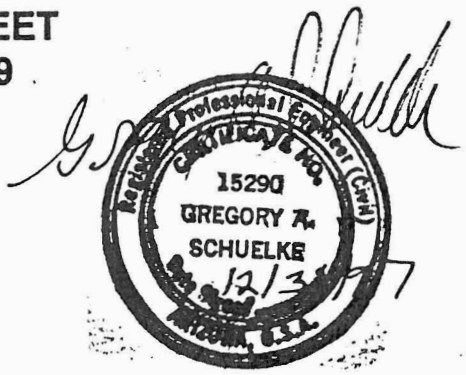
EASTERN CANAL
FLOODPLAIN DELINEATION STUDY
FCDMC NO. 96-10
TECHNICAL DATA NOTEBOOK

JUNE, 1997
REVISED DECEMBER, 1997

PREPARED FOR:

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



PREPARED BY:

A-N WEST, INC.
7600 NORTH 15TH STREET, SUITE 200
PHOENIX, ARIZONA 85020
(602) 861-2200

A-N WEST NO. 7158-04

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

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 Primatech 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

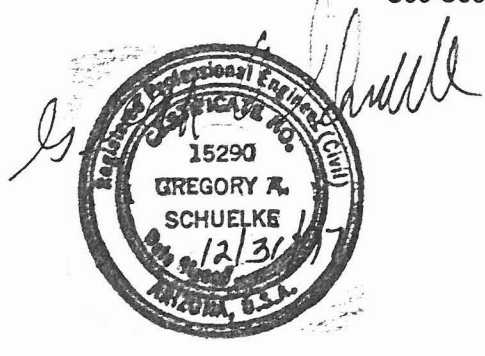
Main Channel - 5.5 Miles and 428.8 Acres
(Updated Zone A)

Length and Area of Floodway Delineated

No Floodway Delineated.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)



12/19/96

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

X-Section markups OK
He will have them delivered to ANW
x-sec. markups

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		Blueline 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: _____

6910-009 R8-93

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

2/19/97

Rajh - of FCD. called G.S.

"N" 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.

A-N WEST INC.
Consulting Engineers

7600 NORTH 15TH STREET
SUITE 200
PHOENIX, ARIZONA 85020
(602) 861-2200

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
FCD No 96-10

ATTN: Mr Raj Shah - Proj Manager

FROM: Greg Schuelke

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

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 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:

COPY TO: File

1.3(5)

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

Project Task		Percent Complete Reporting Month	Cumulative Percent Complete
Task 1	Coordination	10	25
Task 2	Data Collection	60	100
Task 3	Floodplain Delineation		
	a) Reconn. 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/Primatech 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) Reconn. 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 Primatech 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.

A-N WEST INC.
Consulting Engineers

7600 NORTH 15TH STREET
SUITE 200
PHOENIX, ARIZONA 85020
(602) 861-2200

Letter of Transmittal

TO: FCD MC
2801 West Durango Str.
Phoenix AZ 85009

ATTN: Mr Rajh Shah

FROM: Greg Schuelke

DATE: 5/6/97

JOB TITLE:

JOB NO.: A-N west No 7158-04

RE: Eastern Canal FIS
FCD No 96-10

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		Monthly Progress Report
		For Month Ending 4/30/97

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) Reconn. 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.

A-N WEST INC.
Consulting Engineers

7600 NORTH 15TH STREET
SUITE 200
PHOENIX, ARIZONA 85020
(602) 861-2200

Letter of Transmittal

TO: FCD MC
2801 West Durango Str.
Phoenix AZ 85009

ATTN: Mr Rajh shah

FROM: Greg Schuelke

DATE: 5/30/97

JOB TITLE:

JOB NO.: A-N west No 7158-04

RE: Eastern Canal FIS
FCD No 96-10

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		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) Reconn. 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 Primatech 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 ofJune, 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

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

Dortha Klaahsen
Contracts Coordinator

1.4.1 (1)

A-NWEST INC.
Consulting Engineers

7600 NORTH 15TH STREET
SUITE 200
PHOENIX, ARIZONA 85020
(602) 861-2200

Letter of Transmittal

TO: Flood Control District of Mor. Co
2801 west Durango Str.
Phoenix Az. 85009

ATTN: Mr Raju Shah

FROM: Greg Schuelke

DATE: 12/15/96

JOB TITLE:

JOB NO.: ANW # 7158-04

RE: FCD 96-10 Eastern Canal FIS

WE ARE SENDING YOU ☒ ATTACHED ☐ UNDER SEPARATE COVER VIA Delivery

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: Raju, 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 bank elevs. Please review and return this only copy marked 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

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

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

C.S. called Robert Davies, Baker Engr 279-123.
Re: Eastern Canal FIS.
Why ~~were~~ was ex. structure survey not done?
How ~~it~~ was were those structure
Robert to get back to C.S. on this question.
He though storm drain inventory was deleted
~~Alan~~ Maybe Project Engr. misunderstood and assumed storm drain as well as culverts along canal were to be deleted.

1.4.1 (3)

12/31/96 (9:40 AM)

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

Lt. Mess to call back
Re: Eastern Canal FIS.

12/31/96

Robert Dantes 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 ? 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 his 1/14/97 proposal
We have Microstn. in our other office and
want to try for time and money savings to convert
the data from our other office's Microstation.

Robert to get CD-Rom of data ready tomm..
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 Microstation to Autocadd per Aerial Mapping Letter would result in added costs.

G.S. said A-N west just received Microstation data 1/15/97 and was sending to Richmond, Va. office to convert and didn't think there would be added cost.

1.4.1 (6)

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\anwbaker
cc: Raj Shah, FCDMC

1.4.1 (7)

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

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

LETTER OF TRANSMITTAL

TO AN West

DATE	JOB NO.
1/15/97	96020
ATTENTION: Grey Schulke	
RE: Eastern Canal DGN Data	

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 file.
			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 _____

1.4.1(8)

SIGNED: _____

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

1/22/97

Rej. of FCDMC called Greg S.
Got field survey data from Baker and Prospect Engr. on Eastern Amad structure survey of culverts.

Survey notes only, no digital data d.s.k
To leave at front desk for pickup.

A-N WEST INC.
Consulting Engineers

7600 NORTH 5TH STREET
SUITE 200
PHOENIX, ARIZONA 85020
(602) 861-2200

Letter of Transmittal

TO: Flood Control District of Mar. Co
2801 west Durango Str.
Phoenix, Az 85009

ATTN: Mr Raju Shah

FROM: Greg Schuelke

DATE: 1/30/97

JOB TITLE:

JOB NO.: A-N west No. 7158-04

RE: Eastern Canal FIS
FCD No. 96-10

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	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: Raj, Attached is a draft Field Reconn. 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 [x] ATTACHED [ ] UNDER SEPARATE COVER VIA

THE FOLLOWING:

[x] ELECTRONIC FILE	[ ] SHOP DRAWINGS	[ ] ORIGINALS
[ ] PLANS	[ ] REPRODUCIBLES	[ ] CHANGE ORDER (S)
[ ] SPECIFICATIONS	[x] 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 : [X] FOR REVIEW [ ] FOR YOUR USE [ ] AS REQUESTED
[ ] OTHER:

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

COPIES TO: RJK

____ WITH ENCLOSURES
x WITHOUT ENCLOSURES

SIGNED Tony
1.4.1(11)

PRIMATECH Engineers

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 SCHUELKE

FAX NO.: 943-1989

FROM: ALISON BOLIT

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.

1.4.1 (12)

Summary of Peak Discharges
Along the Eastern Canal

MFC001									Date
Mesa Flood Plain Delineation Study									11/5/96
			100-year 24-hr		100-year 6-hr		10-year 6-hr		
STATION	Drainage area (mi^2)	PEAK FLOW cfs	Q / A (cfs / mi2)	PEAK FLOW cfs	Q / A (cfs / mi2)	PEAK FLOW cfs	Q / A (cfs / mi2)	100 - yr Critica Duration	Critical Q_{100} cfs
CP3	0.46	273	593.5	225	489.1	78	169.6	24-hr	273
CP4	0.67	333	723.9	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	469.6	223	484.8	106	230.4	6-hr	223
CP21	2.81	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	1528.3	615	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	1682.8	687	1493.5	120	260.9	24-hr	774
CP53	6.36	767	1667.4	702	1526.1	160	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	1947.8	463	1006.5	24-hr	1004
CP57	7.29	1032	2243.5	948	2058.5	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	1265	2750.0	554	1204.3	24-hr	1326
CP70	8.28	1342	2917.4	1288	2795.7	582	1221.7	24-hr	1342
CP77	9.09	1487	3232.6	1435	3119.6	616	1339.1	24-hr	1487
CP78	9.25	1108	2408.7	1304	2834.8	115	250.0	6-hr	1304
CP79	9.3	1097	2384.8	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	1889.1	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
					11/5/96
STATION	Location	Drainage area (mi^2)	Q 100 cfs		
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.	6.36	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		

3/12/97

Raj. FRD called G.5

Re: Status Eastern Canal EIS.

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

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

Dortha Klaahsen
Contracts Coordinator

1.4.1 (16)

...OD CONTROL DISTRICT OF MARICOPA... UNTY

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 Rakeiski
Date: 3/27/97

Approved by: Stanley G Smith
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 Raju Shah
ORGANIZATION: FCDMC

RE: Eastern Canal FIS FCD No. 96-10
JOB NO. ANW# 7158-04
FROM: Greg Schuelke
REMARKS:

Raju, we request a reproducable of the current FEMA FIS maps for the Eastern Canal – Baseline 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 FIS.

Storm Drains along Canal

Apache Blvd. north

4/9/97

Peter Knudson called back

He gave the FCD copies of their storm drain master plans at start of project. He asked if we could check with Rajh at FCD. & FS we still needed 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 Tomm. Fri 5/9/97 @ 11:00 AM
5TH Floor
Main Str. & 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

IBER OF PAGES (INCLUDING COVER SHEET) 1
OR PROBLEMS REGARDING THIS FAX - CONTACT KAY, SHEILA OR SUZIE.

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

1.41 (22)

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

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

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

GS/dh

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

1.4.1 (23)

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

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: Grey Schueke
REMARKS: Robert, per our teleco of today attached are the ERM's used in our draft FIS report and in 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 Schuelke

REMARKS: Copy of Transmittal 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 HIS 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

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

GS/dh

cc: Mr. Rajh Shah, FCDMC

14.1(26)

