech Engineers and is summarized in a report under separate cover. The peak discharges were computed for the 100-year, 24-hour storm event by the HEC-1 computer model (Ref. 5) using the Flood Control District of Maricopa County Hydrology Manual (Ref. 6).

This hydrologic analysis assumed no breakout of flow across the canal and assumed the peak discharges flowed along upslope (east) side of the canal. Based on the preliminary hydraulic analysis (Ref. 9), which determined that breakouts over the canal were expected, an approximate Zone A floodplain was pursued and no further refinement to the hydrology analysis was pursued.

3.2 Hydraulic Analysis

Cross-sections were digitized from a Digital Terrain Model (DTM) provided with the topographic mapping (Ref. 1) that was completed. The culverts along the upstream side of the Eastern Canal at Baseline, Greenfield, U.S. 60, Southern, Broadway, and Main Streets were field surveyed for inlet and outlet inverts and the length and wingwall configuration was obtained from as-built plans and site visits. The capacities of these field surveyed culverts was estimated by the HEC-5 manual method and were modeled in the HEC-2 model analysis as discussed in Reference 9.

TABLE 1

EASTERN CANAL FIS
UPDATED ROAD CROSSING AND DRAINAGE STRUCTURE SUMMARY

River Mile	Location	Description	Structure Type/Size
16.447	Baseline Road	Major Street with 1± foot Dip(2)	2-4' RCP's x 130' Hdwall and Trsh RK(1)
16.938	Greenfield Road	Major Street with 0.3± foot Dip(2)	1-4' RCP x 95' Hdwall (1)
17.160	U.S. 60 Culvert	Culvert along channel	1-45" x 29" x 196" long HECP, mitered inlet
(5)	Under Canal	under canal	
17.160	U.S. 60 Culvert Along Canal	Freeway with overpass, No Dip(2)	1-4' RCP x 730'/Hdwall and ½ Trsh Rk(1)
17.59	Southern Avenue	Major Street with 1.2± foot Dip(2)	2-24" RCP's x 160' with Hdwall (Bell End) (1)
18.680	Broadway Road	Major Street with 0.6± foot Dip(2)	1-6' and 1-4.5' RCP x 1100' with Hdwall and vertical TRSH RK(1)
19.251	Main Street (Apache Blvd.)	Major Street, No Dip (2)	Inlet 1-30" RCP x 260' with Hdwall (Bell End) (1). Outlet - 1-10' x 4.25' RCB
19.526	Val Vista Drive	Major Street, with 1.7± foot Dip(2)	1-30" RCP x 1780' with Hdwall and TRSH RK (3)
19.832	University Dr.	Major Street with 0.5± foot Dip(2)	same as pipe at Val Vista Drive (3)
20.402	Adobe Street	Major Street with 3.3± foot Dip(2)	Approx. 2 foot storm sewer size (3)
20.987	Brown Road	Major Street with 2± foot Dip(2)	Approx. 2 foot storm sewer size (3)
21.529	Lindsay Road	Major Street with 2.3± foot Dip(2)	Approx. 2 foot storm sewer size (3)
22.230	McKellips Road	Major Street with 0.9± foot Dip(2)	1-24" RCP with Hdwall (3)
22.916	Gilbert Road	Major Street with 2.5± foot Dip(2)	No Culverts/S.D.

Notes:

1. Anticipate modeling culverts in HEC-2 model by special culvert option with road profile for weir flow over road or by subtracting the estimated culvert capacity from flow at cross-section locations where culverts are located.
2. Dip denotes road profile which dips or is depressed below adjacent top of road at the canal to cause flow over road before flow over canal on road. Note: flow upstream may be overflowing canal before flow over road occurs.
3. Where storm drain is noted, it is assumed the hydrology modeling reflects storm drain capacity.
4. TRSH RK = Trash Rack. Hdwall - Headwall. RCP = Reinforced Concrete Pipe. RCB = Reinforced Concrete Box Culvert.
5. This 45" span x 29' rise Horizontal Elliptical Concrete Pipe (HECP) conveys flow in concrete channel along north side.

Other street crossings along the canal to the north, including Val Vista, University, Adobe, Brown, Lindsay, McKellips and Hermosa Vista Streets are drained of nuisance storm water runoff by a small capacity (15 cfs) 24± inch storm drain along the canal. Table 1 summarizes the road crossing inventory and drainage structure summary along the upslope (east) side of the Eastern Canal.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks and descriptions used in this study are shown on the maps (Exhibit 3) and summarized in this report (Exhibit 2). A conversion to North American Vertical Datum 1988 (NAVD88) is also included in Exhibit 2.

A review of the hydrology results along the canal in conjunction with the road crossing structure inventory and preliminary hydraulic analysis (Ref. 9) indicated that there was inadequate capacity to convey the 100-year discharges along the upstream side of the canal and that breakouts over the canal were expected.

A meeting was held on May 9, 1997 with representatives of the City of Mesa, FCDMC, A-N West, Inc., and Primatch Engineers, Inc., to review the results of the May 1, 1997 (Ref. 9) letter report.

At this meeting, the City of Mesa requested that an updated Approximate Zone A 100-year floodplain be delineated. This delineation was to be based on their experience in administering and identifying the floodplain limits for the effective Approximate Zone A 100-year floodplain. The delineation was identified as the floodplain width and water surface elevation associated with the low top of high east or west top of canal bank within approximately 200 feet longitudinally of any location of interest along the canal. The digitized cross-sections from the mapping (Ref. 1), of which cross-section locations are shown on Exhibit 3, were utilized to determine this floodplain width for plotting on Exhibit 3.

This updated Approximate Zone A was transmitted to the FCDMC and the City of Mesa in a letter form A-N West (Ref. 10) with supportive preliminary mapping and data table.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

4.1 Floodplain Boundaries

For the streams studied, the flood boundaries were delineated using the topographic maps at a scale of 1:2,400 and with contour interval of 2 feet (Ref. 1).

The effective (Ref. 10) and updated Approximate Zone A 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 3). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazard. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

No floodway was prepared for this study.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such area, no base flood elevations or depths are shown within this zone.

Zone AO

Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; depths are shown, but no FHF are determined.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding with a constant water-surface elevation (usually areas of ponding) where average depths are between 1 and 3 feet. The BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, and areas of 100-year sheet flow flooding where average depths are less than 1 foot; areas of 100-year stream flooding, where the contributing drainage area is less than one square mile; or areas protected

from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 OTHER STUDIES

No previous FEMA Flood Insurance Studies were found for the study area. The effective FEMA Flood Hazard Zone for the study area was an approximate Zone A (no discharges or BFE's presented).

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Presidio of San Francisco, Building 105, San Francisco, California, 94129.

8.0 BIBLIOGRAPHY AND REFERENCES

1. Aerial Mapping Company, Inc., Phoenix, Arizona, Aerial Photography (1:8400 Scale) and 200 Scale, 2 Foot Contour Mapping. Photography Flown: March 20, 1996.
2. U.S. Department of Army, Corps of Engineers, Hydrologic Engineering Center, Davis California 95616, HEC-2 Computer Program, Water Surface Profiles Version 4.6.2.. Dated May, 1992.
3. U.S. Geological Survey, Water Resources Division, 375 South Euclid Avenue, Tucson, Arizona 85719, Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona, by B.W. Thompson and H.W. Hjalmarson, for Flood Control District of Maricopa County; April, 1991.
4. Hydrology Report for Eastern Canal, FCD No. 96-10, by Primatech Engineers.
5. U.S. Department of Army, Corps of Engineers, Hydrologic Engineering Center, Davis California 95616, HEC-1 Flood Hydrograph Package Computer Program, Version 4.0, September, 1990.
6. Hydrologic Design Manual for Maricopa County, Arizona, prepared by Special Projects Branch, Hydrology Division, Flood Control District of Maricopa County, Dated: September, 1990 with June, 1992 revisions.
7. Estimating Manning's Roughness Coefficients for Stream Channels and Floodplain in Maricopa County, Arizona, prepared by U.S. Geological Survey, Water Resources Division, prepared for Flood Control District of Maricopa County, April, 1994.
8. Chow, Ven T., Open Channel Hydraulics, New York: McGraw-Hill Book Company 1959.

9. A-N West letter report of May 1, 1997 to Flood Control District of Maricopa County and the City of Mesa transmitting preliminary hydraulic HEC-2 model analysis results which identified numerous breakouts over the Eastern Canal.
10. A-N West letter of May 15, 1997 to Flood Control District of Maricopa County and the City of Mesa transmitting preliminary updated Approximate Zone A 100-year floodplain mapping and data table.
11. Flood Insurance Rate Maps (FIRMs), Federal Emergency Management Agency, Maricopa County, Arizona and Incorporated Areas, Panel 2215 (effective date 12/3/93), and Panels 2185D and 2195D (effective date 4/15/88) of 4530.

Ernest F. Brater and Horace Williams King, Handbook of Hydraulics, Sixth Edition, New York: McGraw-Hill Book Company, 1976.

U.S. Geological Survey, Topographic Maps, 7.5 Minute Series: Buckhorn, Arizona: 1956, Photo Revision 1982 and Mesa, Arizona, A52, Photo Revision, 1982.

U.S. Department of Transportation, Federal Highway Administration, Hydraulic Charts for the Selection of Highway Culverts, Hydrologic Engineering Circular No. 5 (HEC-5), December, 1965.

Public reporting burden for this form is estimated to average 2.13 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.

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

- CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).
- LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)
- Other Describe: _____

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

- Physical Change
- Improved Methodology/Data
- Floodway Revision
- Other Describe: New and more detailed mapping

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Ponding along upslope side of Eastern Canal

3. Project Name/Identifier: Eastern Canal

4. FEMA zone designations affected: Approximate Zone A
 (example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex 480301	Katy, City	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040048	City of Mesa	AZ	04013C	2185D	4/15/88
040048	City of Mesa	AZ	04013C	2195D	4/15/88
040048	City of Mesa	AZ	04013C	2215F	12/3/93

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding		Structures	
<input type="checkbox"/> Riverine		<input type="checkbox"/> Channelization	
<input type="checkbox"/> Coastal		<input type="checkbox"/> Levee/Floodwall	
<input type="checkbox"/> Alluvial fan		<input type="checkbox"/> Bridge/Culvert	
<input checked="" type="checkbox"/> Shallow Flooding (e.g. Zones AO and AH) Zone A		<input type="checkbox"/> Dam	
<input type="checkbox"/> Lakes		<input type="checkbox"/> Fill	
<input type="checkbox"/> Other (describe)		<input type="checkbox"/> Other (describe)	

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP? Yes No N/A

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? Yes No N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? Yes No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for performing overseeing compliance with the maintenance and operation plans of the _____ (Name)

flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. Yes No N/A

6. REVIEW FEE

The review fee for the appropriate request category has been included. Yes Fee amount: \$ _____
OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt.

Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: I understand that my signature indicates that all information submitted in support of this request is correct

Signature of Revision Requester

Printed Name and Title of Revision Requester

Company Name

Telephone No. _____

Date _____

Note: Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.

Signature of Community Official

Printed Name and Title of Community Official

Community Name

Telephone No. _____

Date _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR, Ch. 1, Sect 65.2

Gregory A. Schuelke
Signature

Gregory A. Schuelke
Printed Name and Title of Revision Requester

Registr. No. 15290 Expires (Date) 6/30/98 State AZ

Type of License/Expertise: Civil Engineer

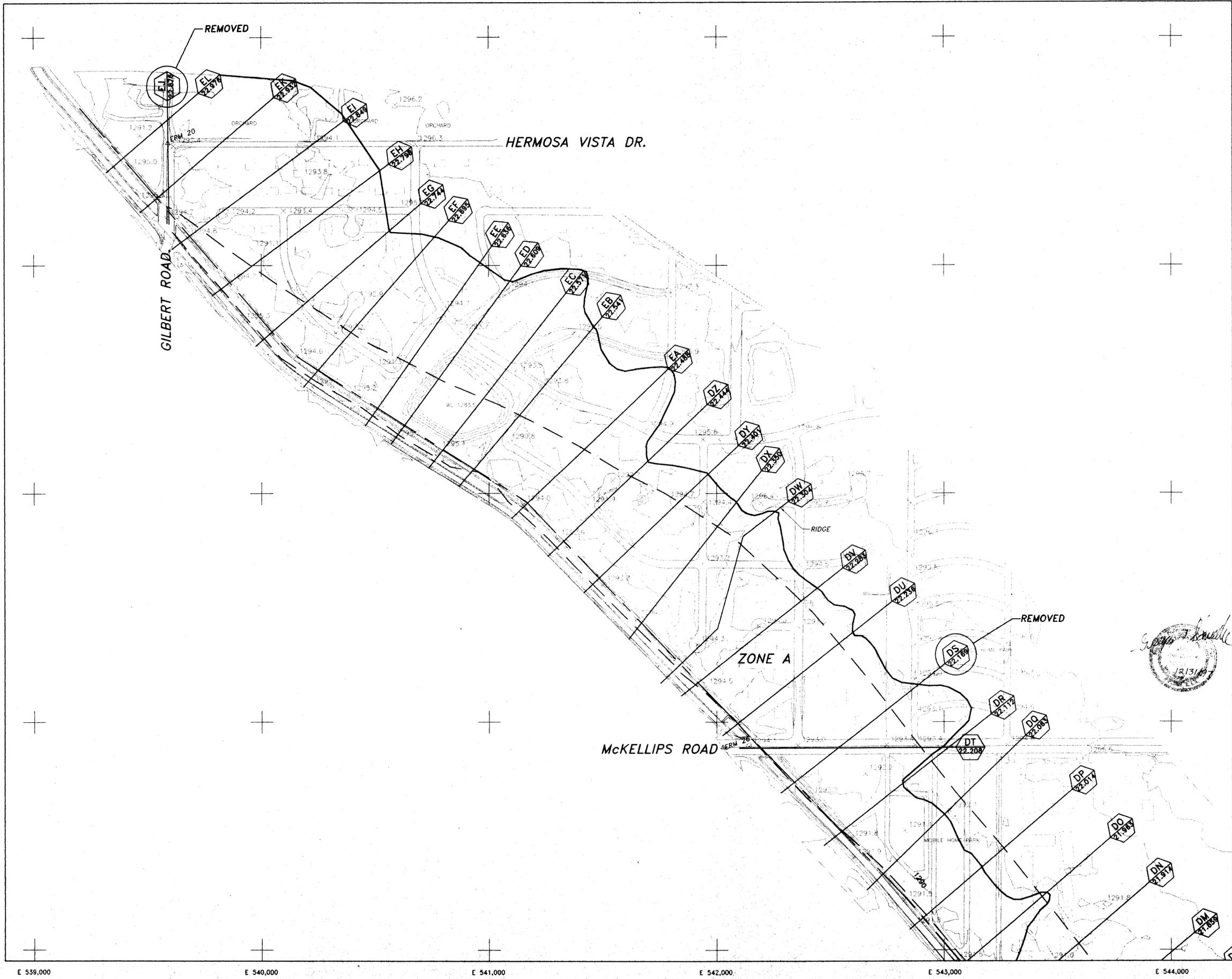
Certification limited to Floodplain Delineation, Mapping and Field Survey by Others.