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

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: 713-943-1989

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 Davies	From	
Co./Dept.	Co. PEC	
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 33.      (W)     SCALED
DU2317  83 minus 27 -       +00.                 +02.              NADCON
DU2317
DU2317
DU2317  HEIGHT      -        388.720 (meters)    1275.3? (feet)     ADJUSTED
DU2317  88 minus 29 -         +0.534 (+/- 2 cm)                    VERTCON
DU2317  DY minus 88 -         -0.460                               COMPUTED
DU2317. (NOTE - For assistance in applying shifts see file readme.dat)
DU2317 ***************************************************************
DU2317
DU2317  GEOID HEIGHT-          -29.56                               GEOID93
DU2317  MODELED GRAV-      979,442.8                                NAVD88
DU2317
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 WAS 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
```

1.4.1 (28)

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 3-INCH LOGO CAP.

DU2319 **********
DU2319 DESIGNATION - C 518
DU2319 PID - DU2319
DU2319 STATE/COUNTY- AZ/MARICOPA
DU2319 USGS QUAD - MESA (1983)
DU2319
DU2319 HORZ 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. +0.3. NADCON
DU2319
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
DU2319 VERT ORDER - FIRST CLASS 2
DU2319
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 gals.).
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. (+/- 180 meters Scaled)
DU2319
DU2319_STATION MARK IS A VERTICAL CONTROL DISK
DU2319_WITH SETTING: SET IN THE ABUTMENT OR PIER OF A LARGE BRIDGE
DU2319_THE MARK IS STAMPED: C 518 1992
DU2319_STABILITY: B = 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

DU2319 STATION DESCRIPTION
DU2319
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.

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.

10.4.1(32)

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

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

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

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

10.4.1 (33)

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.

1.4.1 (34)

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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 From 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)

1.4.1 (35)
A-N WEST INC.

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 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 hydorlogic 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 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.

5.1.3 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 Osborn # 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:

☐ Per Your Request	☒ For Approval	☐ Resubmit For Approval
☐ For Review	☒ For Your Use	☐ For Bid