Check which forms have been included with this request

Form Name and (Number)	Required if _____
<input type="checkbox"/> Hydrologic (3)	new or revised discharges
<input type="checkbox"/> Hydraulic (4)	new or revised water-surface elevations
<input type="checkbox"/> Mapping (5)	floodplain/floodway changes
<input type="checkbox"/> Channelization (6)	channel is modified
<input type="checkbox"/> Bridge/Culvert (7)	addition/revision of bridge/culvert
<input type="checkbox"/> Levee/Floodwall (8)	addition/revision of levee/floodwall
<input type="checkbox"/> Coastal (9)	new or revised coastal elevations
<input type="checkbox"/> Coastal Structures (10)	addition/revision of coastal structure
<input type="checkbox"/> Dam (11)	addition/revision of dam
<input type="checkbox"/> Alluvial Fan (12)	structures proposed on alluvial fan

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N 895,000
N 894,000
N 893,000
N 892,000
N 891,000



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOOD DELINEATION STUDY OF EASTERN CANAL
F.C.D. CONTRACT NO. 96-10

LEGEND

- EFFECTIVE APPROX. A BOUNDARY
- PROPOSED UPDATED APPROX. ZONE A BOUNDARY
- HYDRAULIC BASE LINE WITH RIVER MILE
- CROSS SECTION Q=100 Yr DISCHARGE, CFS
FD=100 Yr WSE
FW=Floodway WSE
- ELEVATION REFERENCE MARK ERM3 X
- BASE FLOOD ELEVATIONS 1221
- ZONE DESIGNATIONS ZONE A
- CORPORATE LIMITS
- COUNTY OR STATE JURISDICTIONAL BOUNDARY

ELEVATION REFERENCE MARKS

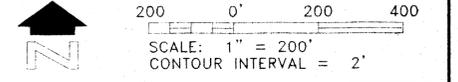
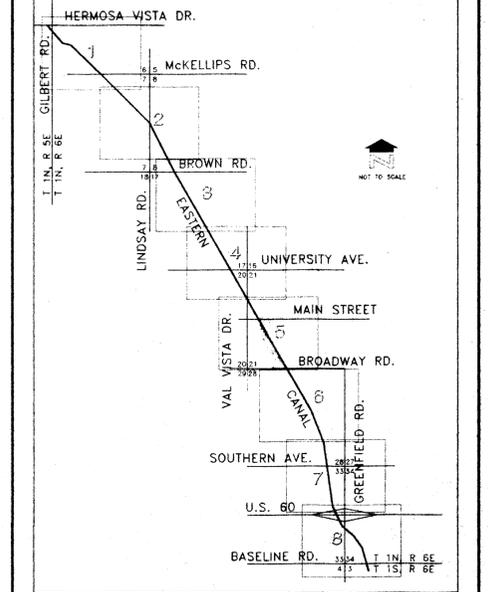
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

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E.R.M. 26	1292.99'	UNMKED. B.C. IN H.H. AT CENTER-LINE MCKELLIPS RD. 100'± W. OF E. CANAL (0.30' BELOW RIM)

NOTES

1. CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE

INDEX MAP



A-N WESTING Consulting Engineers
 7600 N. 15th Street, Suite 200
 Phoenix, Arizona 85020
 (602)861-2200
 A-N W #7158-04

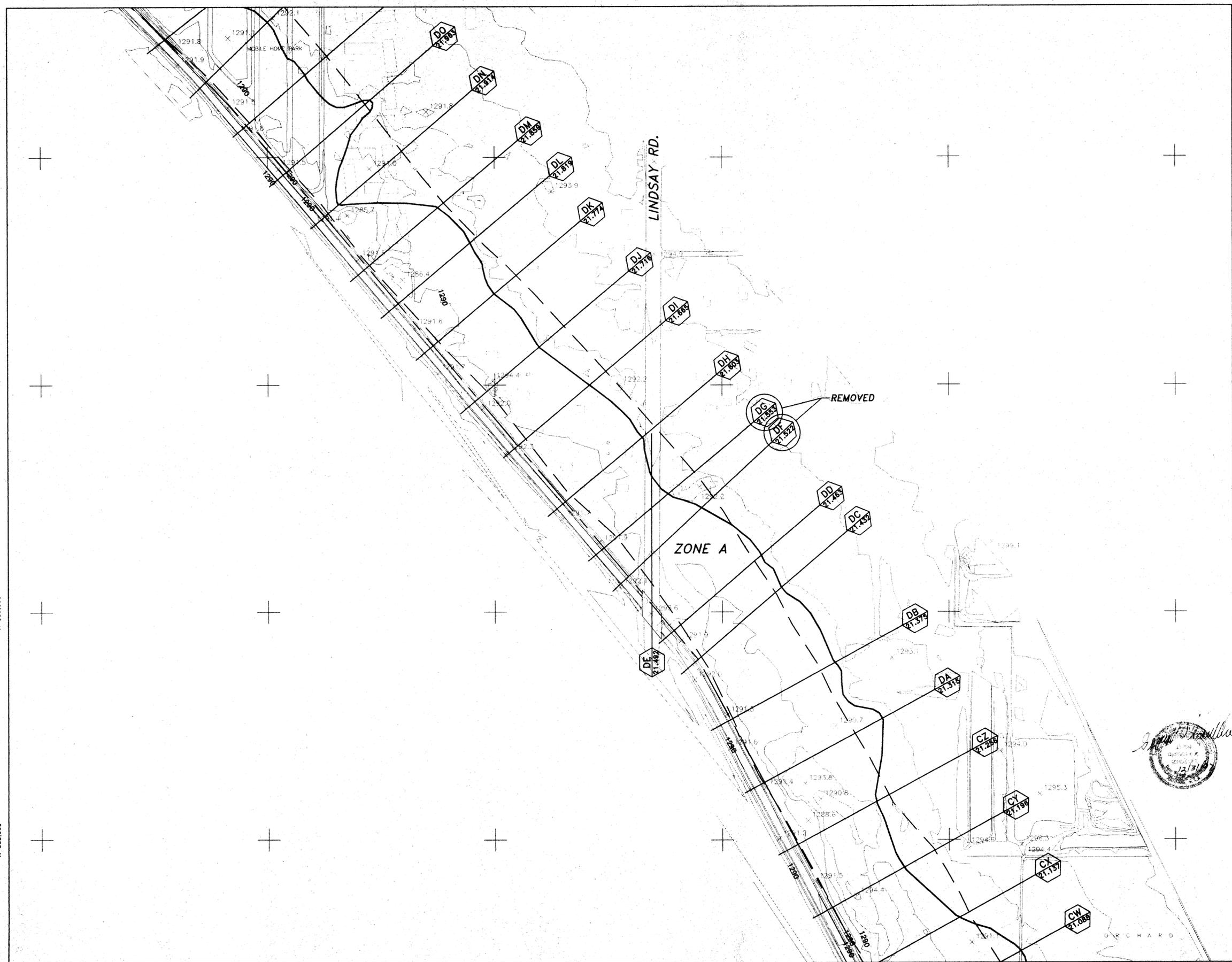
DESIGN	BY GAB	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY RECOMMENDED BY: _____ DATE _____ APPROVED BY: _____ DATE _____ CHIEF ENGINEER AND GENERAL MANAGER SHEET 1 of 8
DESIGN CHK.	GAS		
PLANS	CMB		
PLANS CHK.			
SUBMITTED BY:		DATE: _____	

AERIAL MAPPING COMPANY, INC.
 SURVEYING AND PHOTOGRAMMETRY
 FLIGHT DATE: 3/20/96

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
 DATA PROVIDED BY PROJECT ENGINEERING, CONSULTANTS, LTD.

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF EASTERN CANAL

F.C.D. CONTRACT NO. 96-10

LEGEND

- EFFECTIVE APPROX. A BOUNDARY
- PROPOSED UPDATED APPROX. ZONE A BOUNDARY
- HYDRAULIC BASE LINE WITH RIVER MILE
- CROSS SECTION Q=100 Yr DISCHARGE, CFS
FD=100 Yr WSE
RIVER MILE ID. 22.304 FW=Floodway WSE
- ELEVATION REFERENCE MARK ERM3 X
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- ZONE DESIGNATIONS ZONE A
- CORPORATE LIMITS
- COUNTY OR STATE JURISDICTIONAL BOUNDARY

ELEVATION REFERENCE MARKS

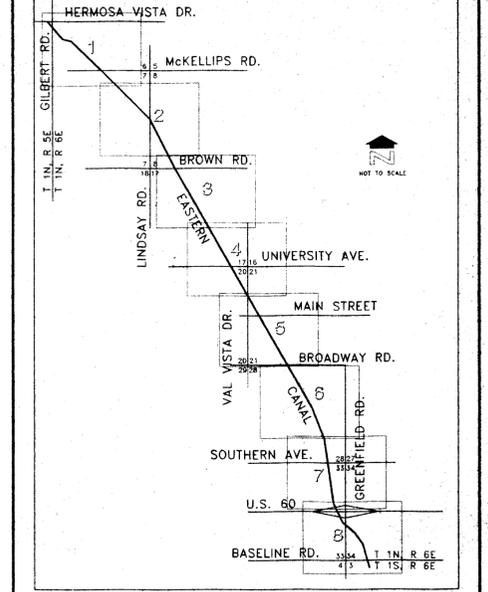
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I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
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NOTES

- CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE

INDEX MAP



SCALE: 1" = 200'
CONTOUR INTERVAL = 2'

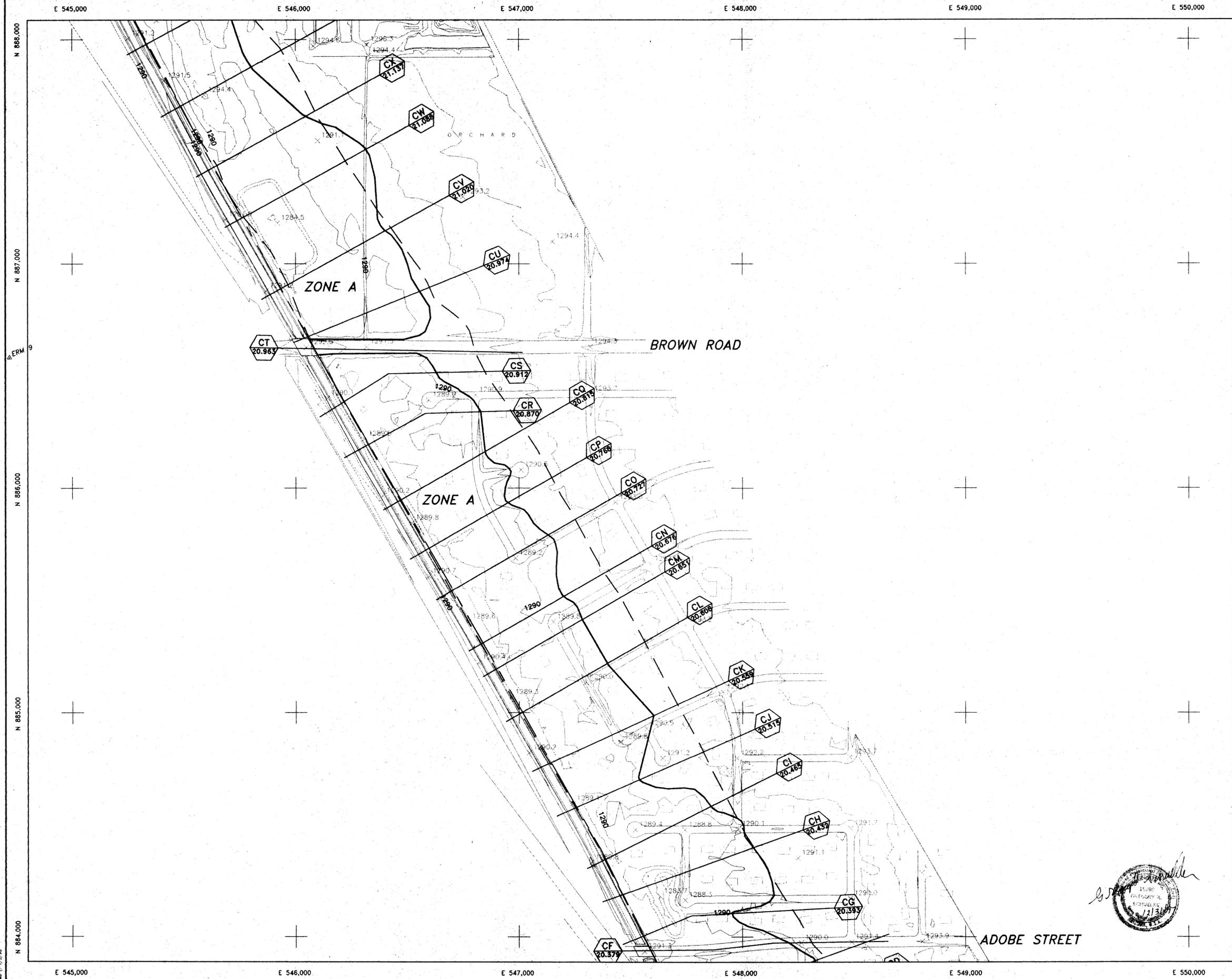
A-N WEST INC. Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200

DESIGN		BY		DATE	
DESIGN CHK.	GAS	GAB			
PLANS	CMB				
PLANS CHK.					
SUBMITTED BY:					

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
RECOMMENDED BY:	DATE
APPROVED BY:	DATE
CHIEF ENGINEER AND GENERAL MANAGER	
SHEET	2 OF 8

7130-04 (12/96) AERIAL MAPPING COMPANY, INC. SURVEYING AND PHOTOGRAMMETRY FLIGHT DATE: 3/20/96

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**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**
**FLOOD DELINEATION STUDY OF
EASTERN CANAL**
F.C.D. CONTRACT NO. 96-10

LEGEND

EFFECTIVE APPROX. A BOUNDARY

PROPOSED UPDATED APPROX. ZONE A BOUNDARY

HYDRAULIC BASE LINE WITH RIVER MILE

CROSS SECTION Q=100 Yr. DISCHARGE, CFS
 FD=100 Yr WSE
 FW=Floodway WSE

ELEVATION REFERENCE MARK ERM3 X

BASE FLOOD ELEVATIONS 1221

ZONE DESIGNATIONS ZONE A

CORPORATE LIMITS

COUNTY OR STATE JURISDICTIONAL BOUNDARY

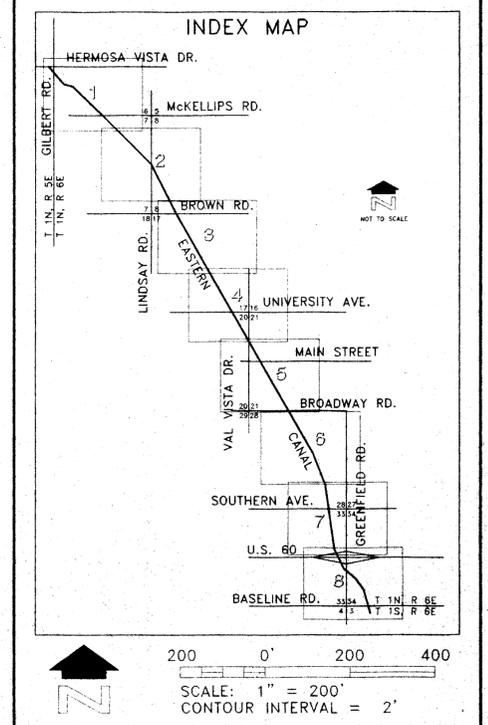
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
E.R.M. 9	1281.32'	C.O.M. B.C. IN H.H. (0.90' BELOW RIM) INTER. BROWN / LINDSAY RD.

NOTES

1. CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE



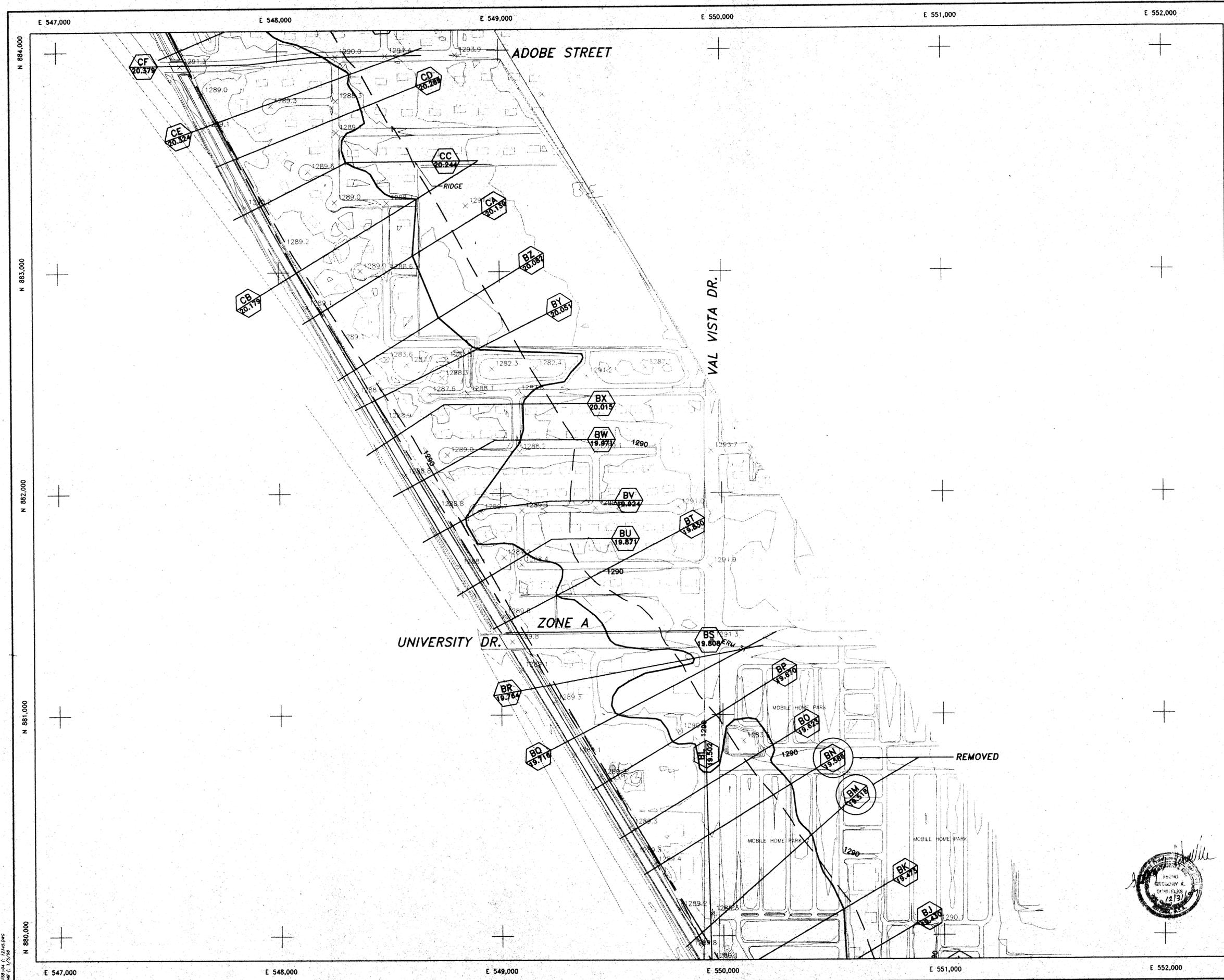
A-N WEST INC.
 Consulting Engineers
 7600 N. 15th Street, Suite 200
 Phoenix, Arizona 85020
 (602)861-2200

DESIGN	BY GAB	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	GAS		
PLANS	CMB		RECOMMENDED BY: _____ DATE _____
PLANS CHK.			APPROVED BY: _____ DATE _____
SUBMITTED BY:			CHEF ENGINEER AND GENERAL MANAGER
			SHEET 3 OF 8

AERIAL MAPPING COMPANY, INC.
 SURVEYING AND PHOTOGRAMMETRY
 FLIGHT DATE: 3/20/96

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
 DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD.

T.D.N. SECTION 2.5



**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**
**FLOOD DELINEATION STUDY OF
EASTERN CANAL**
F.C.D. CONTRACT NO. 96-10

LEGEND

EFFECTIVE APPROX. A BOUNDARY	---
PROPOSED UPDATED APPROX. ZONE A BOUNDARY	---
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 — M13.0
CROSS SECTION	LETTER ID. AA Q=100 Yr DISCHARGE, CFS RIVER MILE ID. 22.304 ED=100 Yr WSE FW=Floodway WSE
ELEVATION REFERENCE MARK	ERM3 X
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE A
CORPORATE LIMITS	---
COUNTY OR STATE JURISDICTIONAL BOUNDARY	---

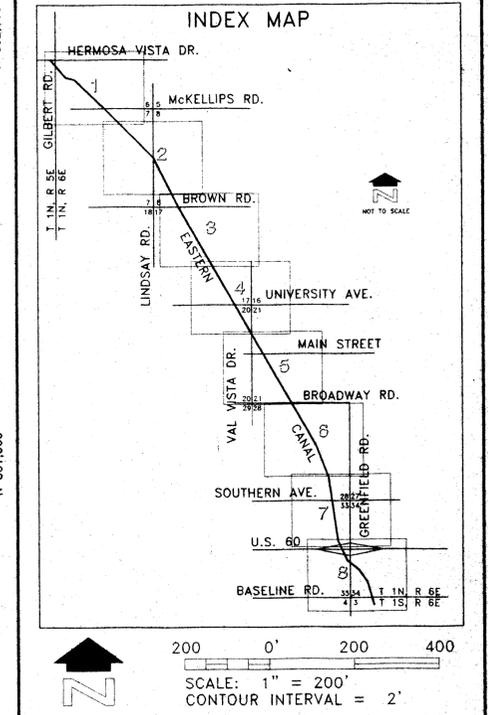
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
E.R.M. 31	1290.53'	C.O.M. B.C. IN H.H. (0.58' BELOW RIM) INTER. UNIVERSITY / VAL VISTA DR.

NOTES

- CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE



A-N WEST INC.
Consulting Engineers

7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200

DESIGN	BY: GAB	DATE:	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	GAS		
PLANS	CMB		
PLANS CHK.			
SUBMITTED BY:		DATE:	RECOMMENDED BY: DATE
			APPROVED BY: DATE
			CHIEF ENGINEER AND GENERAL MANAGER
			SHEET 4 OF 8

E 549,000 E 550,000 E 551,000 E 552,000 E 553,000 E 554,000

N 880,000

N 879,000

N 878,000

N 877,000

E 549,000 E 550,000 E 551,000 E 552,000 E 553,000 E 554,000

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**
FLOOD DELINEATION STUDY OF
EASTERN CANAL
F.C.D. CONTRACT NO. 96-10

LEGEND

- EFFECTIVE APPROX. A BOUNDARY
- PROPOSED UPDATED APPROX. ZONE A BOUNDARY
- HYDRAULIC BASE LINE WITH RIVER MILE
- CROSS SECTION Q=100 Yr DISCHARGE, CFS
FD=100 Yr WSE
FW=Floodway WSE
- ELEVATION REFERENCE MARK ERM3 X
- BASE FLOOD ELEVATIONS 1221
- ZONE DESIGNATIONS ZONE A
- CORPORATE LIMITS
- COUNTY OR STATE JURISDICTIONAL BOUNDARY

ELEVATION REFERENCE MARKS

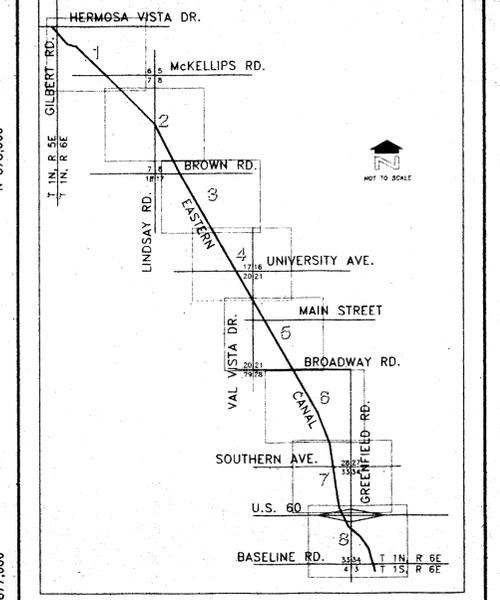
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
-------------	----------------	----------------------

NOTES

- CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE

INDEX MAP



SCALE: 1" = 200'
CONTOUR INTERVAL = 2'

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

DESIGN	BY	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	GAS		
PLANS	CMB		
PLANS CHK.			
SUBMITTED BY:			

RECOMMENDED BY:	DATE
APPROVED BY:	DATE
CHIEF ENGINEER AND GENERAL MANAGER	
SHEET	5 of 8



VAL VISTA DR.

MAIN STREET

ZONE A

30" RCP (INLET) W/HEADWALL (BELL END) & 10'X4.25' RCB (OUTLET)

REMOVED USED FOR BT RECORD

BE 19.237

BD 19.168

BC 19.157

BB 19.088

BA 19.044

AZ 18.999

AY 18.985

AX 18.955

AW 18.867

AV 18.827

AU 18.766

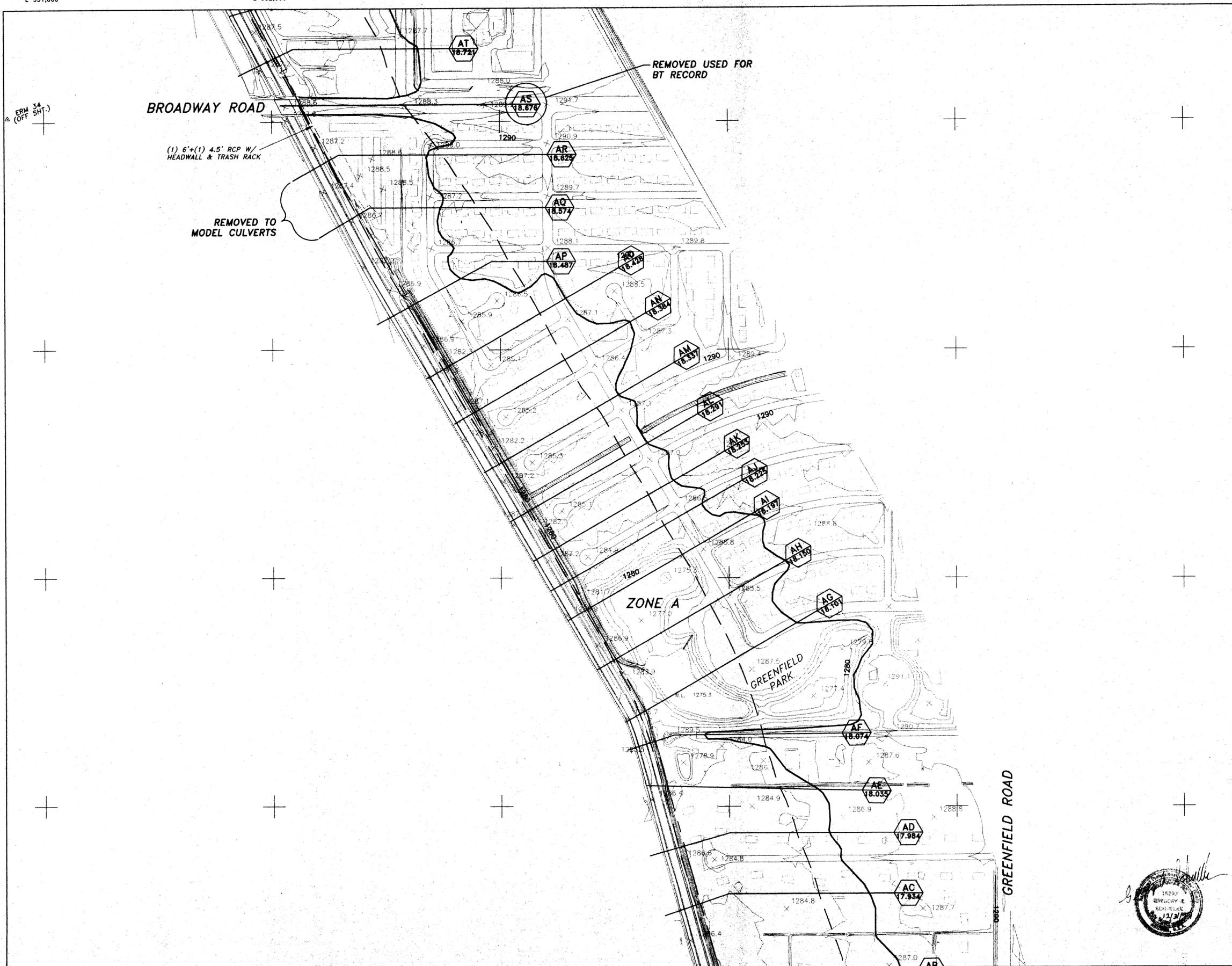
AT 18.727

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD.

AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 3/20/96

E 551,000 E 552,000 E 553,000 E 554,000 E 555,000 E 556,000

N 876,000
N 875,000
N 874,000
N 873,000



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FLOOD DELINEATION STUDY OF EASTERN CANAL
F.C.D. CONTRACT NO. 96-10

LEGEND

- EFFECTIVE APPROX. A BOUNDARY
- PROPOSED UPDATED APPROX. ZONE A BOUNDARY
- HYDRAULIC BASE LINE WITH RIVER MILE
- CROSS SECTION LETTER ID: **AA** Q=100 Yr DISCHARGE, CFS
RIVER MILE ID: **22.304** FD=100 Yr WSE
FW=Floodway WSE
- ELEVATION REFERENCE MARK ERM3 X
- BASE FLOOD ELEVATIONS 1221
- ZONE DESIGNATIONS ZONE A
- CORPORATE LIMITS
- COUNTY OR STATE JURISDICTIONAL BOUNDARY

ELEVATION REFERENCE MARKS

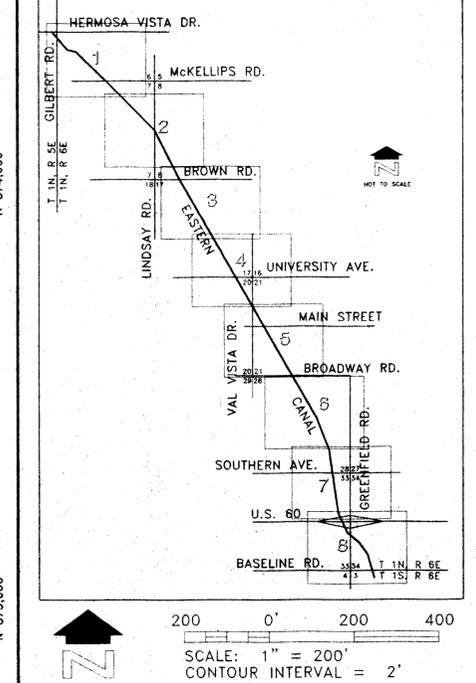
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM. 34	1274.10'	C.O.M. B.C. IN H.H. (0.48' BELOW RIM) INTER. VAL VISTA DR. / BROADWAY RD.

NOTES

1. CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE

INDEX MAP



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

DESIGN	BY	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	GAS		
PLANS	CMB		
PLANS CHK.			
SUBMITTED BY:			RECOMMENDED BY: _____ DATE _____
			APPROVED BY: _____ DATE _____
			CHEF ENGINEER AND GENERAL MANAGER
			SHEET 6 OF 8

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
 1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
 DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD.

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**
FLOOD DELINEATION STUDY OF
EASTERN CANAL
F.C.D. CONTRACT NO. 96-10

LEGEND

- EFFECTIVE APPROX. A BOUNDARY
- PROPOSED UPDATED APPROX. ZONE A BOUNDARY
- HYDRAULIC BASE LINE WITH RIVER MILE
- CROSS SECTION LETTER ID. **AA** Q=100 Yr DISCHARGE, CFS
RIVER MILE ID. **22.304** FD=100 Yr WSE
FW=Floodway WSE
- ELEVATION REFERENCE MARK ERM3 X
- BASE FLOOD ELEVATIONS 1221
- ZONE DESIGNATIONS ZONE A
- CORPORATE LIMITS
- COUNTY OR STATE JURISDICTIONAL BOUNDARY

ELEVATION REFERENCE MARKS

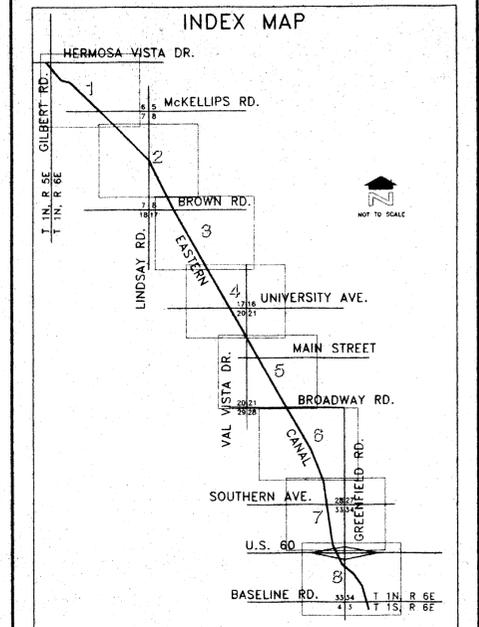
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 37	1289.79'	C.O.M. B.C. IN H.H. (0.49' BELOW RIM) INTER. SOUTHERN AVE. / GREENFIELD RD.

NOTES

- CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE

INDEX MAP

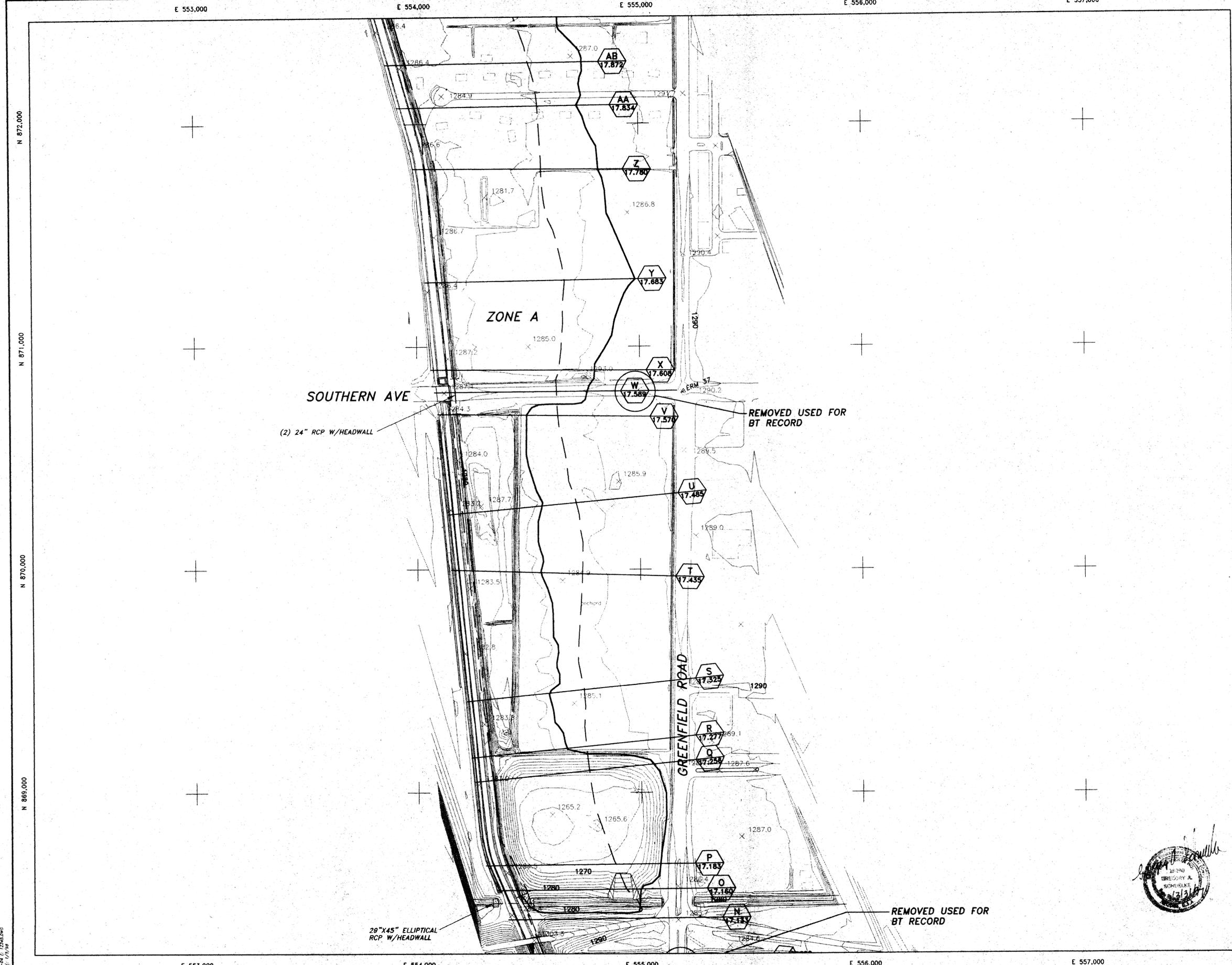


SCALE: 1" = 200'
CONTOUR INTERVAL = 2'

A-N WEST INC. Consulting Engineers
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Phoenix, Arizona 85020
(602)861-2200

DESIGN	BY	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	GAS		
PLANS	CMB		
PLANS CHK.			
SUBMITTED BY:			
RECOMMENDED BY: _____ DATE _____			
APPROVED BY: _____ DATE _____			
CHIEF ENGINEER AND GENERAL MANAGER			
SHEET 7 of 8			

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1" = 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS AND BASED ON GROUND CONTROL SURVEY
DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD.

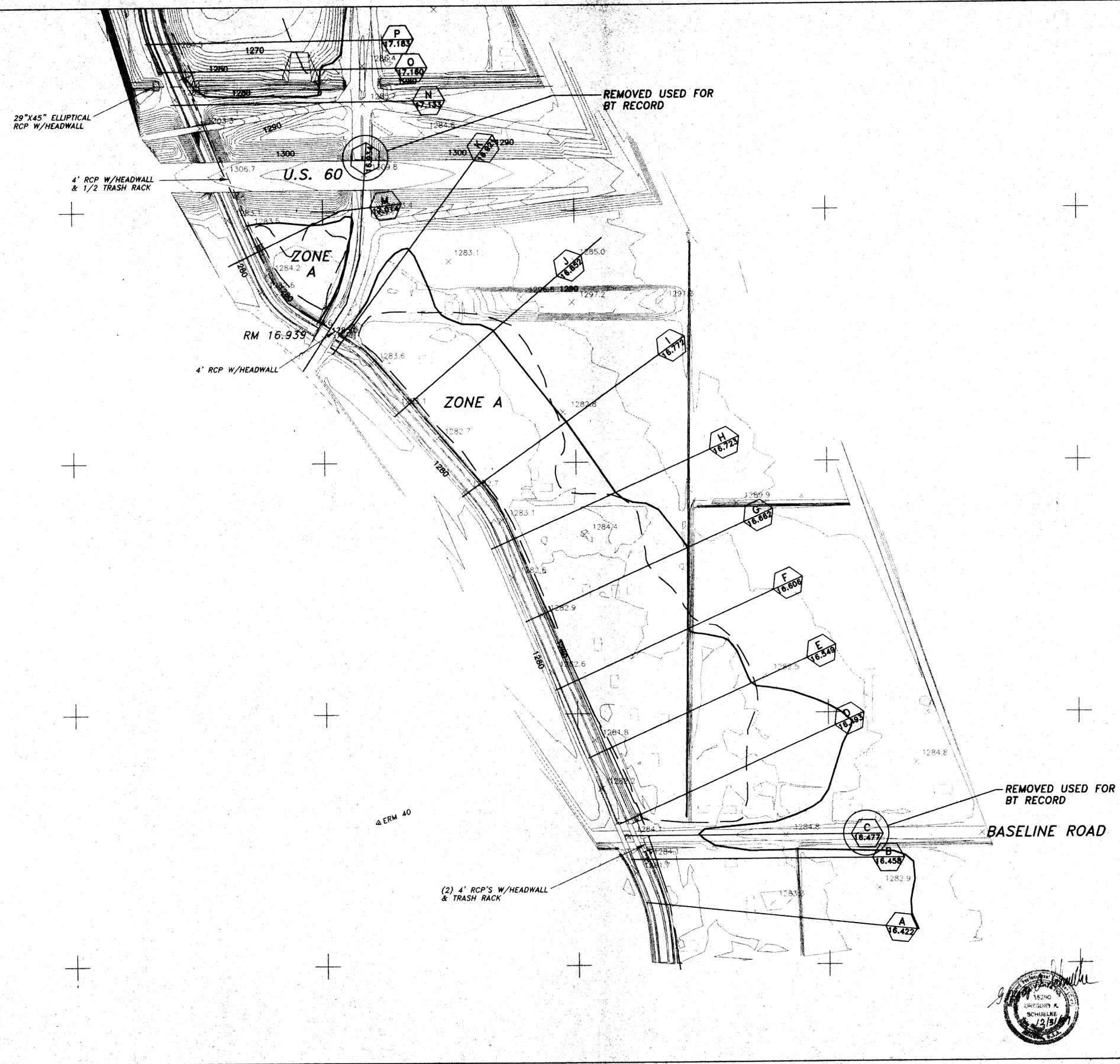


AERIAL MAPPING COMPANY, INC.
SURVEYING AND PHOTOGRAMMETRY
FLIGHT DATE: 3/20/96

T.D.N. SECTION 2.5

E 553,000 E 554,000 E 555,000 E 556,000 E 557,000 E 558,000

N 868,000
N 867,000
N 866,000
N 865,000



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF EASTERN CANAL

F.C.D. CONTRACT NO. 96-10

LEGEND

EFFECTIVE APPROX. A BOUNDARY	---									
PROPOSED UPDATED APPROX. ZONE A BOUNDARY	---									
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0									
CROSS SECTION	<table border="1"> <tr> <td>LETTER ID.</td> <td>AA</td> <td>Q=100 Yr DISCHARGE, CFS</td> </tr> <tr> <td>RIVER MILE ID.</td> <td>22.304</td> <td>FD=100 Yr WSE</td> </tr> <tr> <td></td> <td></td> <td>FW=Floodway WSE</td> </tr> </table>	LETTER ID.	AA	Q=100 Yr DISCHARGE, CFS	RIVER MILE ID.	22.304	FD=100 Yr WSE			FW=Floodway WSE
LETTER ID.	AA	Q=100 Yr DISCHARGE, CFS								
RIVER MILE ID.	22.304	FD=100 Yr WSE								
		FW=Floodway WSE								
ELEVATION REFERENCE MARK	ERM5 X									
BASE FLOOD ELEVATIONS	1221									
ZONE DESIGNATIONS	ZONE A									
CORPORATE LIMITS	---									
COUNTY OR STATE JURISDICTIONAL BOUNDARY	---									

ELEVATION REFERENCE MARKS

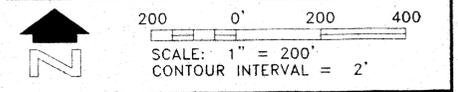
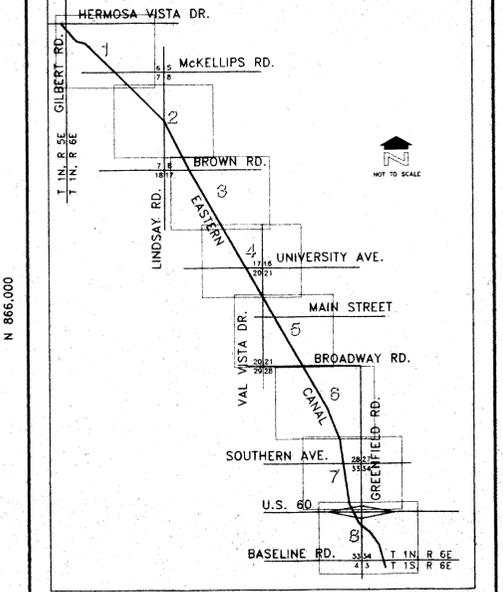
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
E.R.M. 40	1277.84'	C.O.M. B.C. IN H.H. (0.49' BELOW RIM) INTER. BASLINE RD. / E. VALLEY AUTO DR.