☐ For Recording	☐ For Your Signature	☐ For Your Records

REMARKS:

Please give me a call if you need anything Else.

COPY TO: _____

_____

Signed Karl Mortensen

2.3 (1)

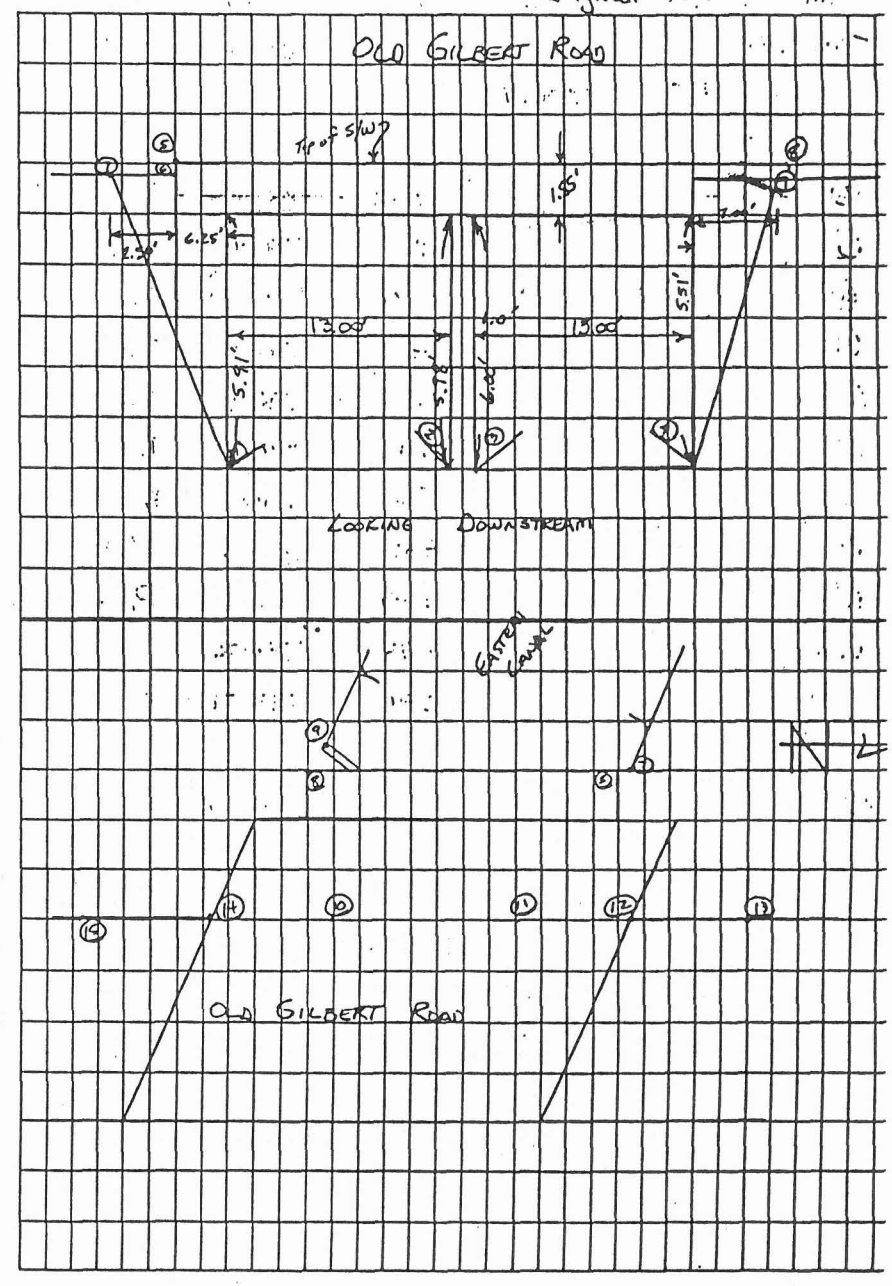
3130 N. 35th Avenue, Suite I, Phoenix, Arizona 85017 (602) 484-7691 FAX (602) 484-7694

1-8-97
Clear, Calm, Cold 45°F

Gardiner
Mortensen
Berghian

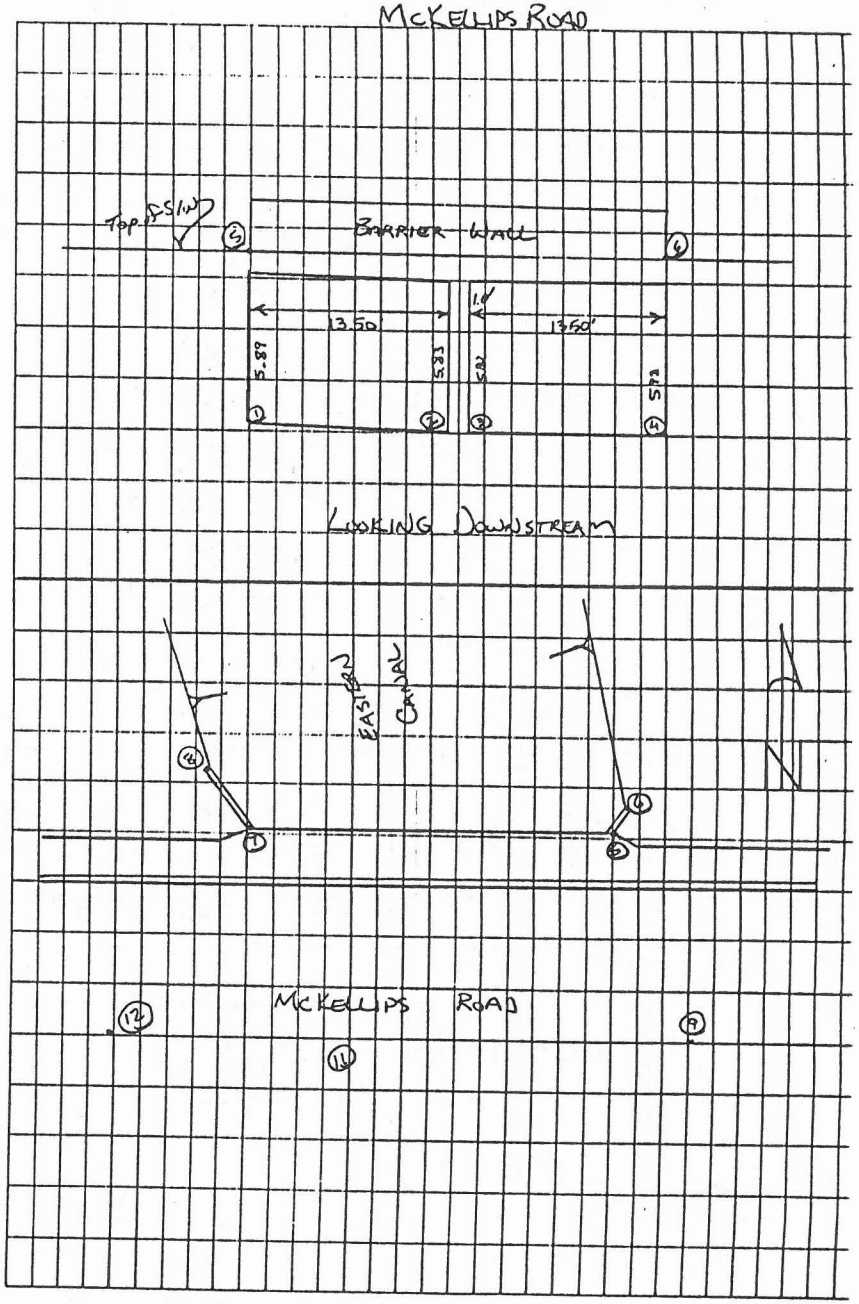
STA	BS+	H.I.	FS-	ELEV	Pt #
TBM 100				1295.401	B.C.
	4.68	1300.08			
①			12.45	1287.63	Invert @ Toe
②			12.67	1287.41	Invert
③			12.65	1287.43	Invert
④			12.12	1287.96	Invert @ Toe
⑤			4.78	1295.30	T/W
⑥			5.50	1294.58	"
⑦			5.50	1294.58	Top of Bank
⑧			4.63	1295.45	T/W
⑨			5.50	1294.58	Top of Bank @ Wingwall
⑩			5.26	1294.82	M
⑪			5.34	1294.74	M
⑫			5.29	1294.79	M @ E.C.
⑬			5.56	1294.52	M @ E.P.
⑭			5.26	1294.82	M @ E.C.
⑮			6.11	1293.97	E.P.
TBM 100			4.68	1295.40	✓

2.3 (2)



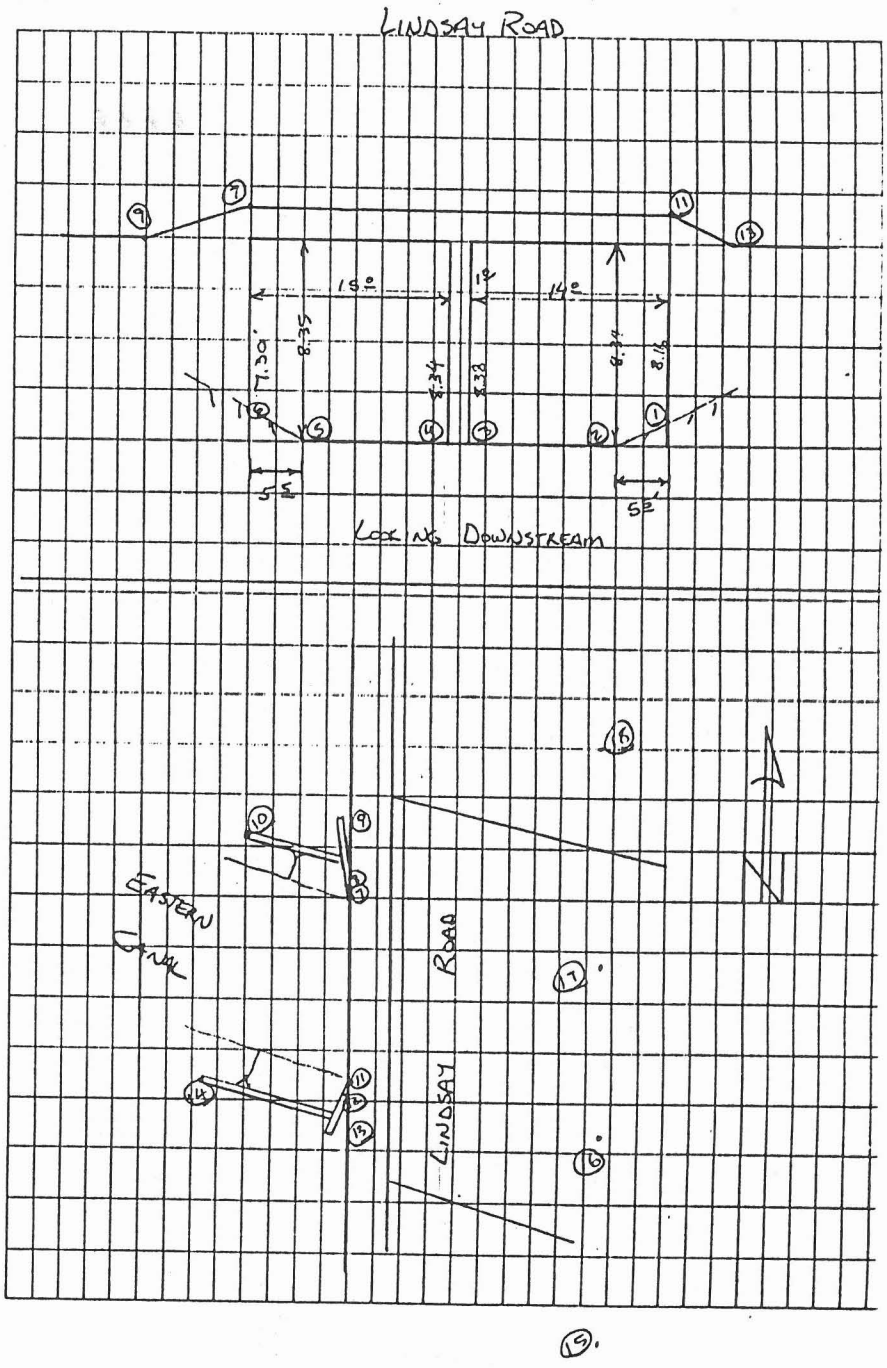
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM 102				1293.867	SRP B.C.
	5.30	1299.17			
①			12.44	1286.73	Invert @ Wingwall
②			12.72	1286.45	Invert
③			12.73	1286.44	Invert
④			12.88	1286.29	Invert @ Wingwall
⑤			4.85	1294.32	T/W @ Wall
⑥			4.82	1294.35	Top of Wingwall
⑦			5.15	1294.02	T/W @ Wall
⑧			5.16	1294.01	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	Inv @ Wingwall
②			12.44	1285.08	Inv @ Toe
③			12.33	1285.19	Invert
④			12.46	1285.06	Invert
⑤			12.43	1285.09	Inv @ Toe
⑥			11.42	1286.10	Inv @ 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	Pvmt
⑯			3.92	1293.60	Pvmt
⑰			4.00	1293.52	Pvmt
⑱			3.99	1293.53	Pvmt
TBM #134			4.14	1293.38	✓

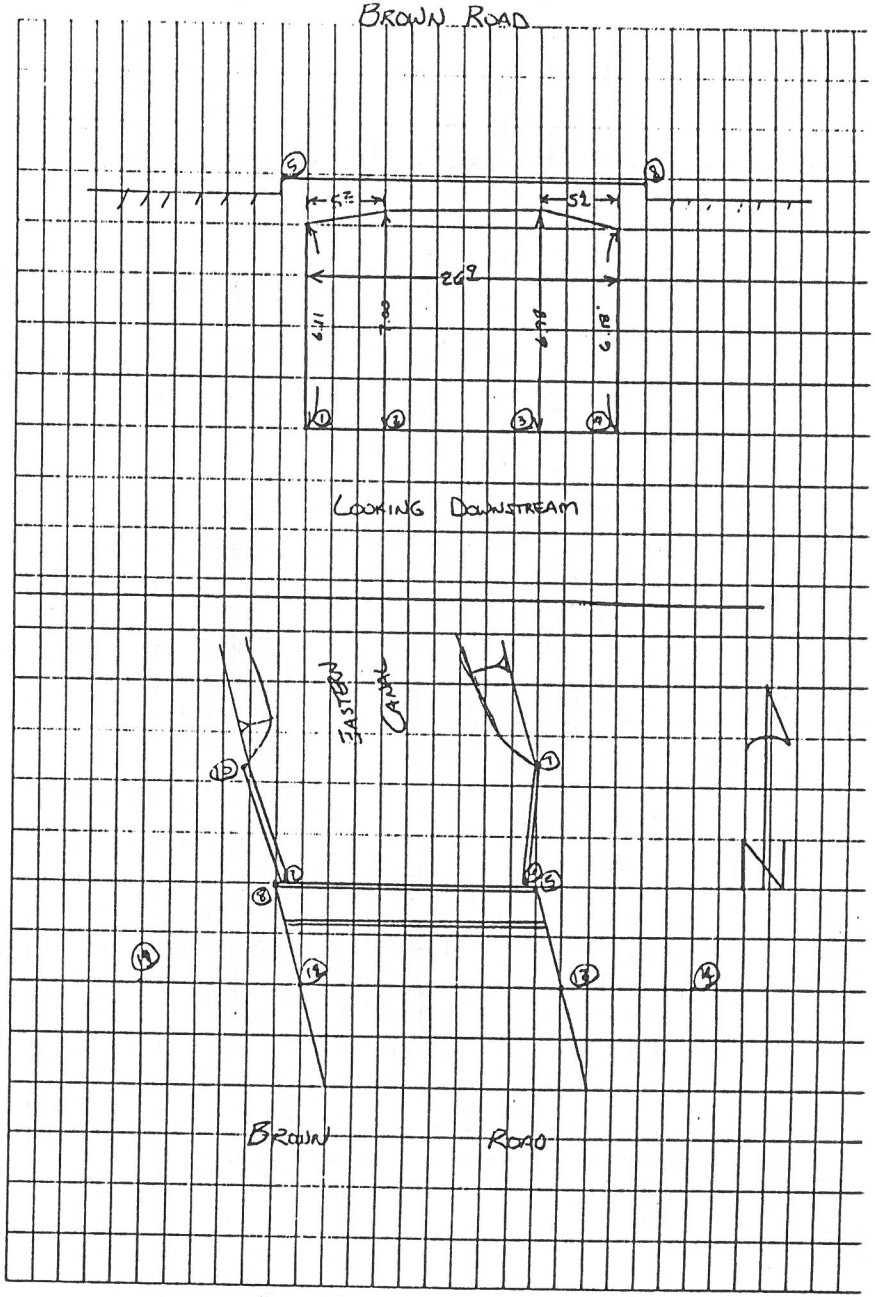
2.3 (4)



(15)

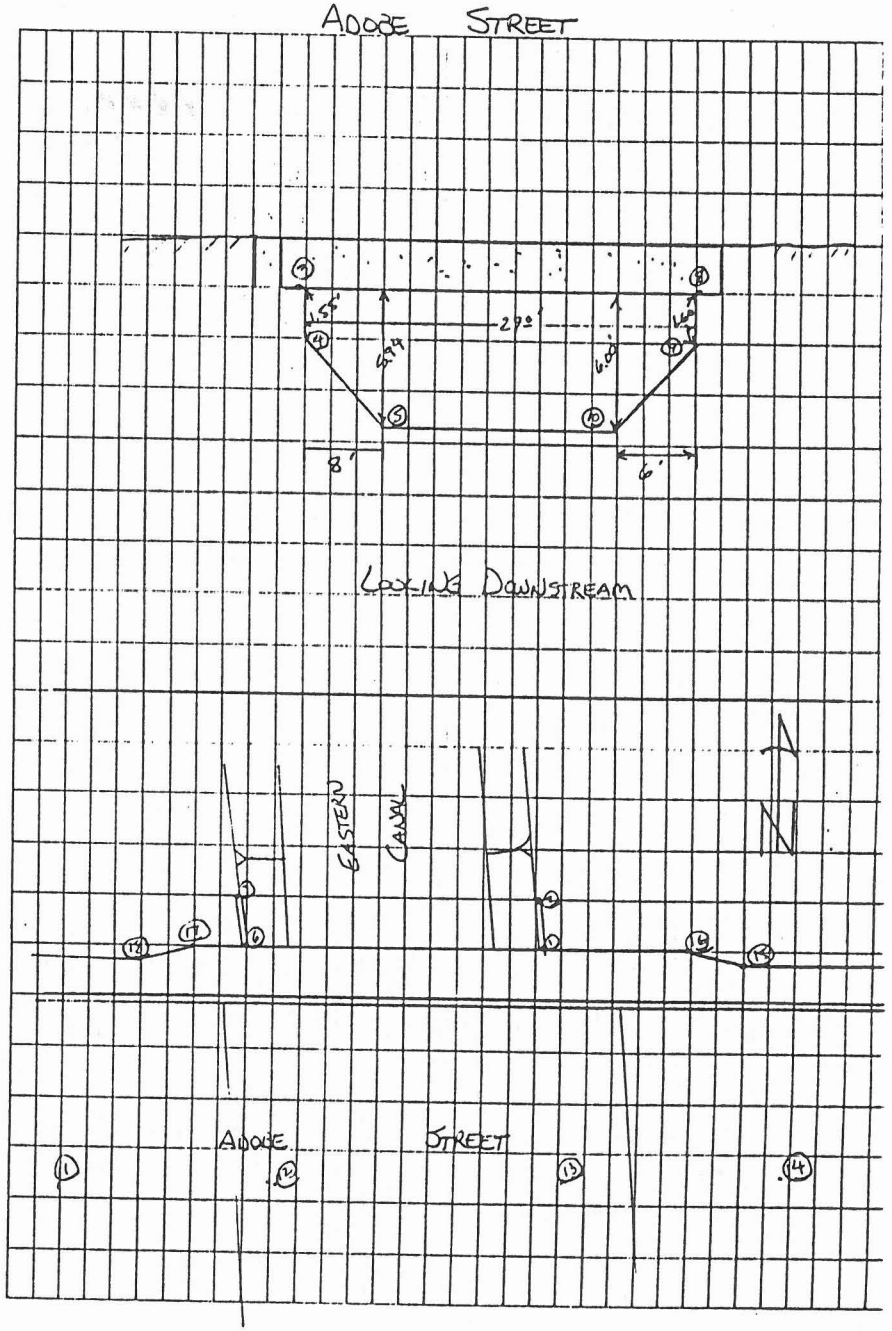
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #136				1292.346	MCHD BC
	5.10	1297.45			
(1)			12.87	1284.68	Inv @ Wingwall
(2)			13.15	1284.30	Invert
(3)			13.05	1284.40	Invert
(4)			13.00	1284.45	Invert @ Wingwall
(5)			4.01	1293.44	Top of Conc
(6)			5.13	1292.32	Top of Wingwall
(7)			5.60	1291.85	Top of Wingwall
(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	Pvmt
(12)			4.74	1292.71	Pvmt
(13)			4.60	1292.85	Pvmt
(14)			4.64	1292.81	Pvmt
TBM #136			5.10	1292.35	✓

2.3(5)



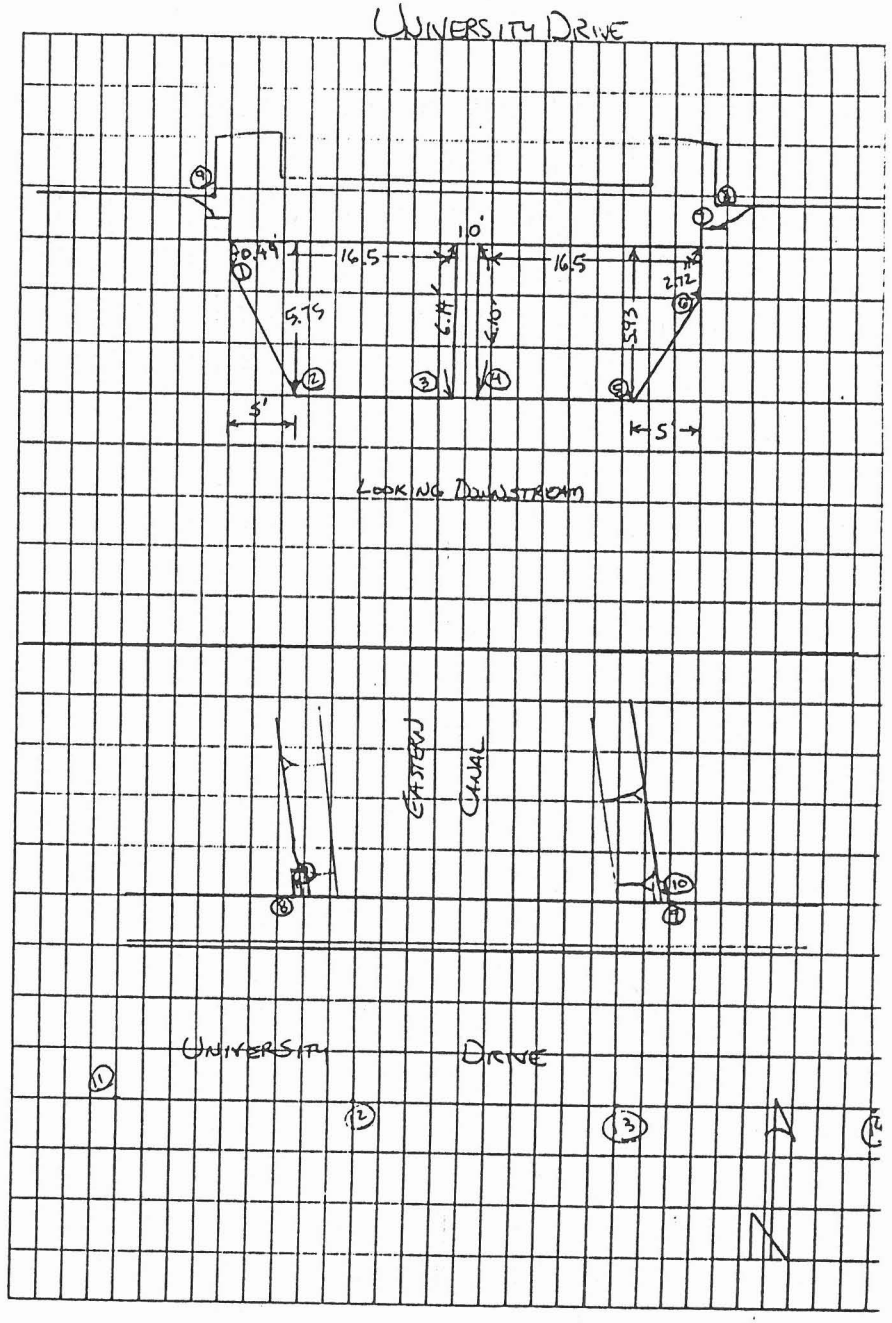
Sta	BS+	H.I.	FS-	Elev	Remarks
TBM#152				1291.050	SRP B.C.
	4.05	1295.10			
①			3.95	1291.15	Top of Wingwall
②			4.27	1290.83	Top of Wingwall
③			5.83	1289.27	Top of Abutment
④			7.38	1287.72	Top of Brk(-) Abutment
⑤			11.53	1283.57	Toe of Slope
⑥			4.07	1291.03	Top of Wingwall
⑦			4.32	1290.78	Top of Wingwall
⑧			5.81	1289.29	Top of Abutment
⑨			7.41	1287.69	Top of Brk(-) Abutment
⑩			11.66	1283.44	Toe of Slope
⑪			3.92	1291.18	Pvmt
⑫			3.53	1291.57	Pvmt
⑬			3.55	1291.55	Pvmt
⑭			3.83	1291.27	Pvmt
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#75				1288.367	SRP BC
	6.01	1294.38			
①			6.59	1287.79	Top of Slope
②			11.86	1282.52	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	Pvmt
⑫			4.87	1289.51	Pvmt
⑬			4.84	1289.54	Pvmt
⑭			4.87	1289.51	Pvmt
TBM#75			6.01	1288.37	✓

2.3 (1)

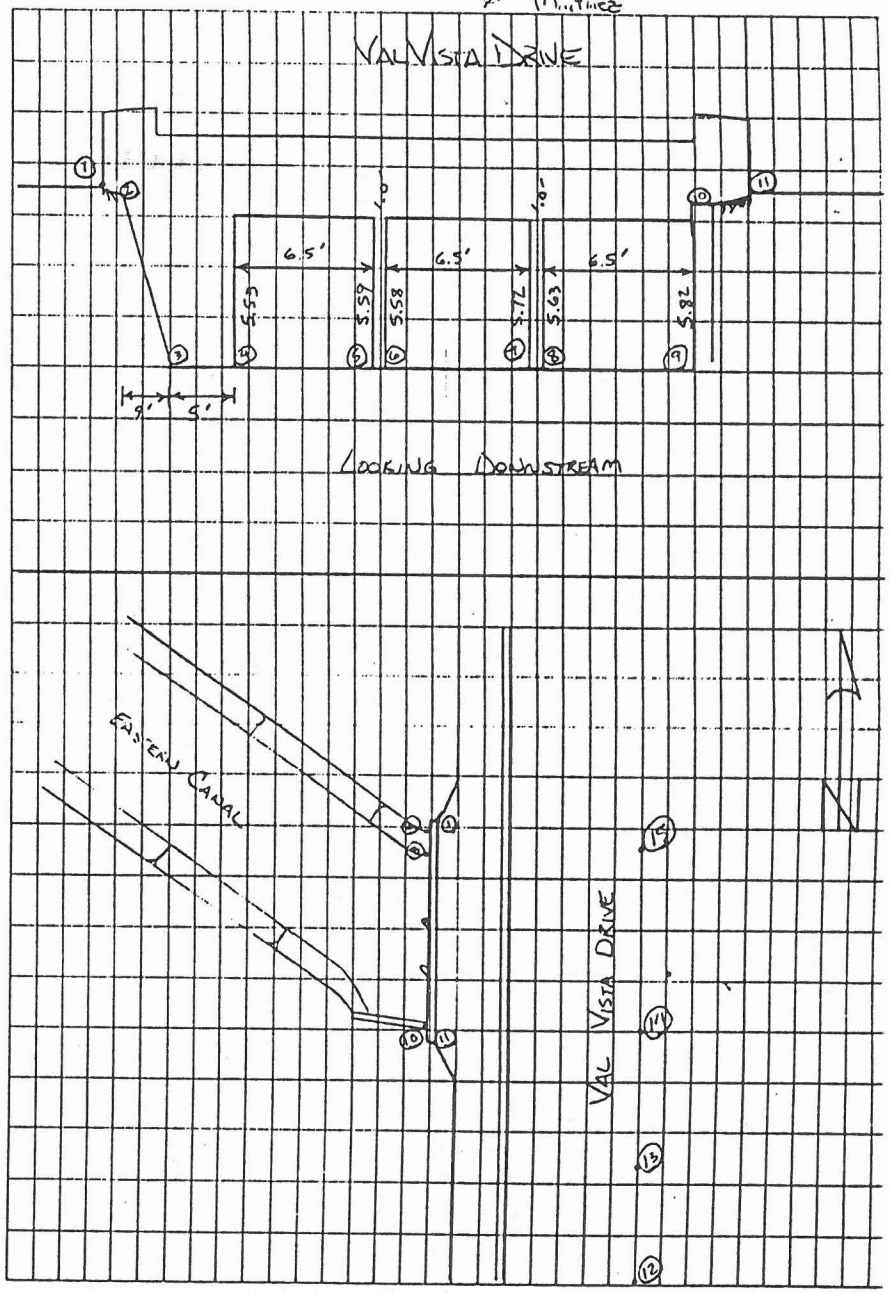


1-10-97
Clear, Calm, Cold 50°F

Gashler
Mortensen
Berghian
Martinez

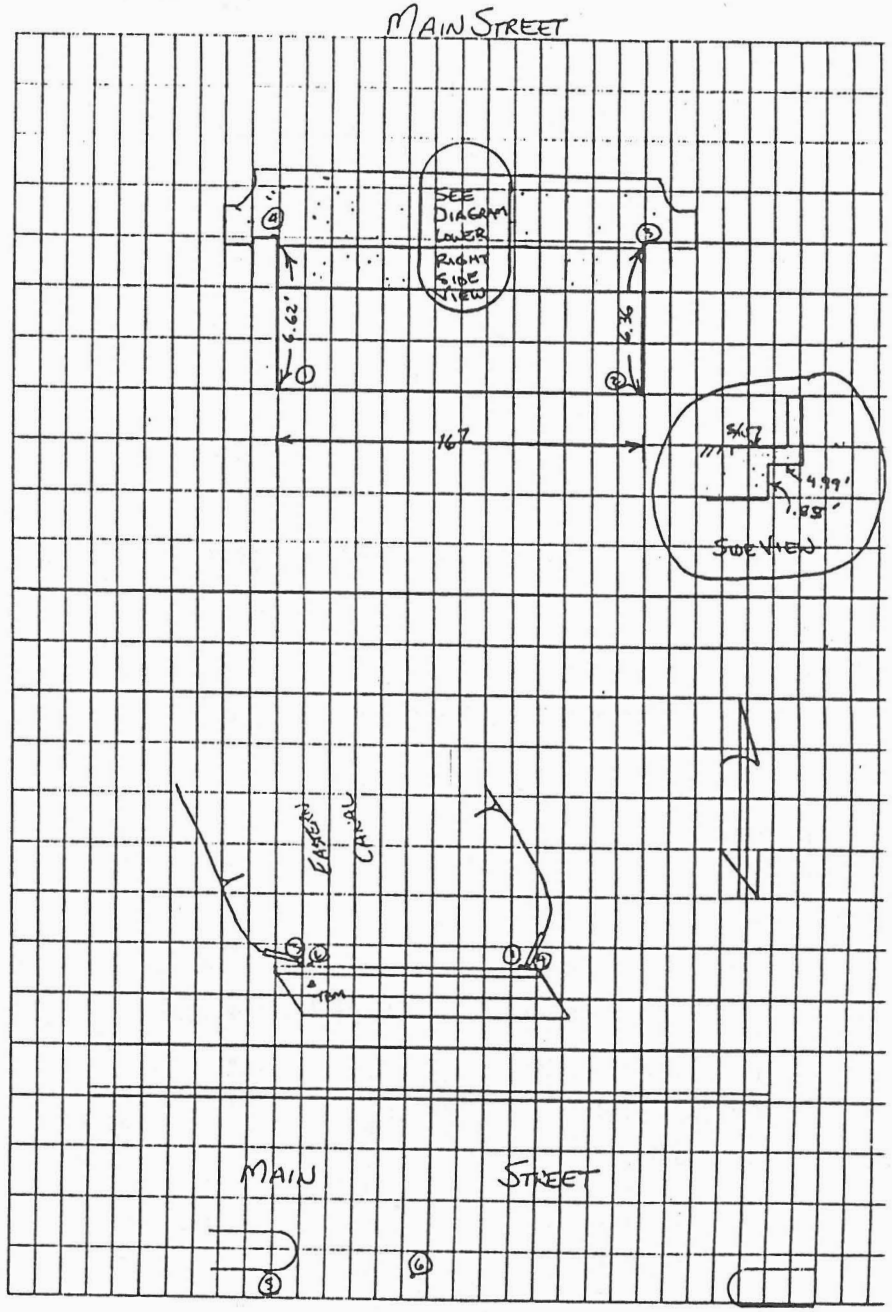
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #182				1289.328	"X" in Concrete
	4.79	1294.12			
①			4.69	1289.43	B/W
②			5.60	1288.52	Top of Bank
③			12.11	1282.01	Toe of Slope
④			12.19	1281.93	Inv
⑤			12.23	1281.89	Inv
⑥			12.18	1281.94	Inv
⑦			12.19	1281.93	Inv
⑧			12.14	1281.98	Inv
⑨			12.16	1281.96	Inv
⑩			5.37	1288.75	Top of Wingwall
⑪			4.71	1289.41	B/W
⑫			4.87	1289.25	Pvmt
⑬			4.85	1289.27	Pvmt
⑭			4.80	1289.32	Pvmt
⑮			4.78	1289.34	Pvmt
TBM #182			4.78	1289.34	✓

2.3 (8)



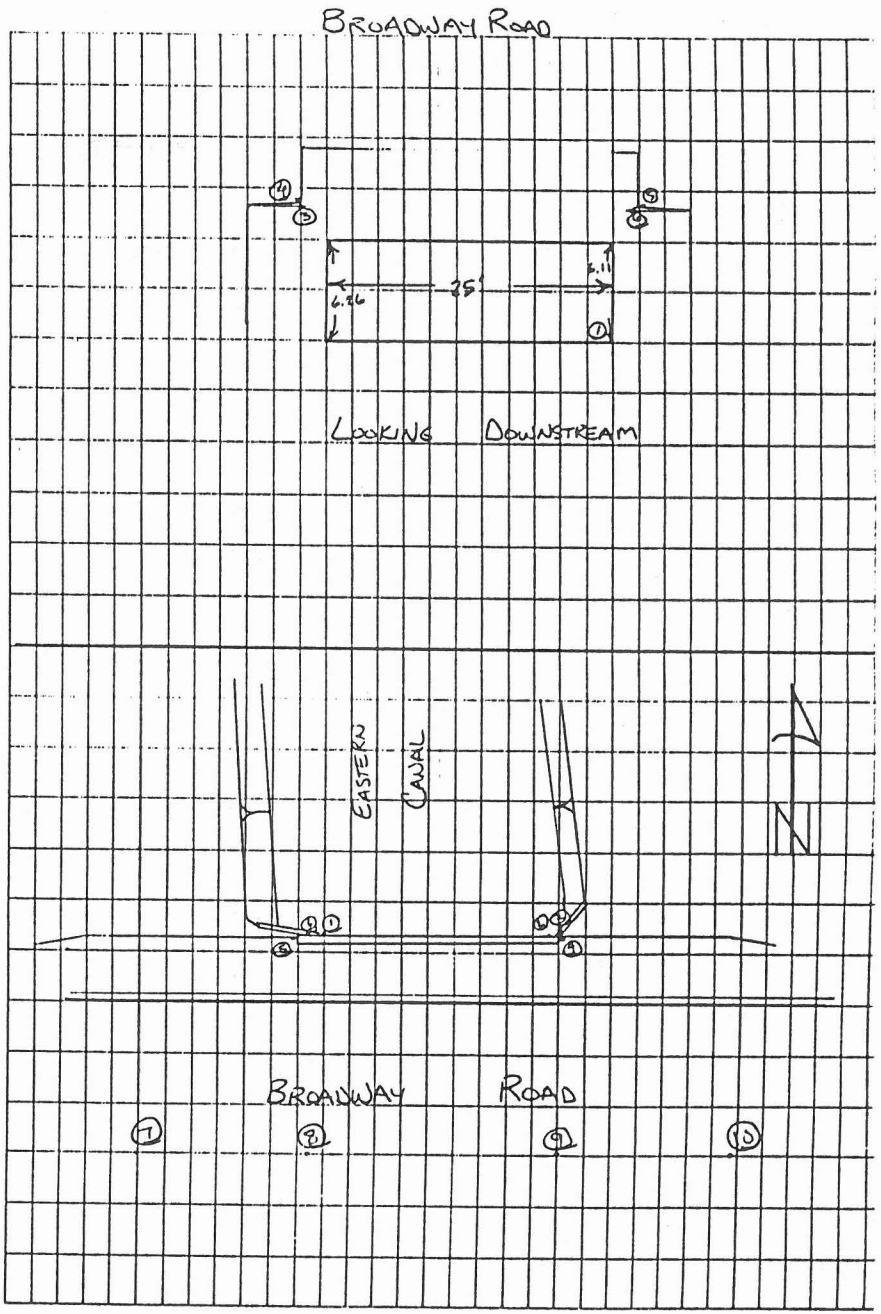
Sta	BS+	H.I.	FS-	Elev	Remarks
TBM #183				1288.548	AHD B.C.
	5.57	1294.12			
①			12.33	1281.79	Invert
②			12.36	1281.76	Invert
③			5.58	1288.54	Top of Wingwall
④			5.41	1288.71	Top of Wingwall
⑤			6.39	1287.73	Pvmt
⑥			6.15	1287.97	Pvmt
⑦			6.06	1288.06	Pvmt
⑧			5.78	1288.34	Pvmt
TBM #183			5.56	1288.56	✓

2.3 (9)



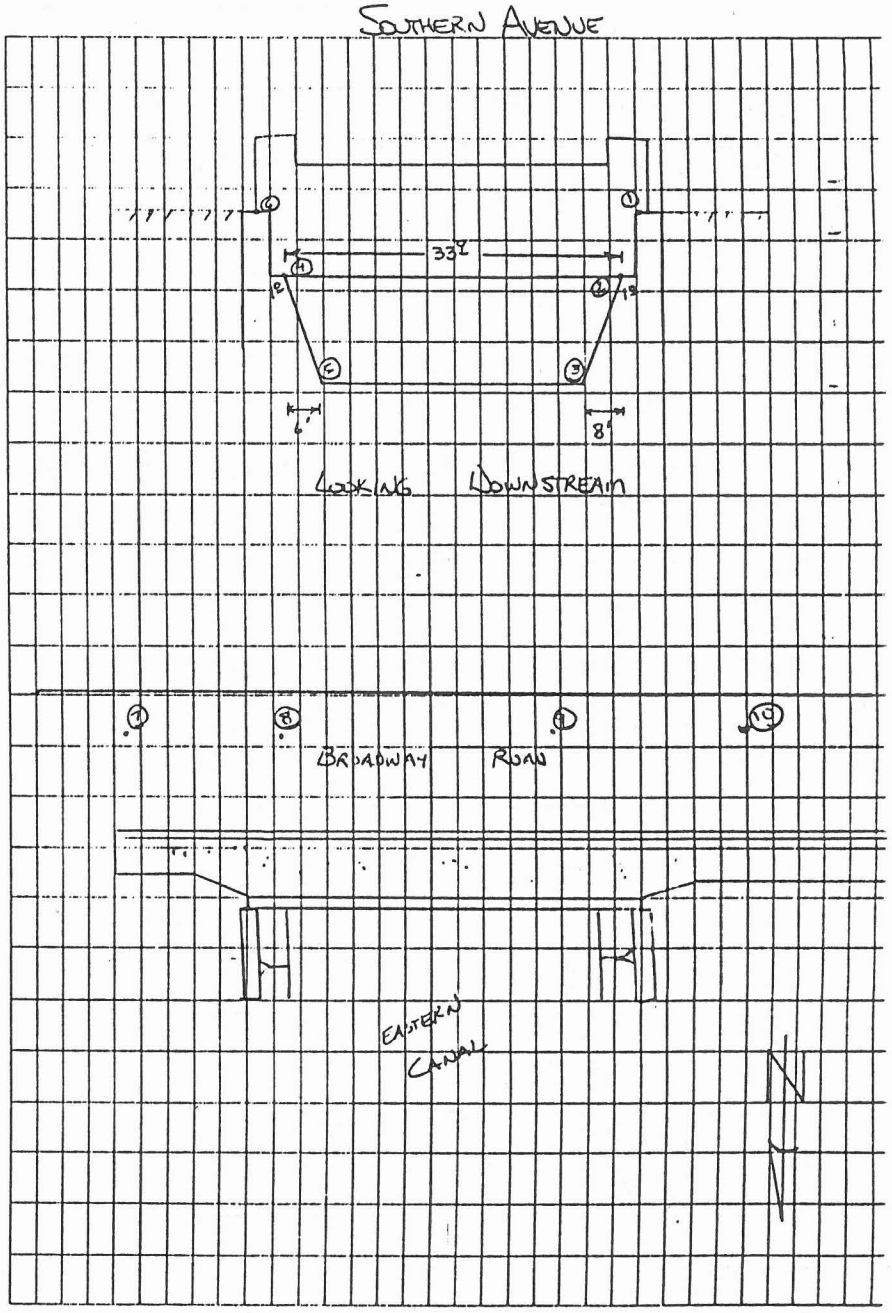
Sta	BS+	H.I.	FS-	Elev	Remarks
TBM #190				1288.477	"+" in Conc
	4.60	1293.08			
(1)			12.30	1280.78	Invert
(2)			12.24	1280.84	Invert
(3)			4.60	1288.48	Top of Wingwall
(4)			4.31	1288.71	B/W
(5)			4.30	1288.78	B/W
(6)			4.60	1288.48	Top of Wingwall
(7)			4.30	1288.78	Pvmt
(8)			4.51	1288.57	Pvmt
(9)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

2.3 (10)



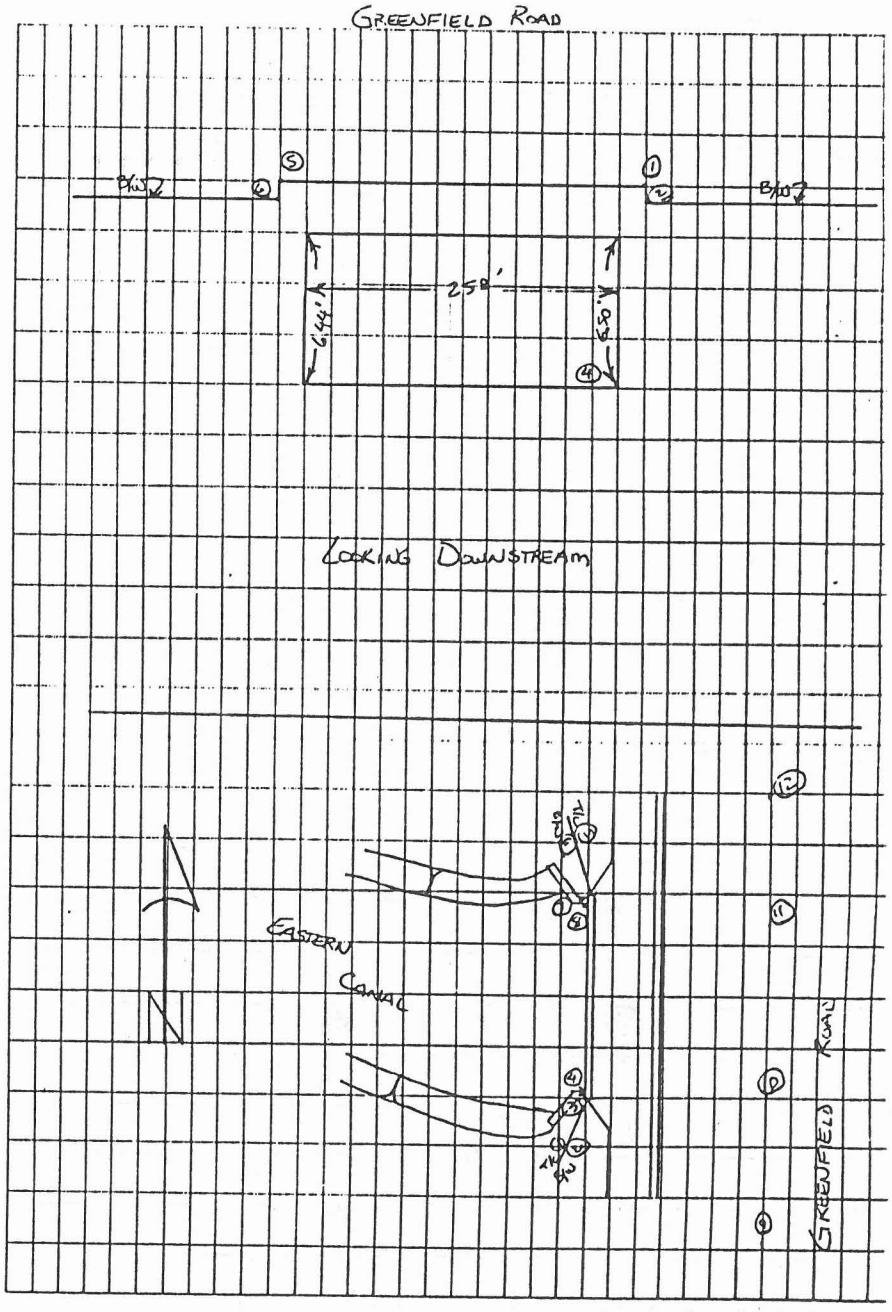
Sta	BS+	H.I.	FS-	Elev	Remarks
TBM#216				1285.828	SRP B.C.
	5.87	1291.70			
①			4.49	1287.21	Top of Wingwall
②			7.75	1283.95	Top of Abutment
③			12.90	1278.80	Toe of Slope
④			7.65	1284.05	Top of Abutment
⑤			12.63	1279.07	Toe of Slope
⑥			4.36	1287.34	Top of Wingwall
⑦			4.92	1286.78	Pvmt
⑧			4.70	1287.00	Pvmt
⑨			4.93	1286.77	Pvmt
⑩			5.06	1286.64	Pvmt
TBM#216			5.87	1285.83	✓

2.3(11)



Sta	BS+	H.I.	FS-	Elev	Remarks
TBM#75				1279.408	Rebar
	9.51	1288.92			
①			3.60	1285.32	T/c
②			3.96	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	128496	B/w
⑦			4.54	1284.38	Top of Wingwall
⑧			12.53	1276.39	Inv
⑨			4.27	1284.65	Pvmt
⑩			4.20	1284.72	Pvmt
⑪			4.13	1284.79	Pvmt
⑫			4.11	1284.81	Pvmt
TBM#75			9.52	1279.40	✓

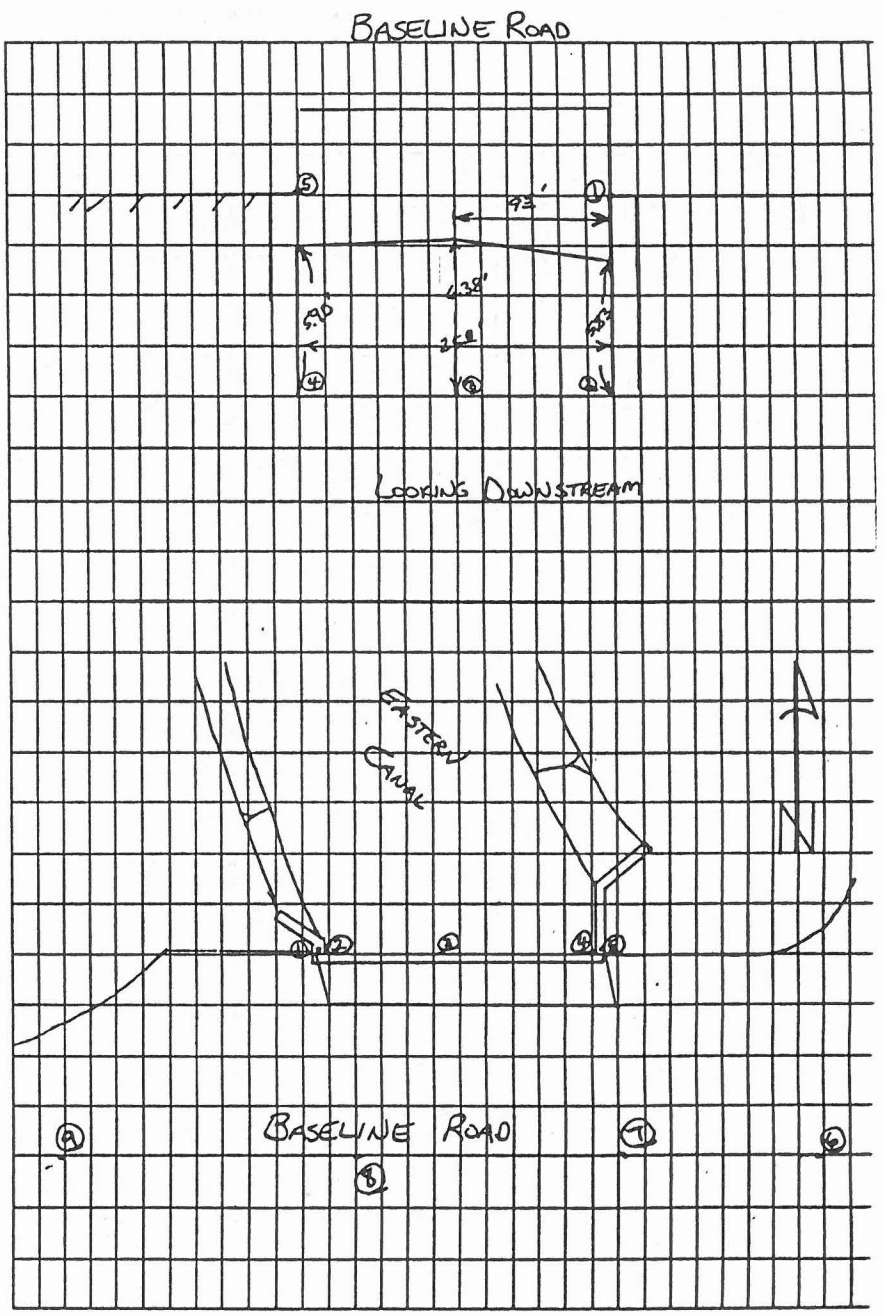
2.3 (12)



Sta	BS+	H.I.	FS-	Elev	Remarks
TBM #227	---			1283.017	"4" in Concrete
	4.98	1288.00			
①			4.98	1283.02	Top of Wingwall
②			12.55	1275.45	Inv
③			12.62	1275.38	Inv
④			12.54	1275.46	Inv
⑤			5.00	1283.00	Top of Wingwall
⑥			3.92	1284.08	Pvmt
⑦			3.70	1284.30	Pvmt
⑧			3.74	1284.26	Pvmt
⑨			4.16	1283.83	Pvmt
TBM #227					✓

2.3 (13)

Backsight 4.98 on Wingwall
4.17 on S/W

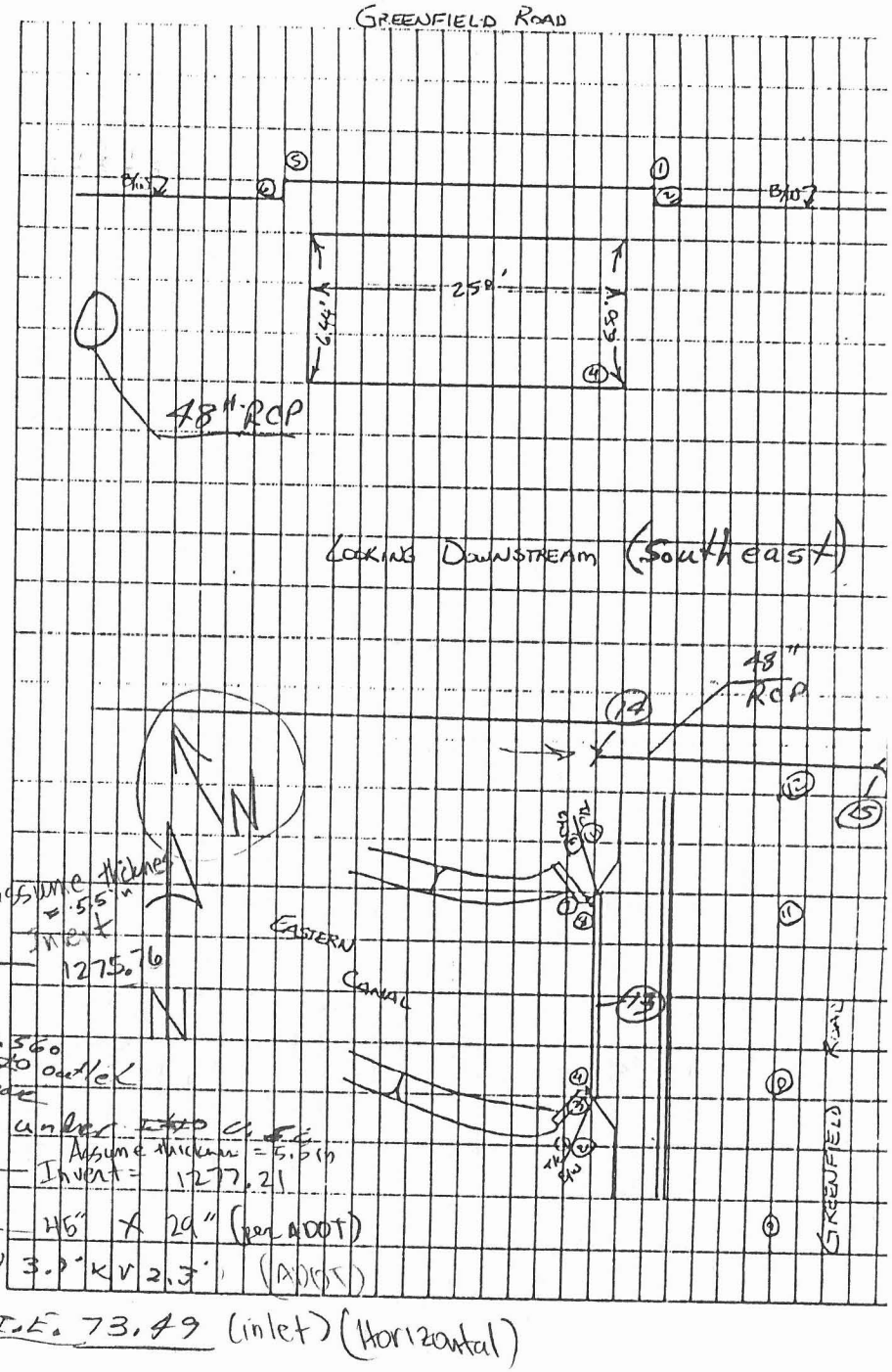


Sta	BS+	H.I.	FS-	Elev	Remarks
TBM#75				1279.408	Rebar
	9.51	1288.92			
①			3.60	1285.32	T/C
②			3.96	1284.96	B/W
③			4.60	1284.32	Top of Wingwall
④			12.56	1276.36	Invert
⑤			3.55	1285.37	T/C