NOTES

- CROSS-SECTION STA. 10,000.00 IS HYDRAULIC BASELINE

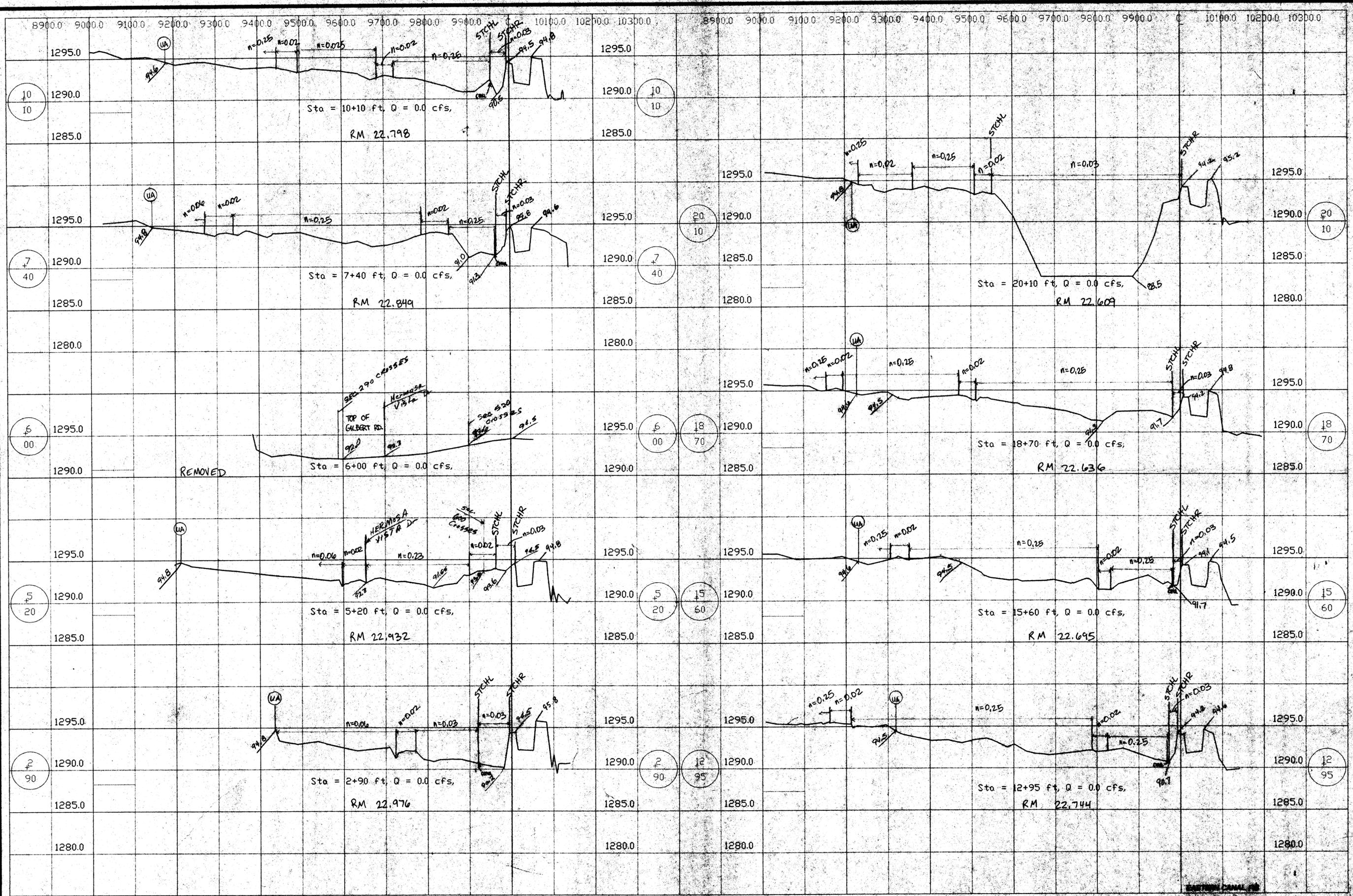
INDEX MAP



A-N WEST INC. Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602)861-2200
A-N W #7159-04

DESIGN	BY GAB	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	GAS		
PLANS	CMB		RECOMMENDED BY: DATE
PLANS CHK.			APPROVED BY: DATE
SUBMITTED BY:			CHIEF ENGINEER AND GENERAL MANAGER
			SHEET 8 OF 8

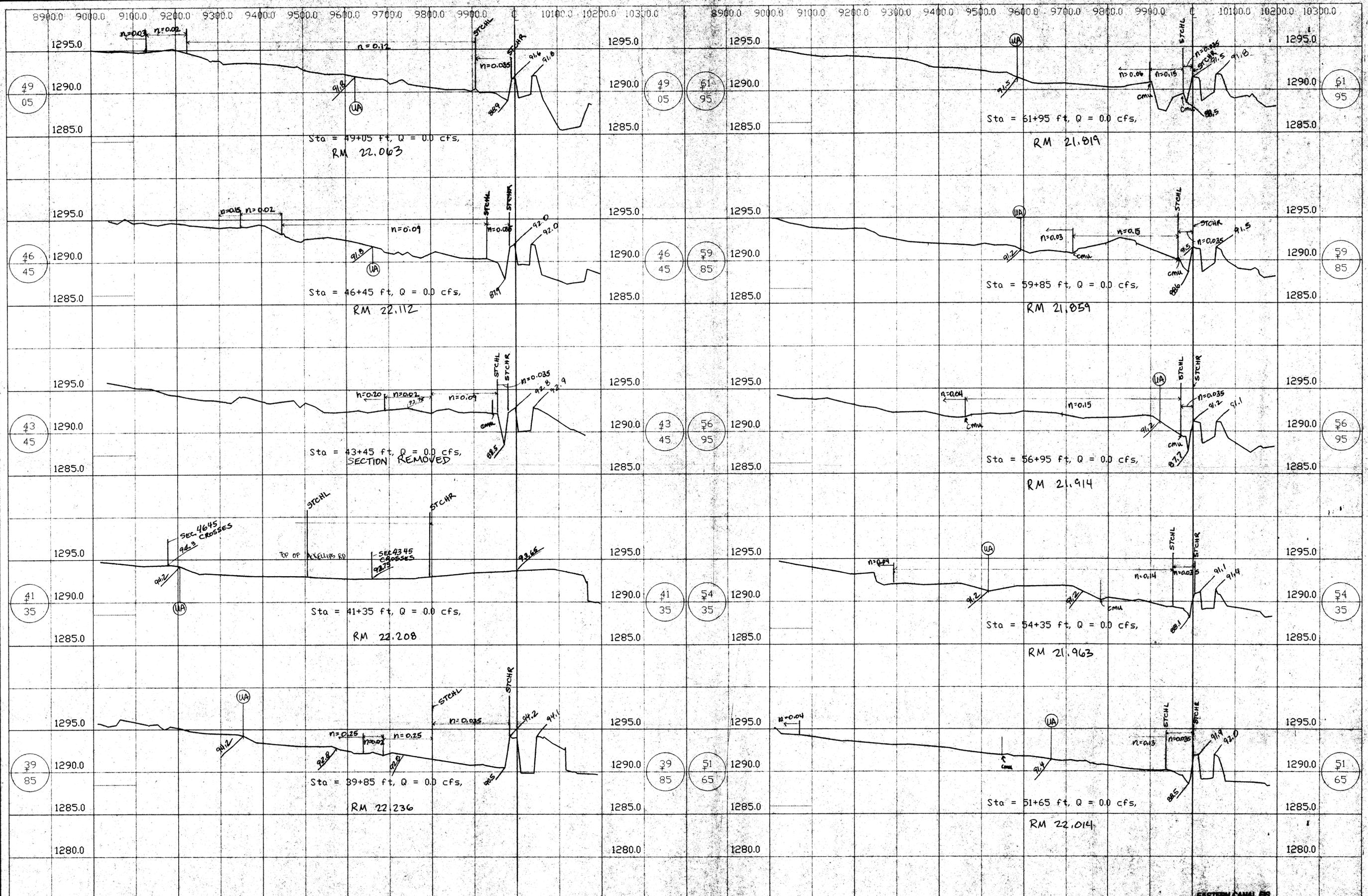




UNLIMITED APPROXIMATE ONLY A MODIFICATION
WIDTH/ELEVATION

A-NWESTING
Consulting Engineers
7600 N. 15th Street, Suite 200
Phoenix, Arizona 85020
(602) 951-2200

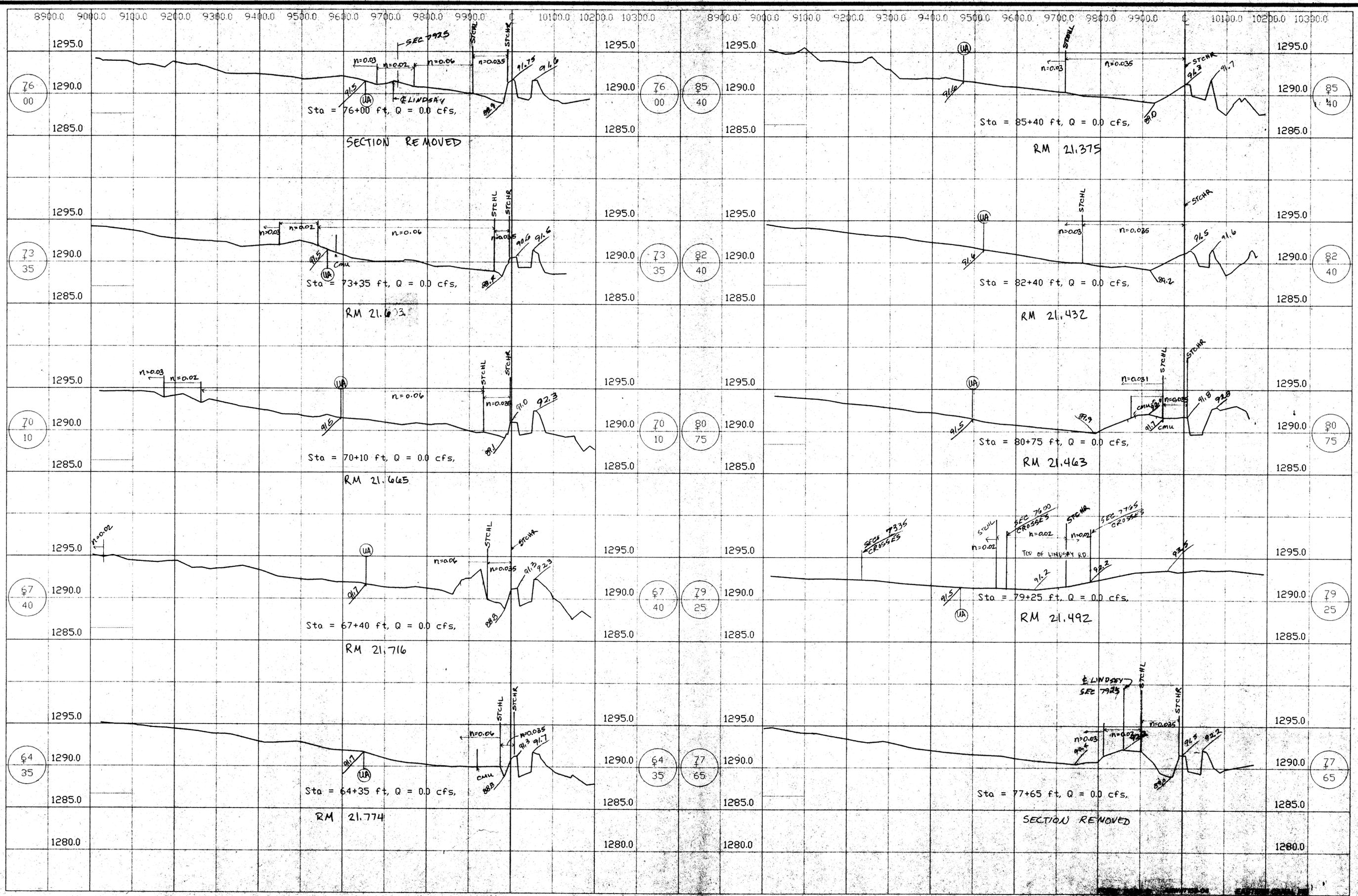
4/17



(UA) = UPDATED APPROXIMATE ZONE A FLOODPLAIN WIDTH/ELEV.