⑥			3.96	128496	B/W
⑦	4.86	1289.24	4.54	1284.38	Top of Wingwall
⑧			12.53	1276.39	Inv
⑨			427	1284.65	Pvmt
⑩			4.20	1284.72	Pvmt
⑪			4.13	1284.77	Pvmt
⑫			4.11	1284.81	Pvmt
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	Soffit ± outlet pipe
⑯		UG 60	12.23	1277.01	I.E. 48" pipe under
TBM	5.56	1289.18	5.62	1283.62	T. Hdwall same location as above
T.B.M.	5.23	1289.43	4.98	1284.20	T. Hdwall Inlet 48" pipe
			7.76	1281.67	Soffit I.E. Inlet 48" Pipe
		ADOT	12.96	1276.47	Top Pipe

2.3 (14)

10

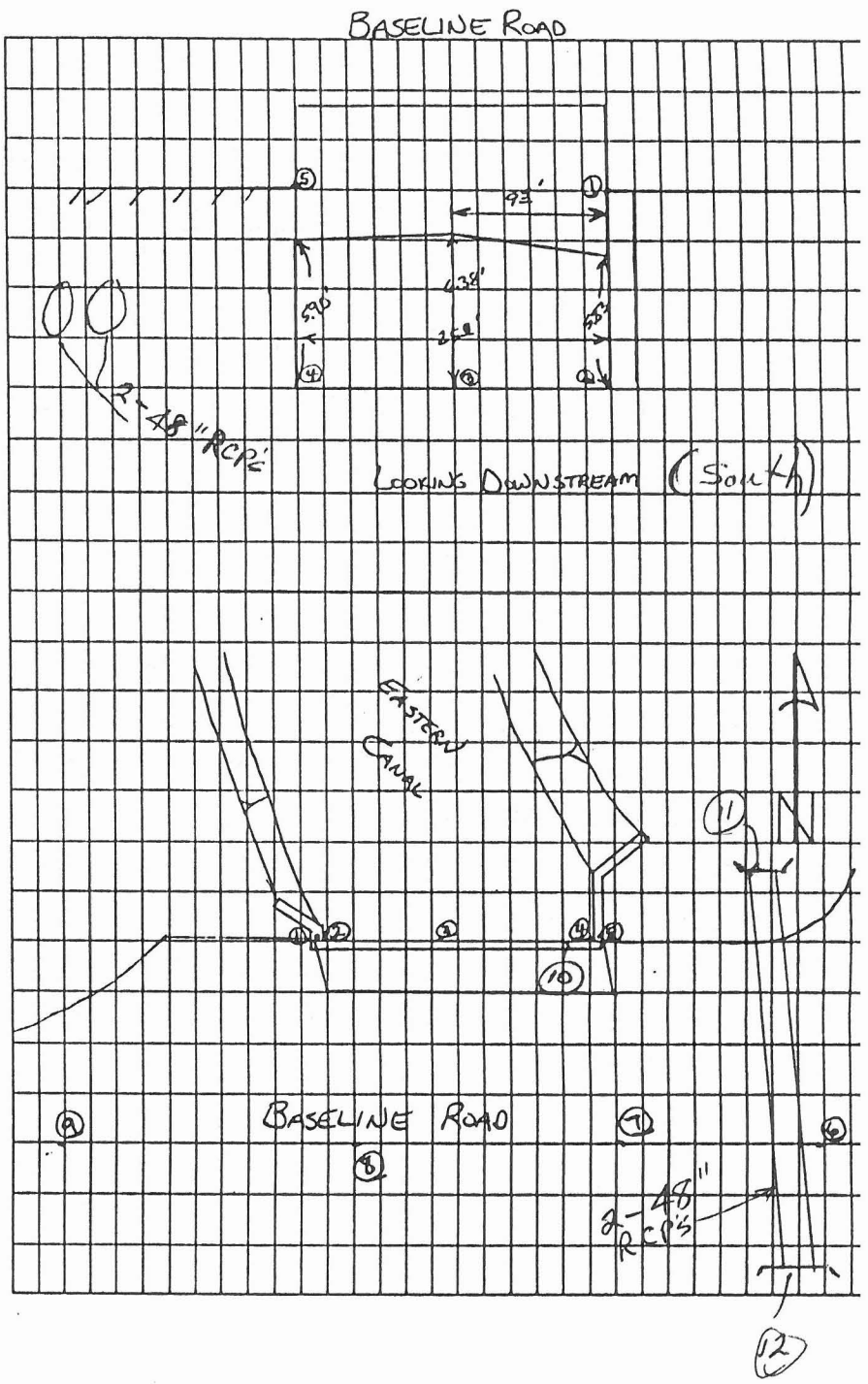
2.98 T.P. to I.E.



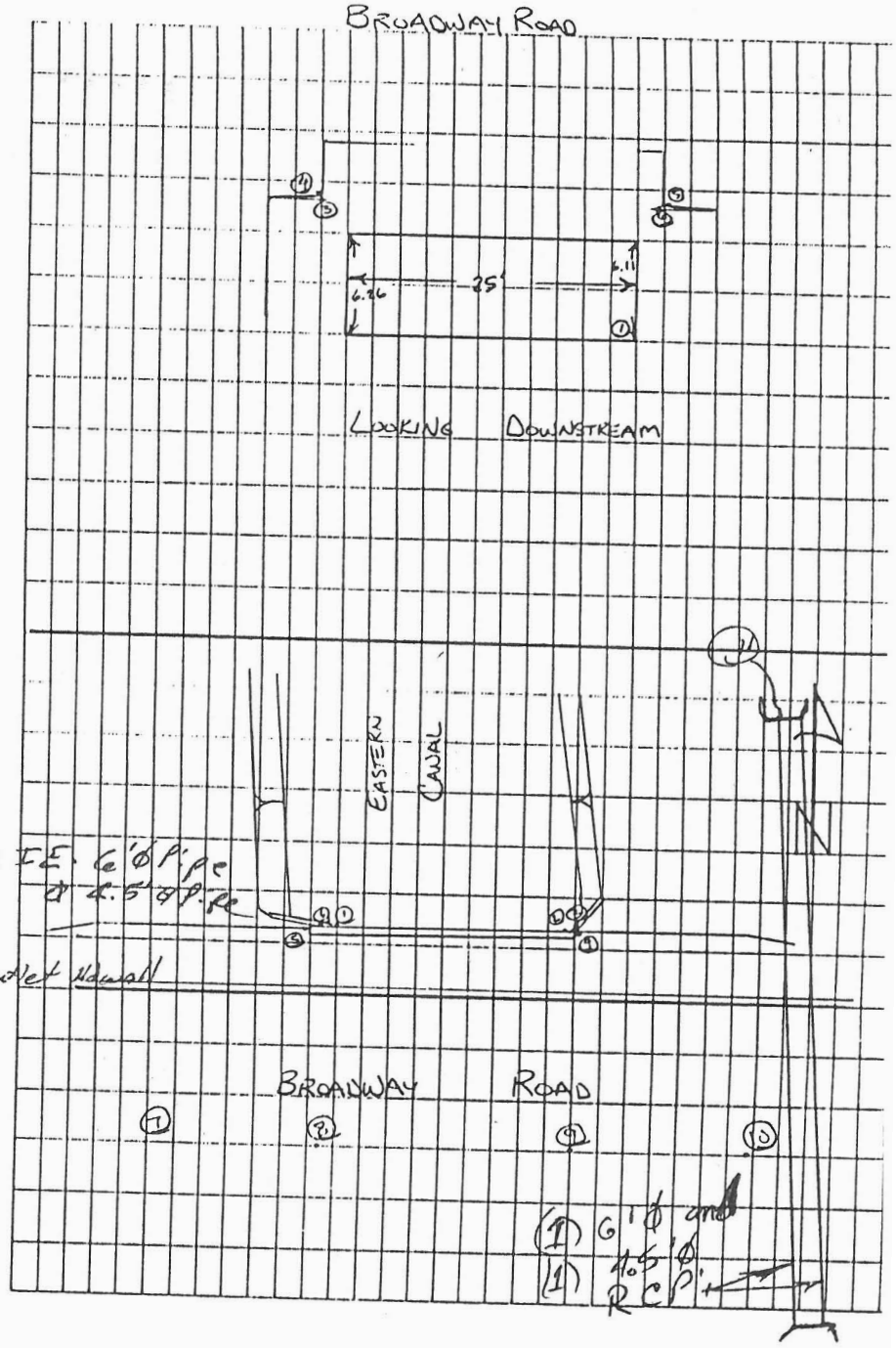
STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #227				1283.017	"4" in Concrete
	4.98	1288.00			
①			4.98	1283.02	Top of Wingwall
②			12.55	1275.45	INV
③			12.62	1275.38	INV
④			12.54	1275.46	INV
⑤	5.58	1288.58	5.00	1283.00	Top of Wingwall
⑥			3.92	1284.08	PVMT
⑦			3.70	1284.30	PVMT
⑧			3.74	1284.26	PVMT
⑨			4.16	1283.83	PVMT
⑩			1.61	1286.97	MCDOT B.C
⑪			12.56	1276.02 2-48"	I.E. Inlet 1287.72 ✓
TBM #227					
⑫			12.95	1275.63	I.E. Outlet

Backsight 4.98 on Wingwall

4.17 on S/W

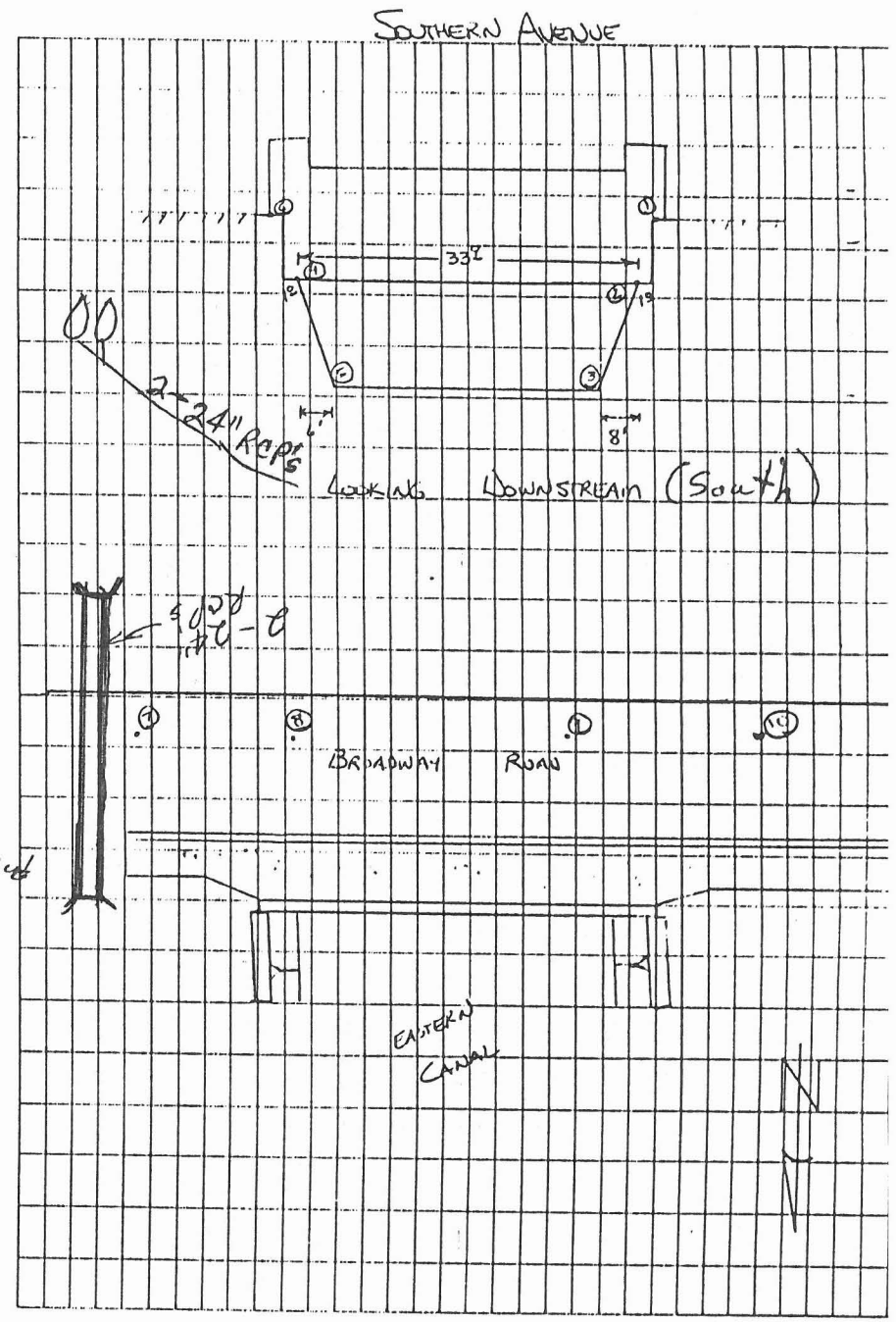


: STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #190				1288.477	"+" in Conc
	4.60	1293.08			
(1)			12.30	1280.78	Invert
(2)			12.24	1280.84	Invert
(3)	4.05	1292.53	4.60	1288.48	Top of Wingwall
(4)			4.31	1288.71	B/W
(5)			4.30	1288.78	B/W
(6)			4.60	1288.48	Top of Wingwall
(7)			4.30	1288.78	Pvmt
(8)			4.51	1288.57	Pvmt
(9)			4.50	1288.58	Pvmt
(10)			4.51	1288.57	Pvmt
2.3(15) TBM #190			4.60	1288.48	✓
(11)			4.98	1287.55	Top Hdwall 8.4' Above I.E. 6'ϕ Pipe
					Invert = 1279.15
T.B.M	3.89	1291.67	4.75	1287.78	M.H. Rim 15sp. N. of outlet Hdwall
			7.43	1284.24	Top Hdwall
					7.52' Top Hdwall to I.E.
					Invert = 1276.72



STA	BS+	H.I.	FS-	ELEV	REMARKS
TBM #216				1285.828	SRP B.C.
	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	4.03	1291.37	4.36	1287.34	Top of Wingwall
⑦			4.92	1286.78	Pvmt
⑧			4.70	1287.00	Pvmt
⑨			4.93	1286.77	Pvmt
⑩			5.06	1286.64	Pvmt
TBM #216			5.87	1285.83	✓
			10.44	1280.93	Inlet I.E.
			11.29	1280.08	outlet I.E.
				+0.1 = 1279.08	+0.1 For Mud

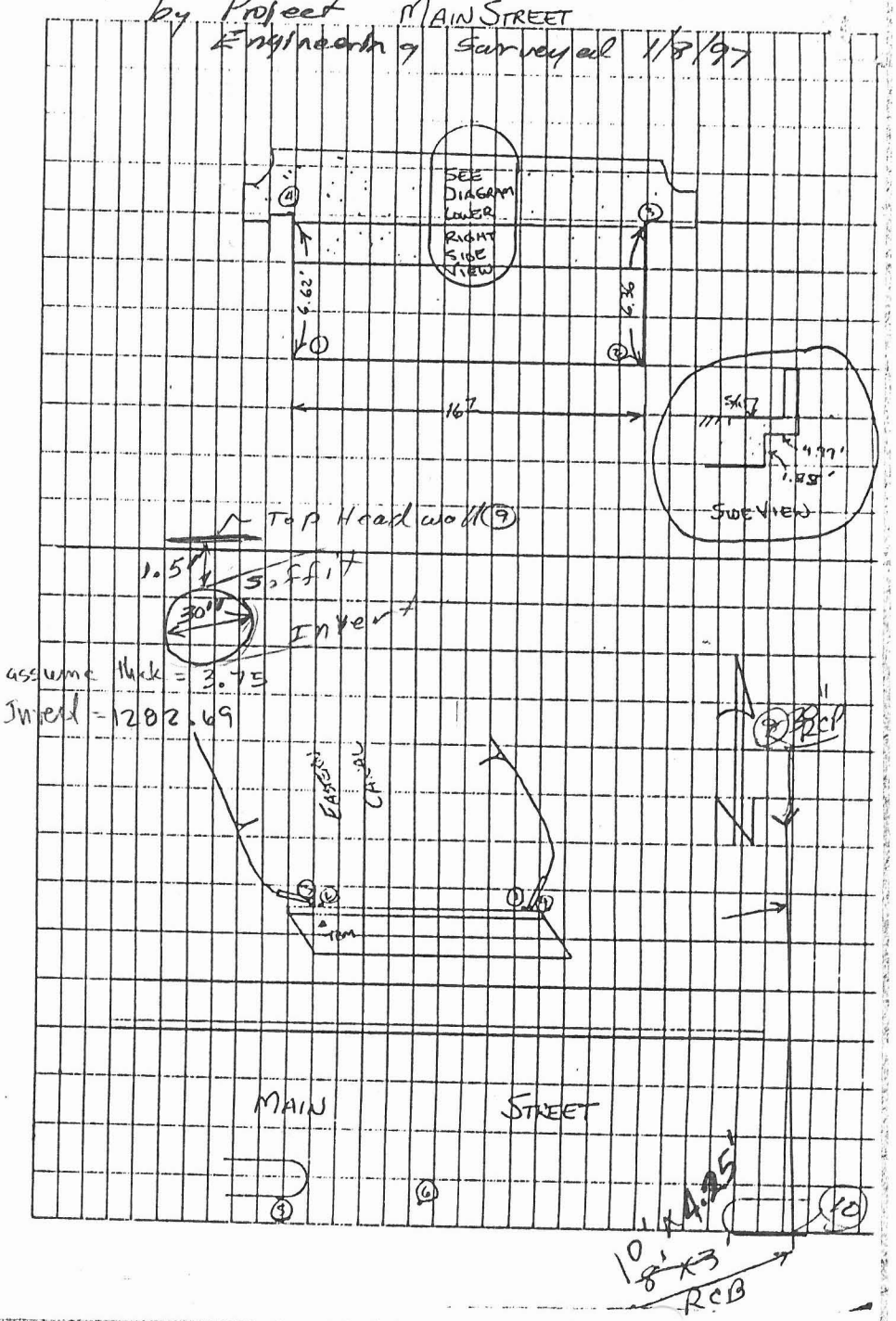
(2) 3.5 C.I.P.



3/13/97 Greg S. and Eddie of A-N west using Field Notes of Canal Bridges by Project 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	1281.79	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	Pvmt
⑥			6.15	1287.97	Pvmt
⑦			6.06	1288.06	Pvmt
⑧			5.78	1288.34	Pvmt
TBM #183			5.56	1288.56	✓
⑨			5.93	1287.00	Inlet T. Head wall 1.5' T.H. to Soffit
⑩			10.66	1282.27	I.E. outlet 10.5' x 4.25' RCB.

2.3 (14)



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
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(602) 861-2200

TABLE OF CONTENTS

FIGURES

TABLES

APPENDIX A

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 subracting 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

A-N WEST INC.
Consulting Engineers

0 2000
SCALE 1"=2000'

EXPLANATION

STUDY LIMITS

RM 16.477 RIVER MILE NO.

LOCATION MAP
EASTERN CANAL FIS
FIGURE 1

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

A-N WEST INC.
Consulting Engineers

0 2000
SCALE 1"=2000'

EXPLANATION
STUDY LIMITS
P1 SITE PHOTO I.D. AND DIRECTION

SITE VISIT PHOTO LOCATION MAP
EASTERN CANAL FIS
FIGURE 2

Appendix A

#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)

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 Green field Rd.

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

Math p. A-3 Top

Match p A-2 Bottom

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

Eastern Canal In Background.

#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. $n = 0.035$

Field Visit Photos Along Eastern Canal

#10

Upstream From Southern Ave.

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

#11

Downstream at Concrete Channel Into Greenfield Park / Detention Basin.

$n_{LOB} = 0.03$
$n_{channel} = 0.015$

#12

Upstream at Concrete Channel From Greenfield 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.

Match Above, Rt.

#14 Same as #13 Above

#15 Upstream At 1-6'ϕ RCP (Left) and 1-4.5'ϕ RCP (Right) with Headwall 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' Top width 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

#19
Downstream From South side of Main Street (Apache Blvd.) at Concrete Channel

Bottom 2'±
Topwidth 10'±
Depth 4'±

n (conc. chann.) = 0.015

#20
Downstream at 30"Ø 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)

#22.

Upstream at Pipe Outlet At Val Vista Blvd.

2'ø± RCP In Headwall

Wtd. Chann. n = .035
(Top Bank to Large Trees

#23 Downstream at Val Vista Blvd. (Back ground) and Catch Basin (Foregrou with 15" to 18" Connector Pipe To 24"? RCP

n chann. = 0.030
(Top / Bank to Fence or shrubs - width = 25'±

#24

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

Shallow Swale This Location

n chann. = 0.030
(Top Bank To Fence or Shrubs - width = 25

#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 Headwall 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' Ø RCP
(Square Edge)

#33
Upstream From
North side Lindsey
Road

n(chann) = 0.035
(Top Bank to Fence)

#34
Upstream at Outlet of 24"ϕ RCP Under McKellips Road

n(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.

nchann. = 0.035
(Top Bank to Fence)

#37
Downstream at Park Along Canal Between McKellips and Gilbert Rd

n_{chann} = 0,030
(Top Bank to Fence)
n_{LOB} = 0,030
(Park / Det. Basin

#38
Upstream at Gilbert Rd / Hermosa Vista Dr

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

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

[Modified from Chow, 1959]

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

See footnotes at end of table.

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

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

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