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

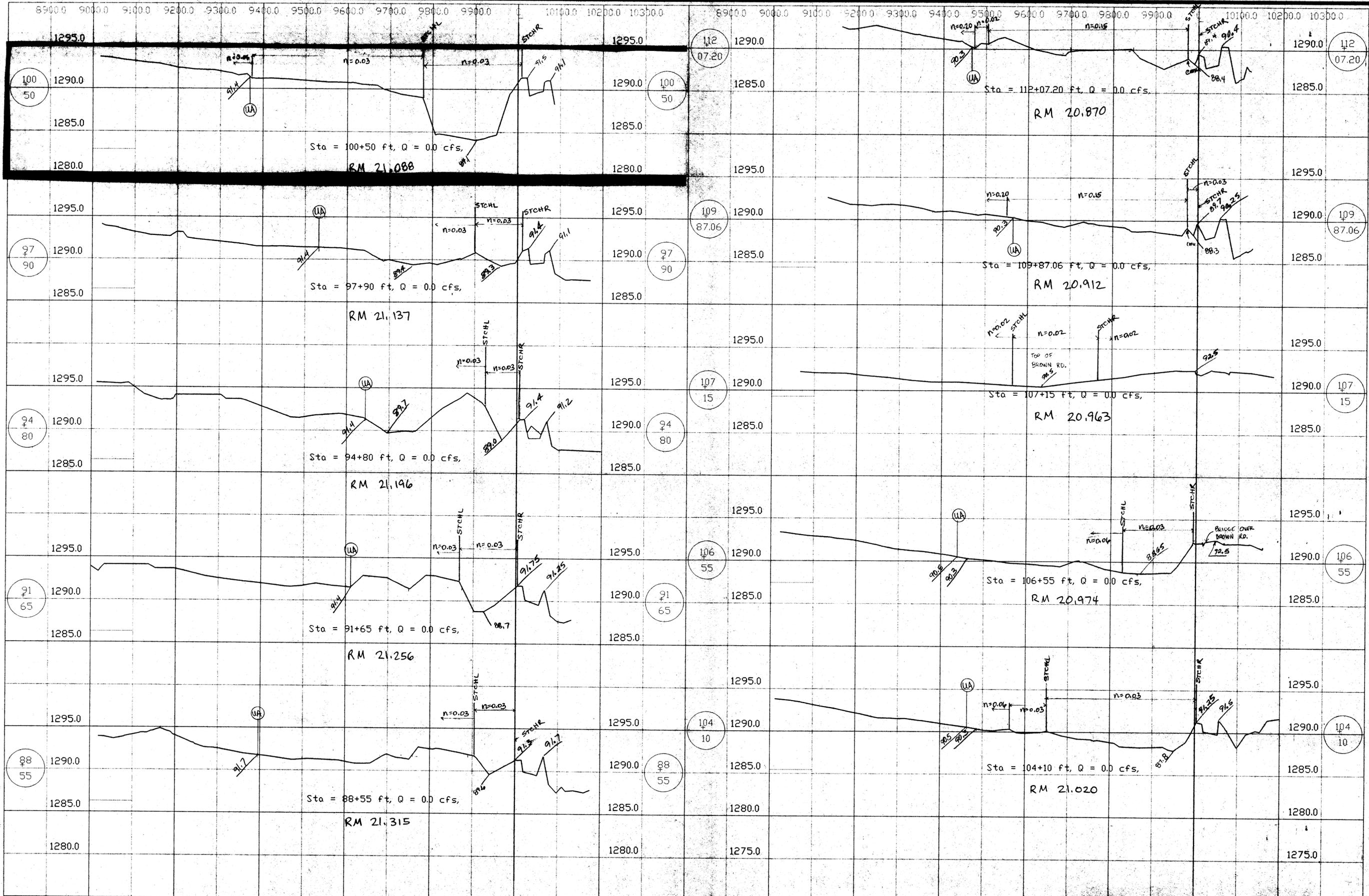
3/17



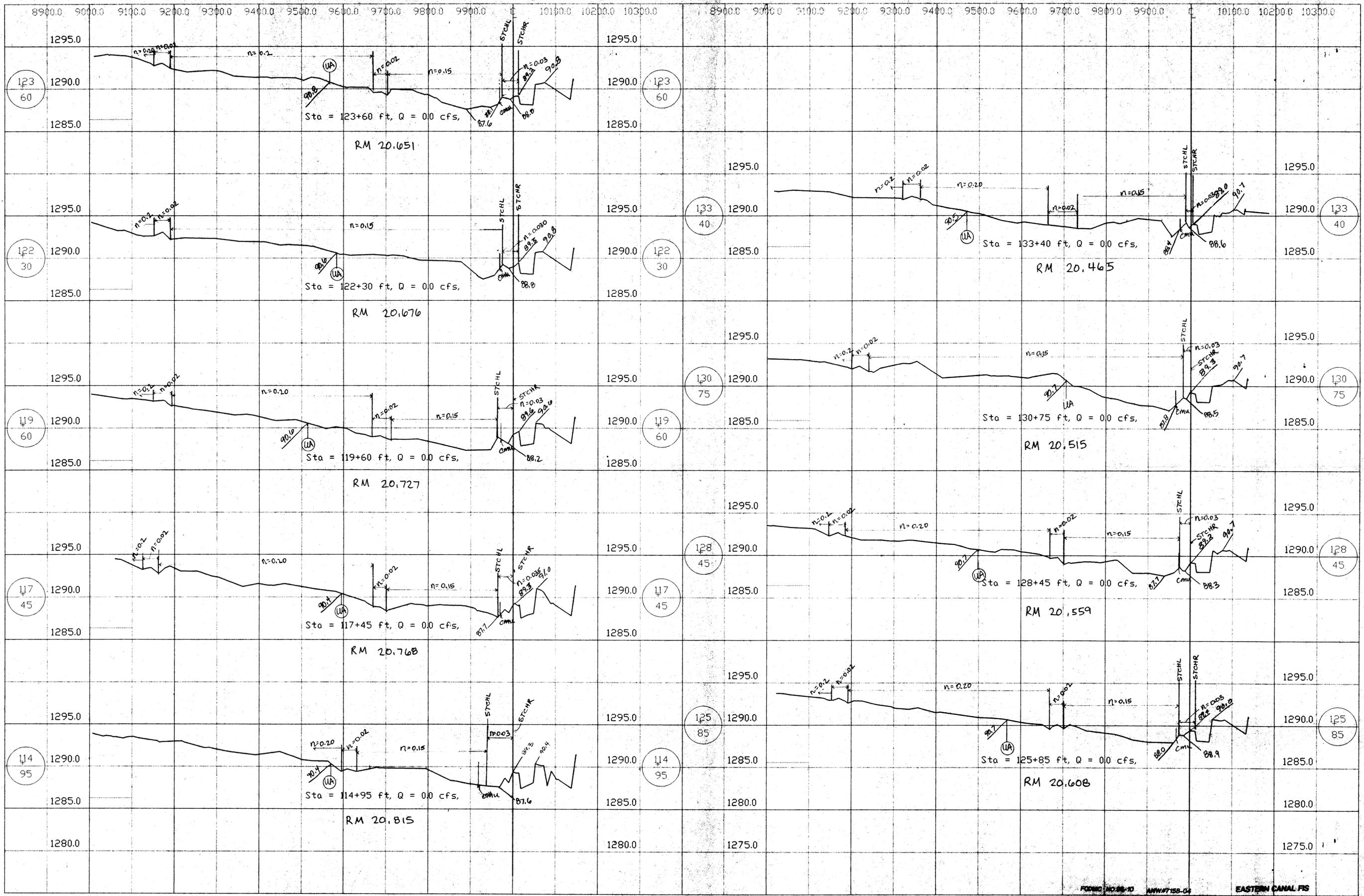
UPDATED APPROXIMATE ZONE A FLOODPLAIN WIDTH/ELEV.

R-N WEST INC.
 Consulting Engineers
 7600 N. 15th Street, Suite 200
 Phoenix, Arizona 85020
 (602)861-2200

4/17



9/17

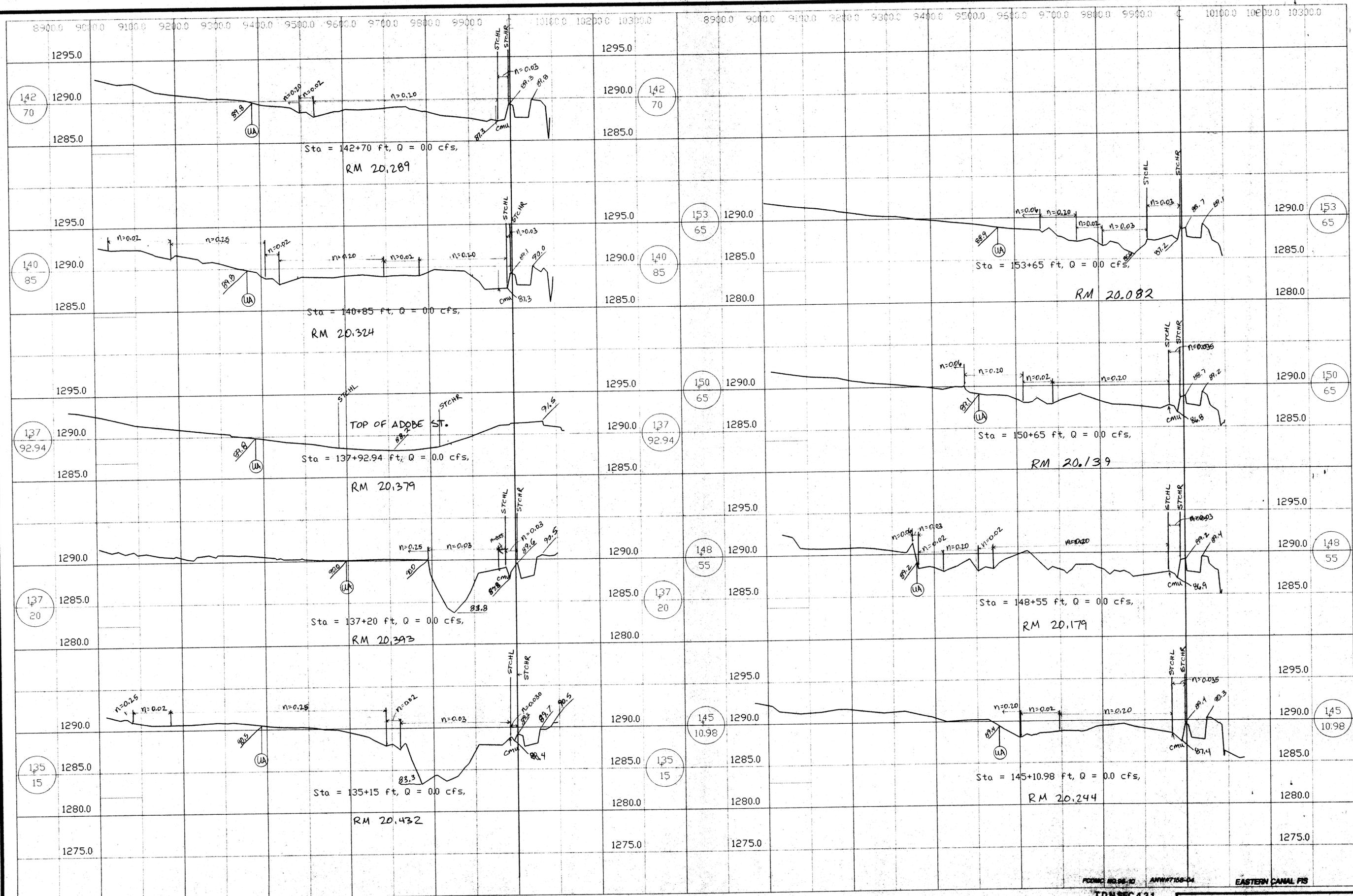


FDNR 10-88-10 ANW 7158-04 EASTERN CANAL FIS

LA - UPDATED APPROXIMATE ZONE A FLOODPLAIN WIDTH/ELEV.

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

4/17

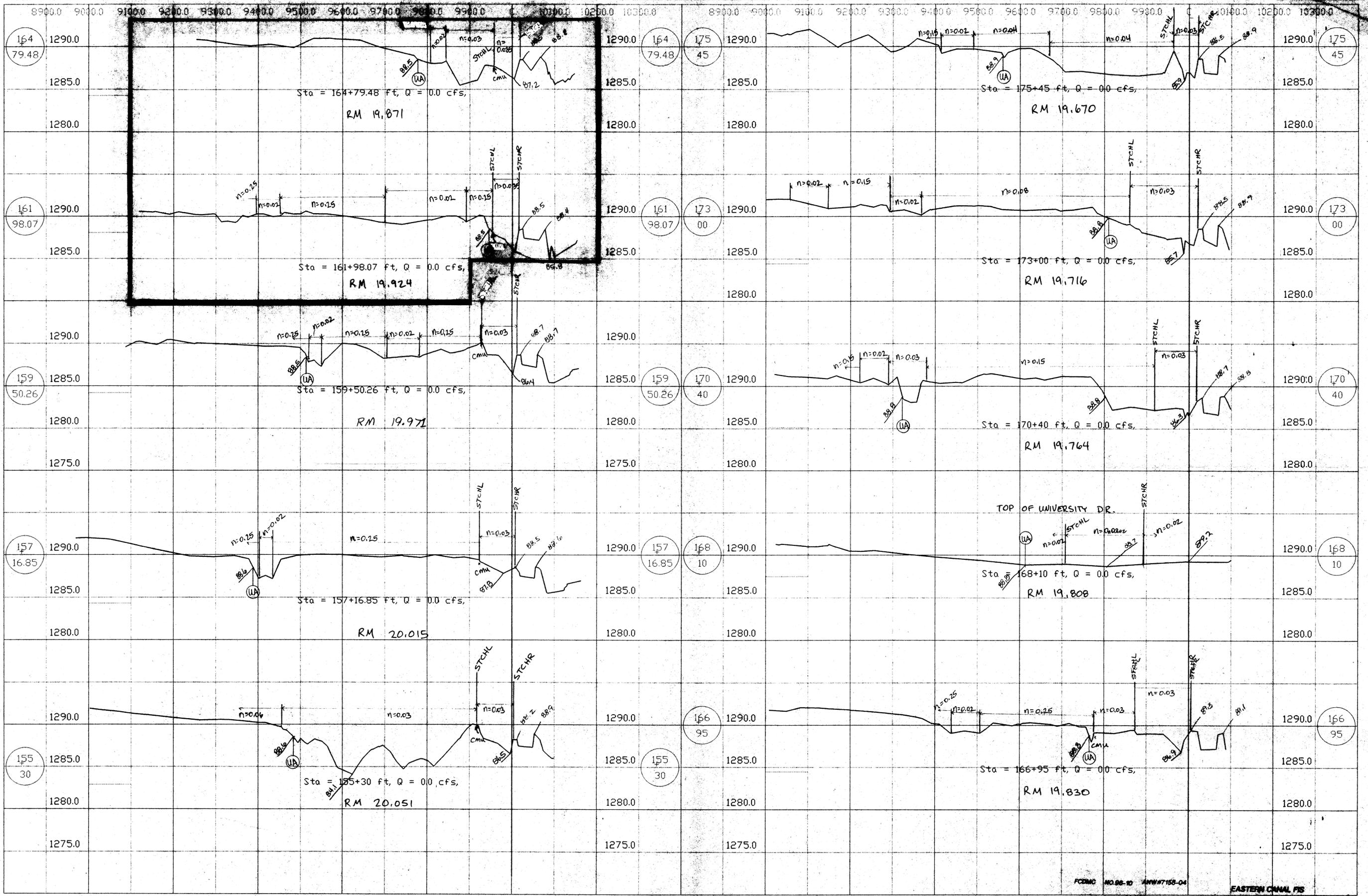


PCOING 02.06.10 ANW7158-04 EASTERN CANAL FIS

T.D.N. SEC. 4.3.1

(UA) = UPDATED APPROXIMATE ZONE A FLOOD PLAIN WIDTH/ELEV.

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

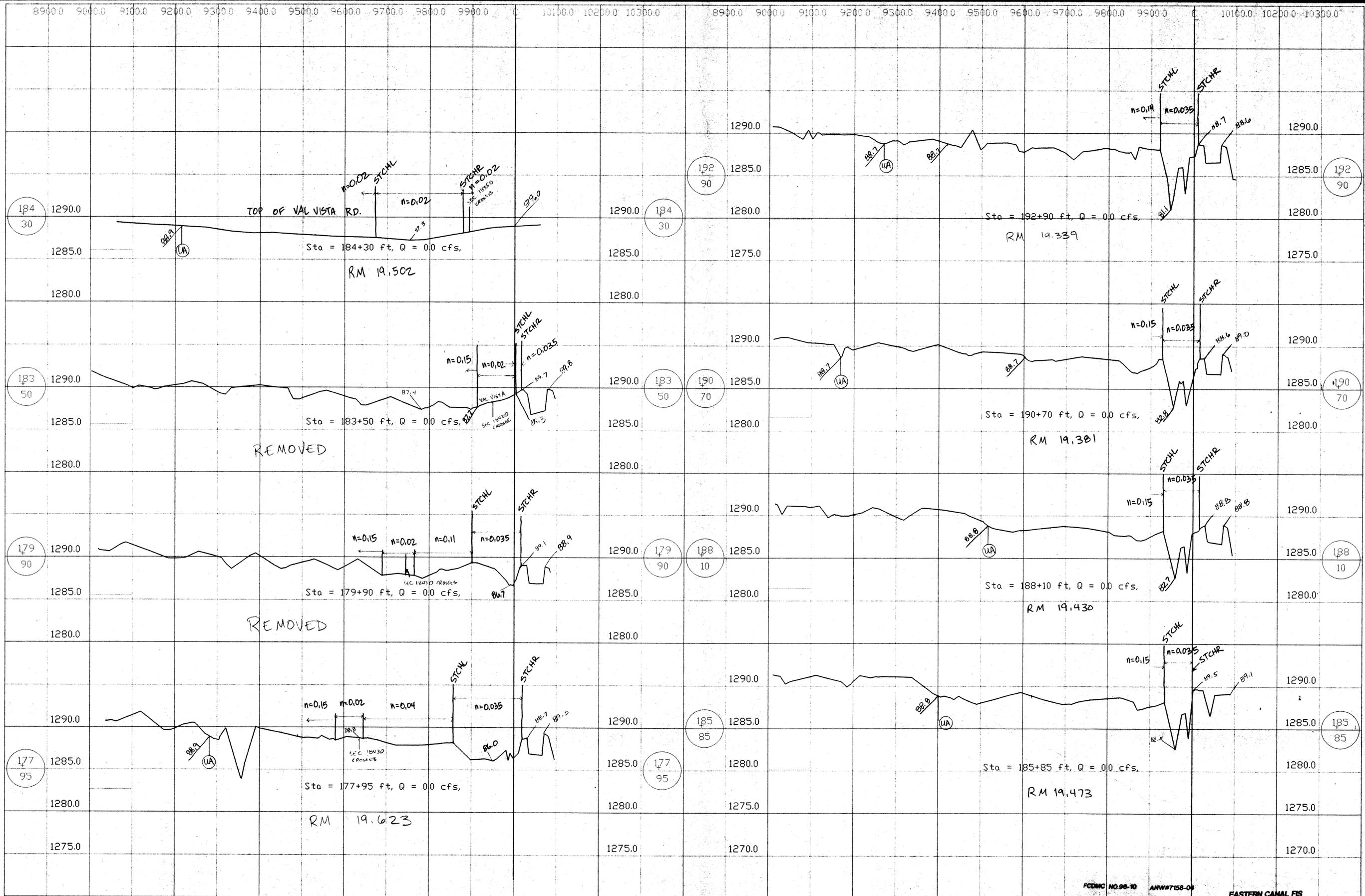


T.D.N. SEC. 4.31
 (UA) - UPDATED APPROXIMATE ZONE A
 FLOOD PLAIN WIDTH/ELEV.

PCDMC NO. 06-10 ANW7158-04

EASTERN CANAL FIS

01/17



PCDMC NO.98-10 ANW#7158-04

EASTERN CANAL FIS

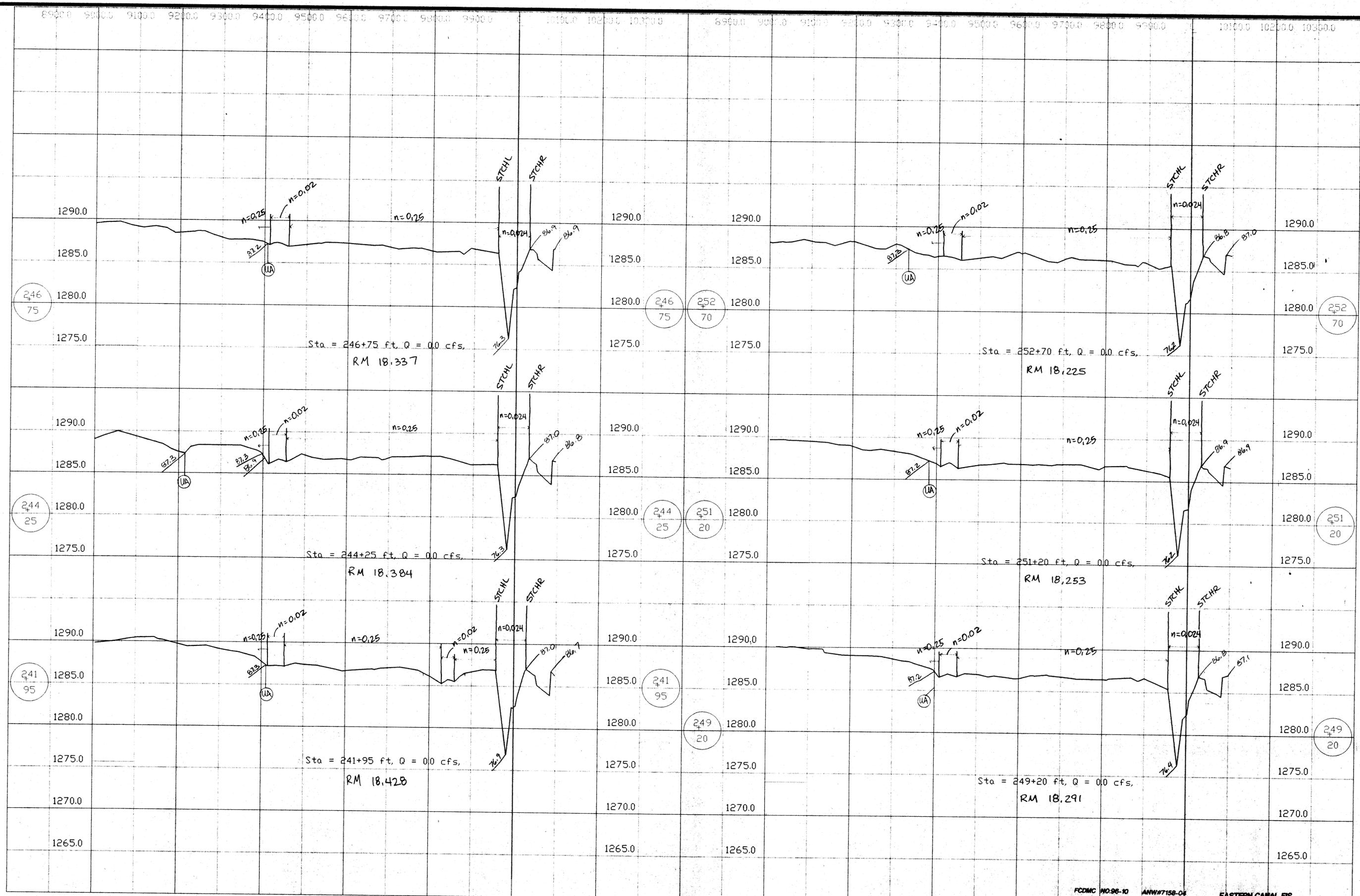
T.D.N.SEC.4.3.1

(UA) = UPDATED APPROXIMATE ZONE A
FLOOD PLAIN WIDTH/ELEV.

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

9/17

4/6/97



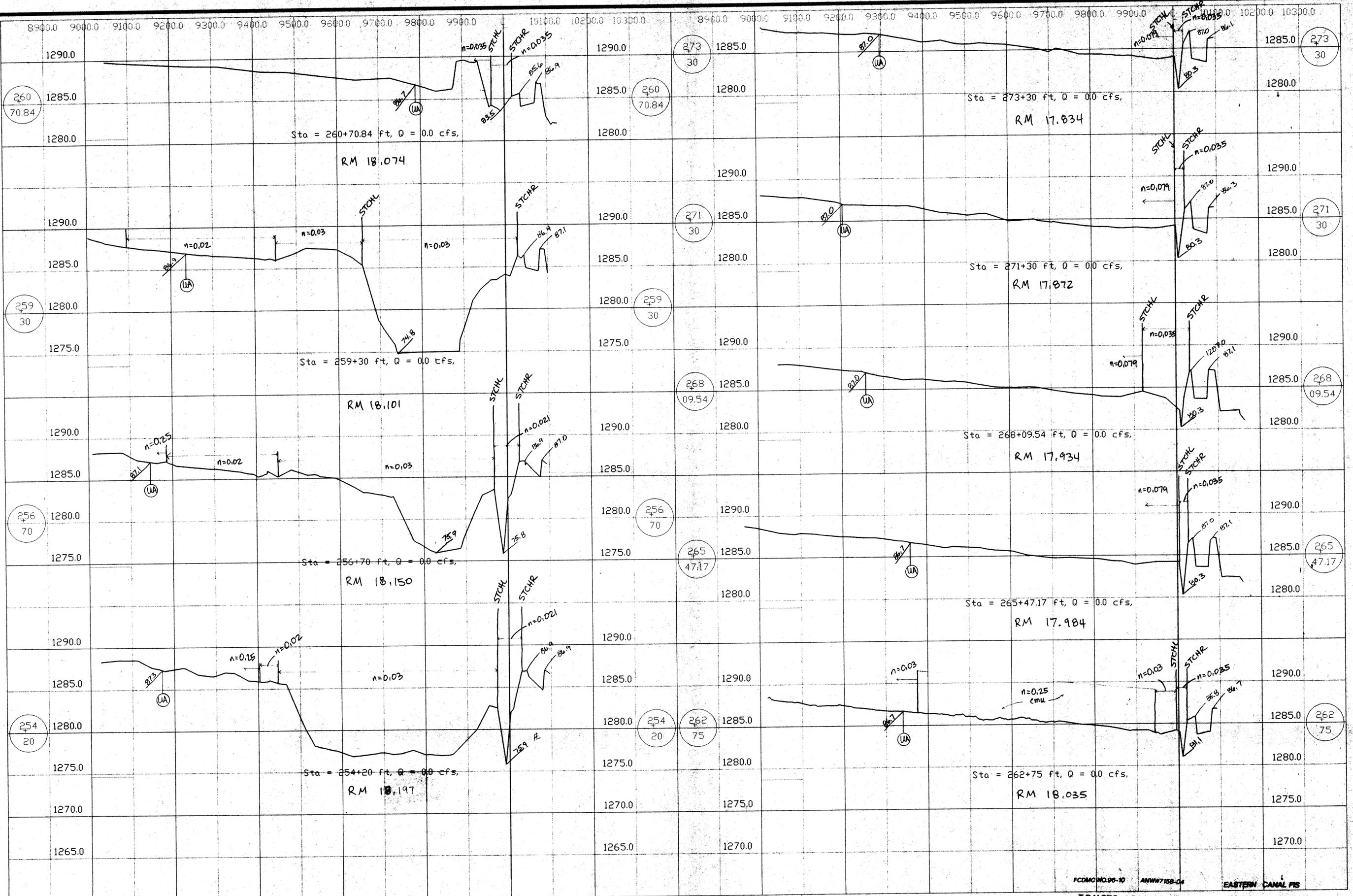
FCDMC NO.96-10 ANW7158-04 EASTERN CANAL FIS

T.D.N.SEC. 4.3.1

UA: UPDATED APPROXIMATE ZONE A FLOODPLAIN WIDTH/ELEV.