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

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

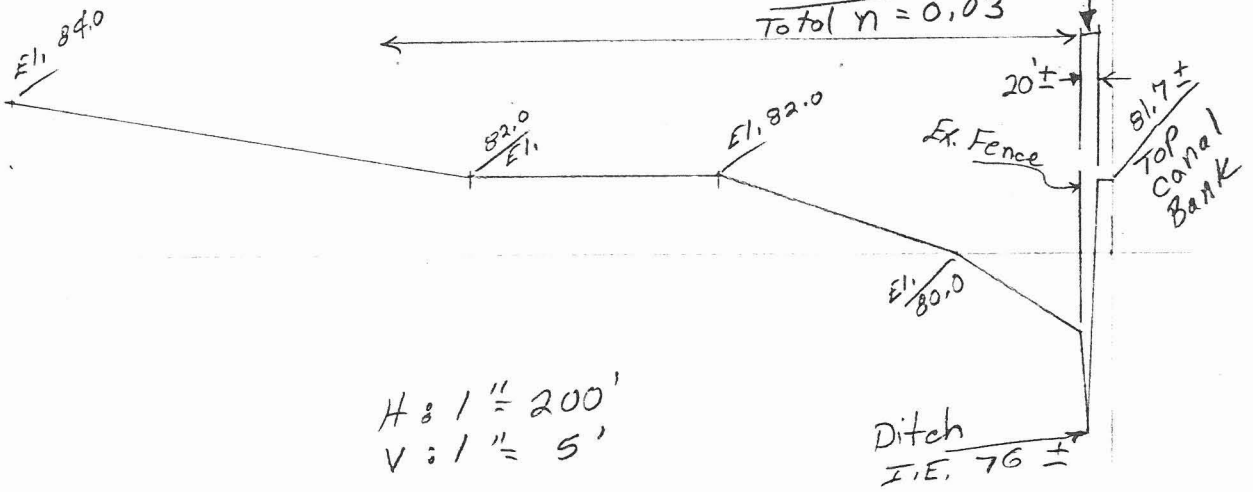
[1]Straight uniform channel.
[2]Smoothest channel attainable in indicated material.

n_b

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

$n_b = 0.024$
$n_1 = 0.$
$n_2 = 0.005$
$n_3 = 0.011$
Total $n = 0.040$ = channel

Lt. Overbank – $n_b = 0.024$
$n_1 = 0$
$n_2 = 0.006$
$n_3 = 0$
Total $n = 0.03$

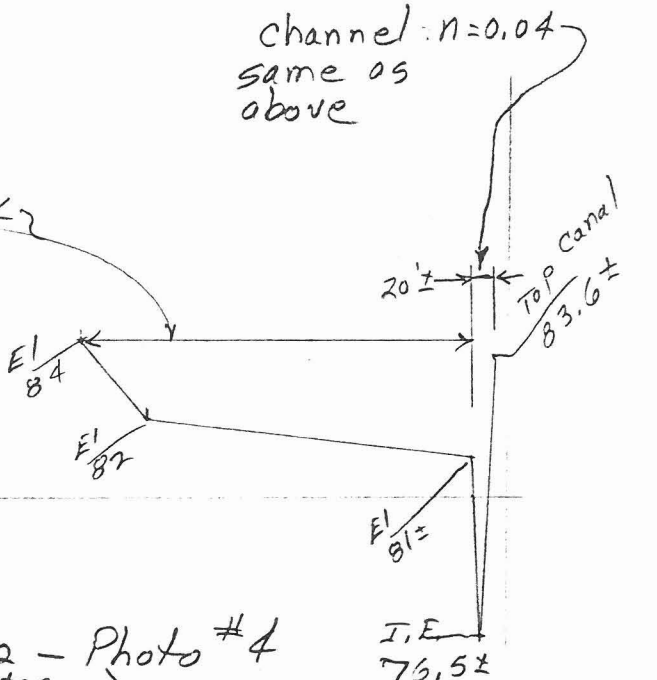


H: 1" = 200'
V: 1" = 5'

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

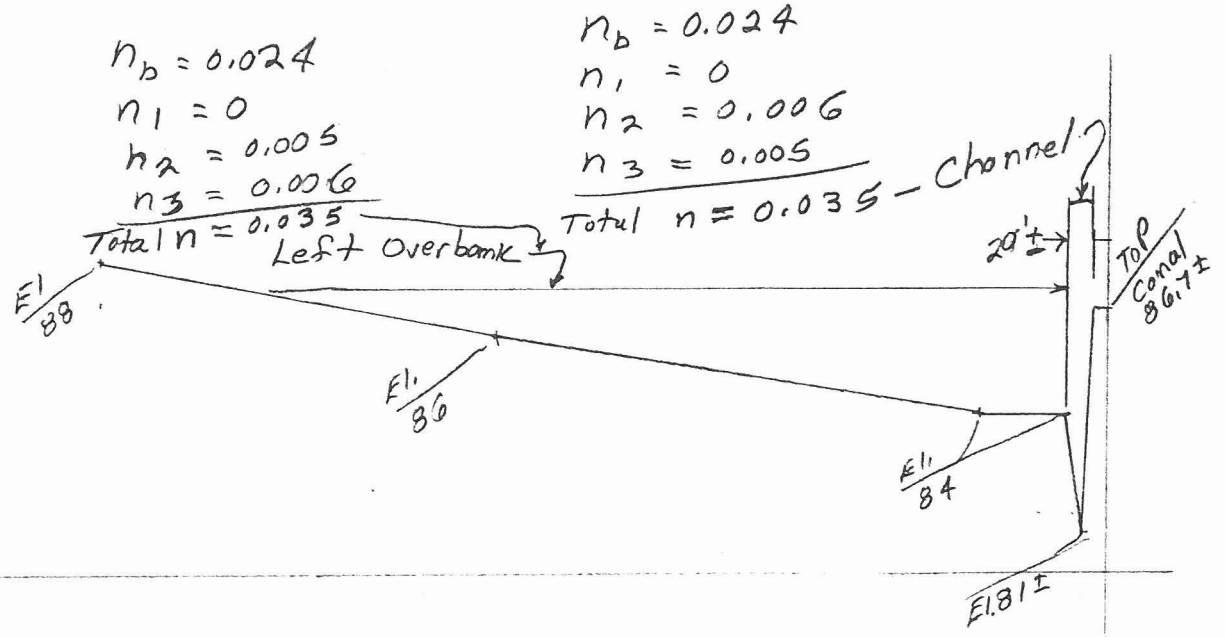
$n_b = 0.024$
$n_1 = 0$
$n_2 = 0.006$
$n_3 = 0.005$
Total $n = 0.035$, Lt. overbank

channel: $n = 0.04$
same as above

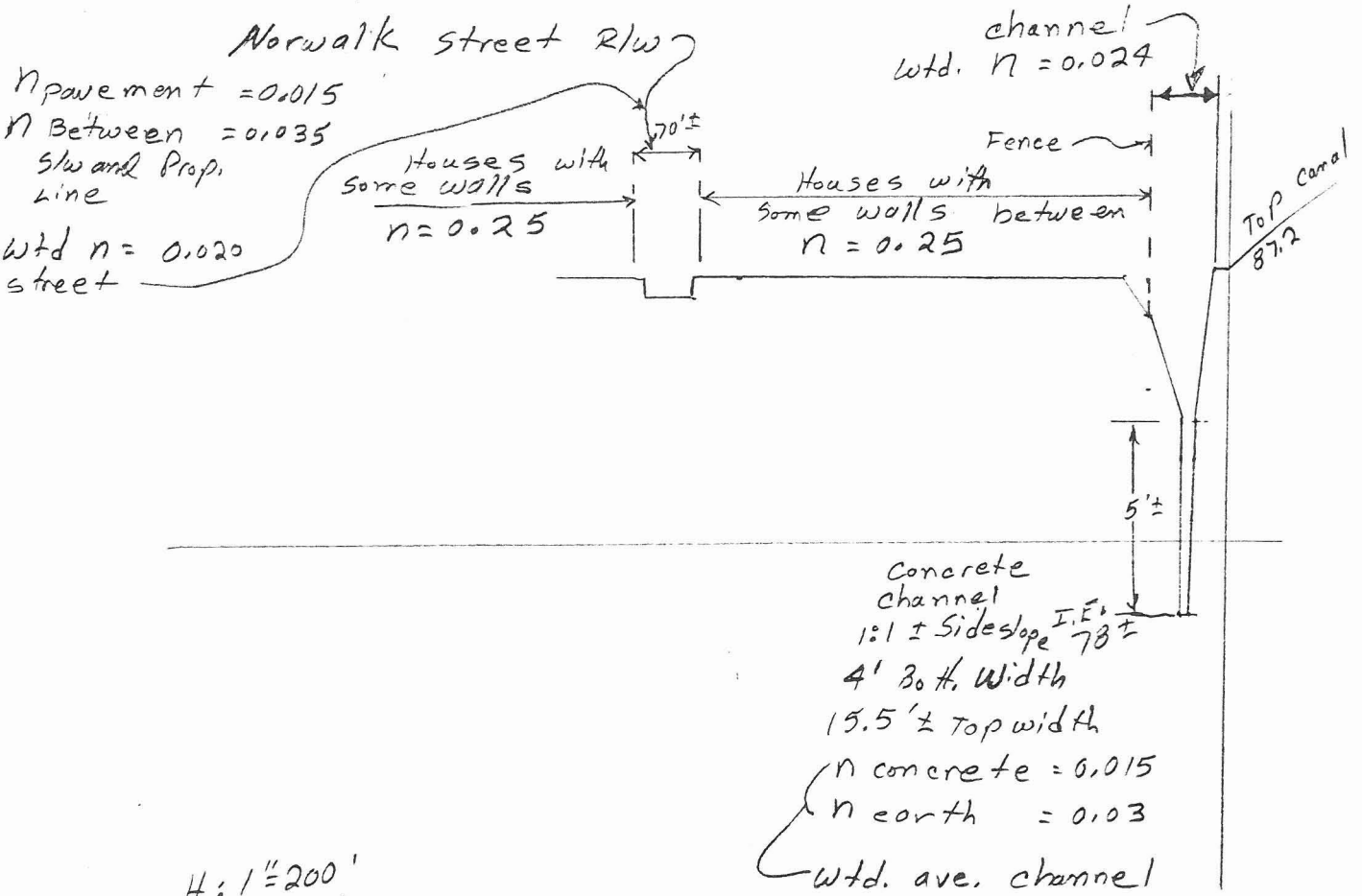


H: 1" = 200'
V: 1" = 5'

Section @ R.M. 16.872 – Photo #4
(Looking Downstream)



H: 1" = 200'
V: 1" = 5'
Section @ RM 17.685 - Photo #10



H: 1" = 200'
V: 1" = 5'
Section @ RM 18.215 - Photo #12

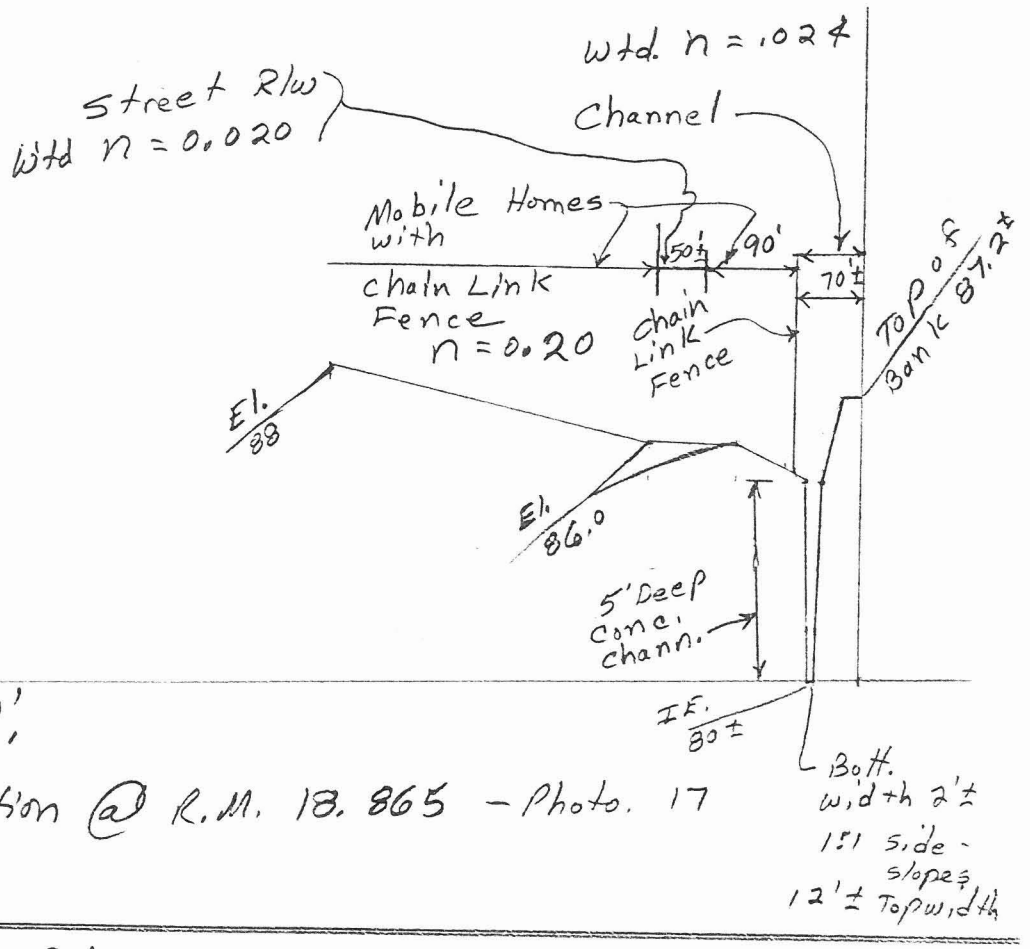
HWEST INC.
Consulting Engineers
Richmond, California
San Jose, California
Phoenix, Arizona

Eastern Canal FIS

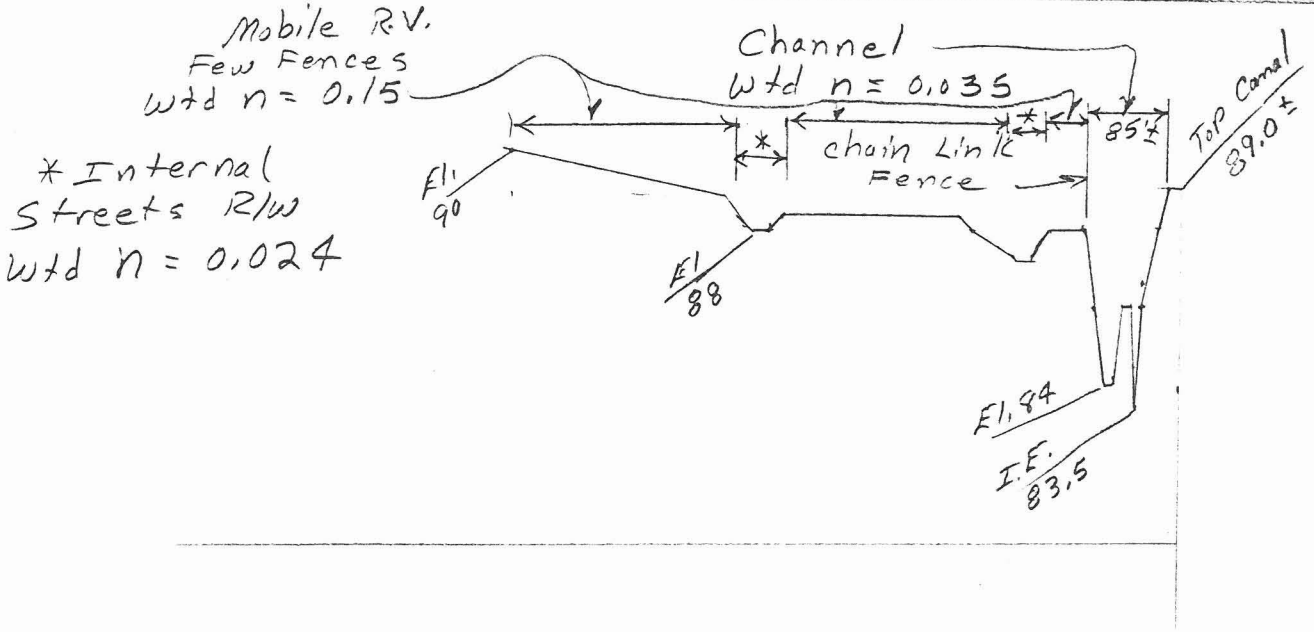
Project 115 8-07 Sht. ___ of ___

Calc. By GAS Date 1/29/97

Chkd. ___ Date ___



Section @ R.M. 18.865 - Photo. 17



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 bluelines 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)

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

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, Table2).

The 45 " (span) x 29" (rise) x 196 foot long HECP 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.

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

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.

4.5(4)

Eastern Canal FIS
Modeled Culvert Summary
Table 2

Location	Inlet I.E.	Outlet I.E.	Qmax(5) (cfs)	Weir Flow	HEC-2 Q (CFS)	U/S Section RM	Profile 1 (HW) EG	D/S Section RM	(TW) WSEL	HEC_5 Check
Baseline Rd.	1276.02	1275.63	200	0	190	16.493	81.79	16.458	79.97	Outlet Control Q = 160 cfs
Greenfield Rd.	1275.76	1276.22	145	0	60	16.939	83.35	16.921	82.68	Inlet Control Q = 140
U.S. 60 Culvert Along Canal	1277.21	1277.01	95	0	60	17.16	84.26	17.014	83.35	Outlet Control Q = 57
U.S. 60 Culvert Under Canal	1274.11	1273.55	102	0						
Southern Ave.	1280.93	1279.08	58	0	32	17.608	85.58	17.57	84.29	Inlet Control Q = 50 cfs
Broadway Rd. (6; RCP)	1279.15	1276.72	255	0	162	18.721	86.97	18.487	85.96	Outlet Control Q = 112
Broadway Rd. (4.5' RCP)	1279.15	1276.72	142	0	162	18.721	86.97	18.487	85.96	Outlet Control Q = 57
Main St.	1282.69	1282.27	40	0	23	19.262	87.98	19.186	86.98	Outlet Control Q = 22
Note: 5. Qmax assumes Tailwater depth (TW)=(dc+D)/2 (dc=critical depth), Culvert flowing full with inlet Head = outlet Head, effects of trash racks not determined										
6. Based on ADOT as built for Superstition Freeway project no. BP-028-1-510, sheet 85 (8/23/90)										