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

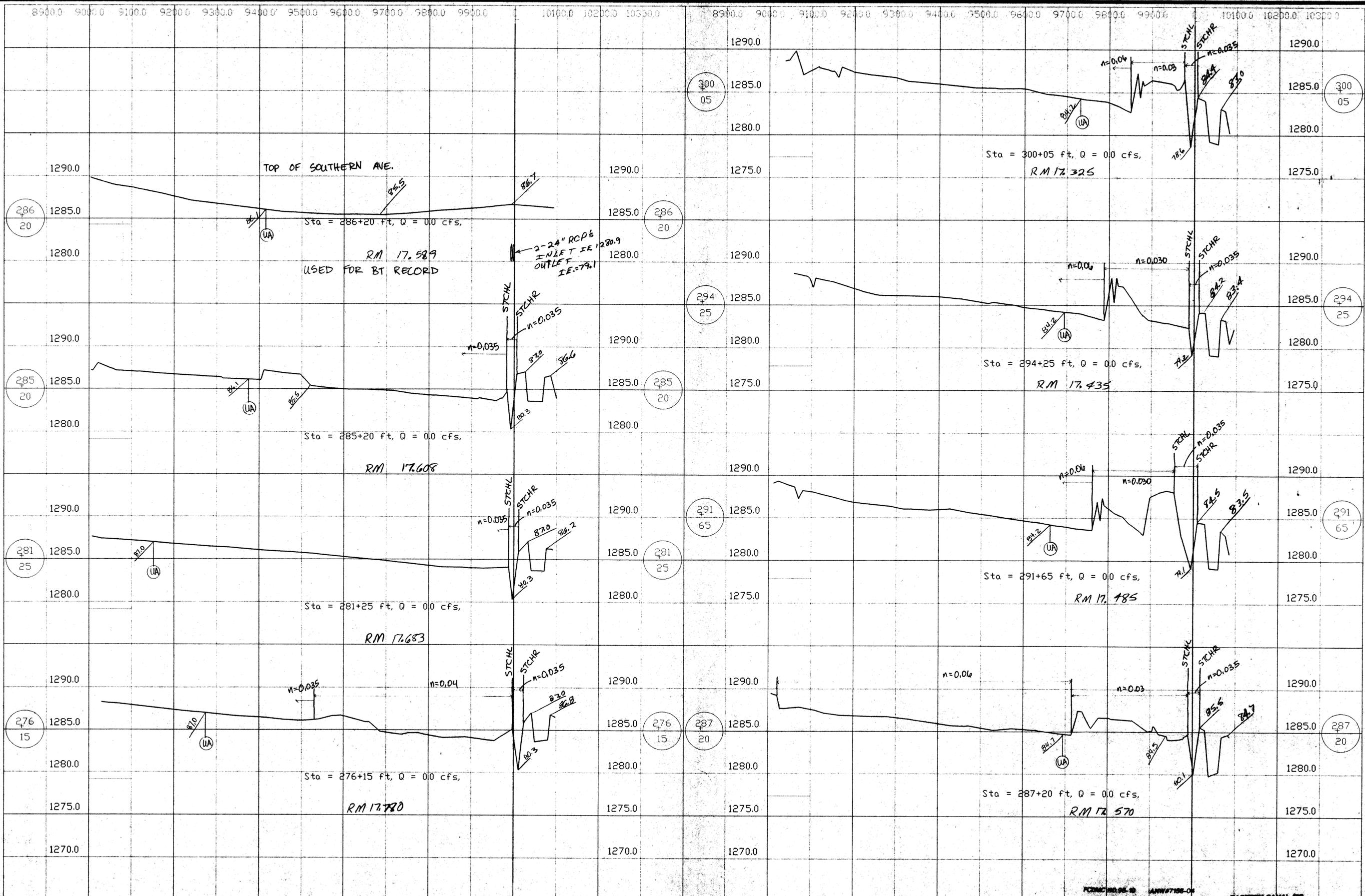
12/17



FCDMCO.98-10 ANW7158-04 EASTERN CANAL FIS

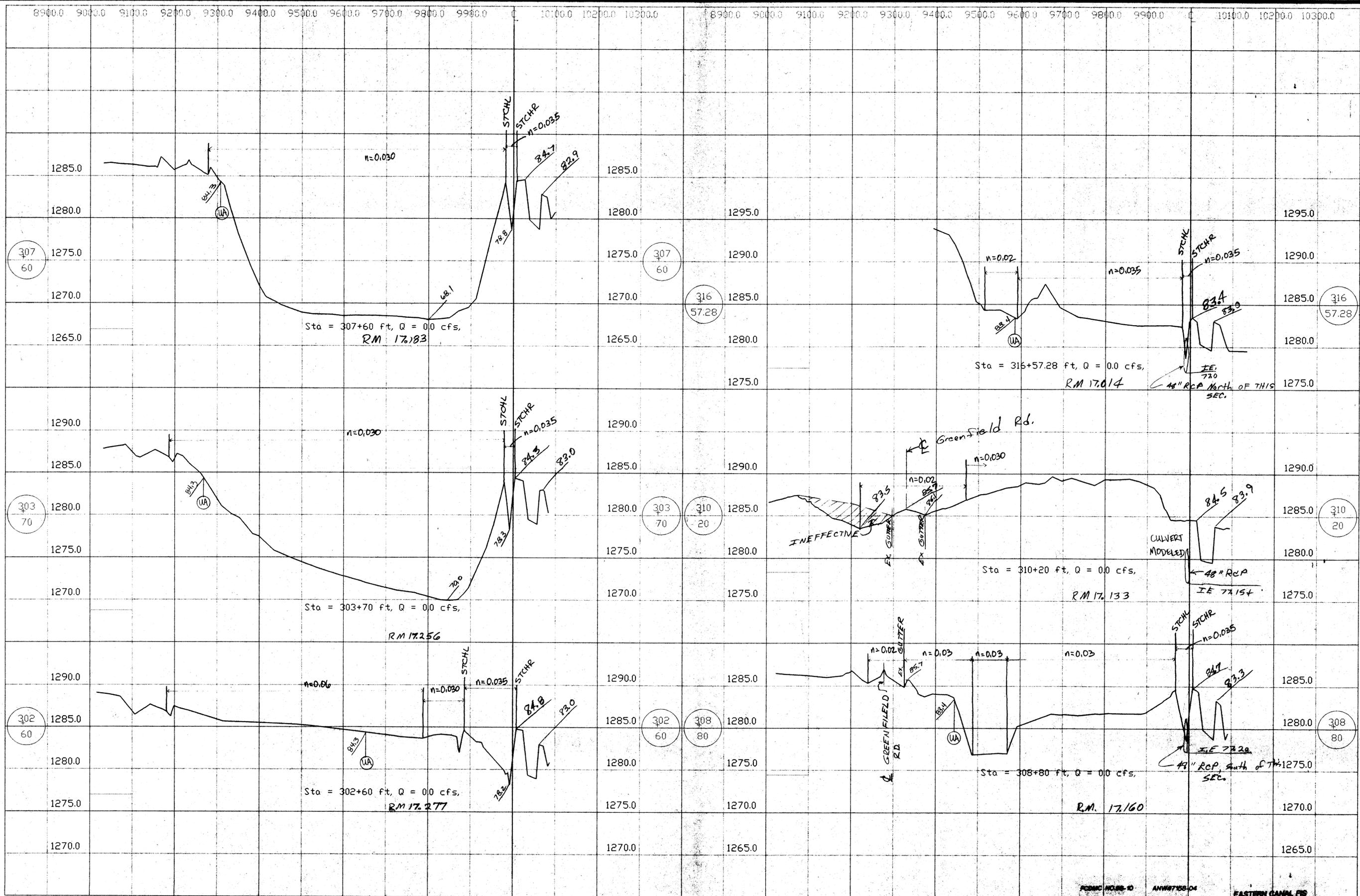
T.D.N. SEC. 4.31
 (UA) * UPDATED APPROXIMATE ZONE A
 FLOODPLAIN WIDTH/ELEV.

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



UA = UPDATED APPROXIMATE ZONE A FLOOD PLAIN WIDTH/ELEV.

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

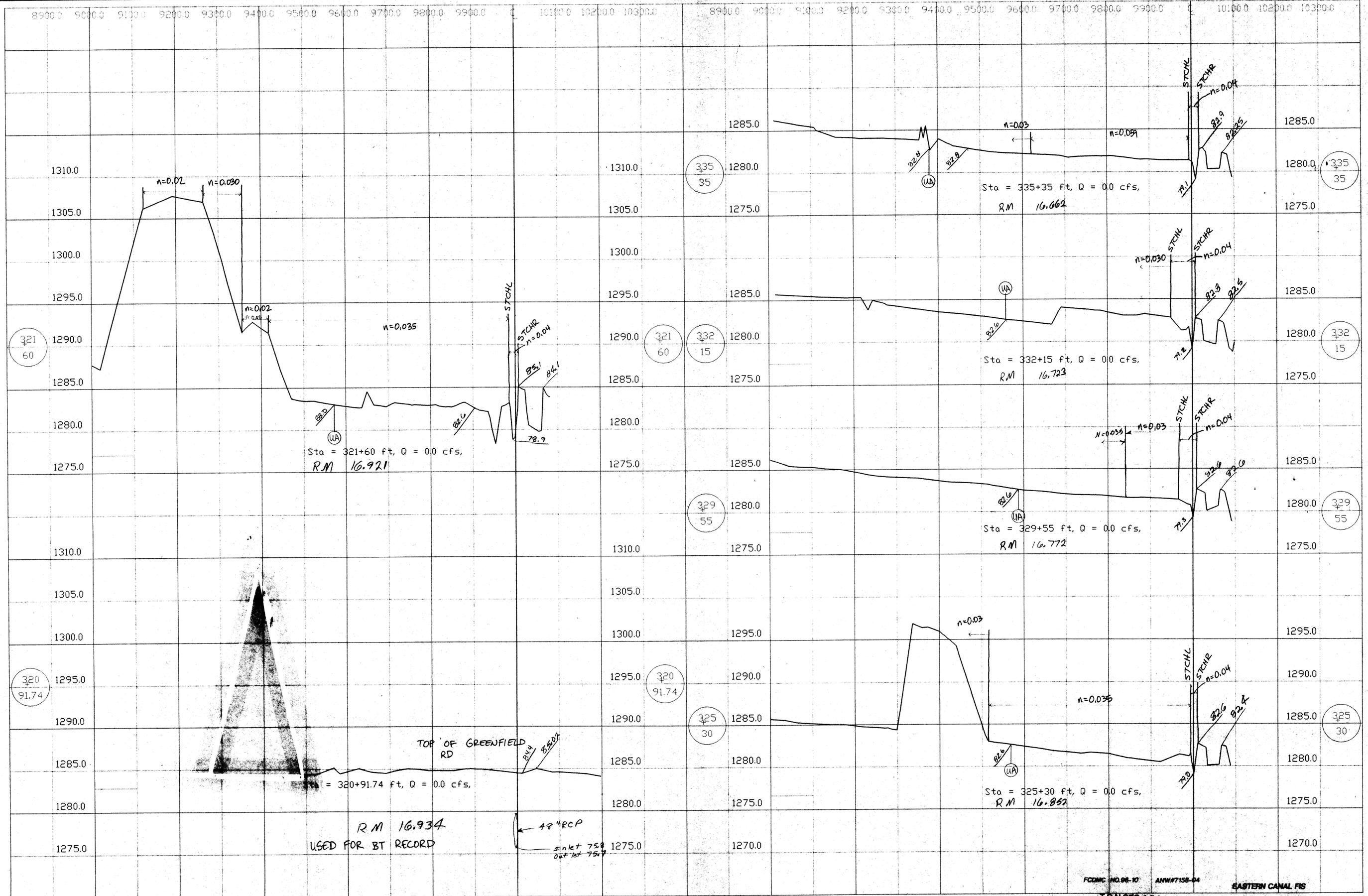


PCBNC NO. 10 AN# 7158-04 EASTERN CANAL FIS

T.D.N. SEC. 4.31
 (UA) - UPDATED APPROXIMATE ZONE A
 FLOODPLAIN WIDTH/ELEV.

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

15/17

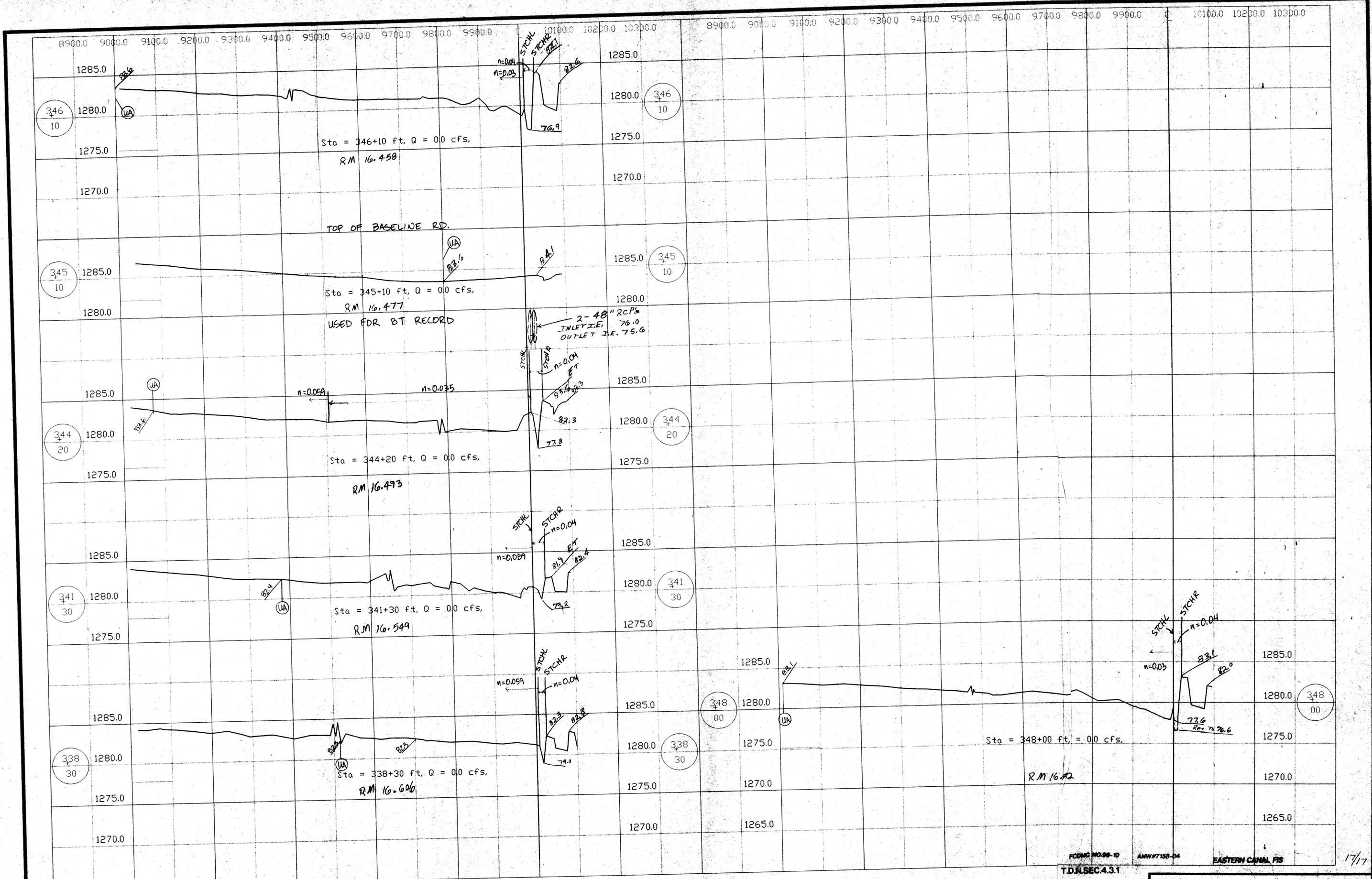


FDOMC NO. 98-10 ANW#7158-04 EASTERN CANAL FIS

T.D.N. SEC. 4.3.1
 (UA) - UPDATED APPROXIMATE ZONE A
 FLOODPLAIN WIDTH/ELEV.

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

16/17



FORM NO. 98-10 ANW 7158-04 EASTERN CANAL FIS

T.D. SEC. 4.31
 UA - UPDATED APPROXIMATE ZONE
 A FLOODPLAIN WIDTH/ELEV.

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

17/17