4,5(5)

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

HEC-1 Q 100 cfs	Sec. No.	Estimate cfs Capacity Profile 1	Capacity Profile 2	WSEL Profile 1	WSEL Profile 2	Upslope Top of Bank	Downslope Top of Bank	Remarks
	16.422	190	215	79.84	79.94	83.1	82	
	16.458			79.97	80.07	84.1	82.6	Baseline Road Culvert Q 200 WSE 82.2
897	16.493			81.71	82.41	83.6		Baseline Road Culvert, Low Top of Road 83.6
	16.549			81.9	82.41	81.9	82.4	
	16.606			81.98	82.44	82.3	82.8	
	16.662			82.48	82.63	82.9	82.3	
	16.723	60	75	82.6	82.73	82.8	82.5	
869	16.772			82.67	82.8	82.6	82.6	
	16.852			82.69	82.82	82.6	82.4	
	16.921			82.68	82.81	85.1	84.1	Greenfield Road Culvert, Low Top of Road = 85.0
	16.939			83.35	83.86	85.1	84.1	Greenfield Road Culvert
	17.014			83.35	83.86	83.4	83	U.S. 60 Culvert
	17.16	45	50	84.26	84.98	84.7	83.3	U.S. 60 Culvert
1206	17.183			84.26	84.98	84.7	82.9	Holmes Park Detention Basin
	17.256			84.26	84.98	84.3	83	Holmes Park Detention Basin
1081	17.277			84.26	84.98	84.8	83	
	17.325			84.27	84.98	84.4	83	
	17.435			84.28	84.99	84.2	83.4	
	17.485			84.28	84.99	84.5	83.5	
	17.57	32	190	84.29	85	85.5	84.7	Southern Avenue Culvert, Low Top of Road = 85.5
	17.608			85.58	85.89	87	86.6	Southern Avenue Culvert
1097	17.683			85.58	85.9	87	86.2	
	17.78			85.58	85.91	87	86.8	
	17.834			85.58	85.92	87	86.1	
1108	17.872			85.58	85.94	87	86.3	
	17.934			85.58	85.95	87	87.1	
	17.984			85.58	85.97	87	87.1	
	18.035			85.58	86	85.8	86.7	
	18.074			85.59	86.04	85.6	86.9	Greenfield Park Detention Basin
	18.101	162	170	85.59	86.09	86.4	87.1	Greenfield Park Detention Basin
1487	18.15			85.59	86.09	86.9	87	
	18.197			85.59	86.09	86.9	86.9	
	18.225			85.59	86.09	86.8	87	
	18.253			85.59	86.09	86.9	86.9	
	18.291			85.93	86.36	86.8	87.1	
1342	18.337			85.94	86.37	86.9	86.9	
	18.384			85.95	86.38	87	86.8	

4.5(c)

	18.428			85.95	86.38	87	86.7	
1326	18.487			85.96	86.38	87.2	86.7	Broadway Road Culvert, Low Top of Road = 88.0
1293	18.721			86.97	87.5	87.1	87.3	Broadway Road Culvert, Low Top of Road = 88.0
	18.766	23	23	86.98	87.5	87.3	87.1	
	18.821			86.98	87.5	87	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	Main Street Culvert, Low Top of Road = 90.0
	19.262			87.98	88.5	88	88.5	Main Street Culvert, Low Top of Road = 90.0
	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			Val Vista Road, Low Top of Road = 87.3
	19.623			88.42	88.93	88.7	89.3	
	19.67			88.45	88.97	88.5	88.9	
	19.716			88.48	88.99	88.5	88.9	
	19.764			88.7	89.19	88.7	88.8	
767	19.808	1	1	88.85	89.29			University Drive
	19.83			88.85	89.29	89.3	89.1	Low Top of Road 88.7
	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	88.7	88.7	
	20.015			88.85	89.29	88.5	88.6	Overtops Bank
	20.051			88.85	89.29	88.2	88.9	Overtops Bank
	20.082			88.85	89.29	88.7	89.1	
	20.139			88.85	89.29	88.7	89.2	
	20.179			88.85	89.29	89.2	89.4	
781	20.244			88.85	89.29	89.4	90.3	Ridge
	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			Adobe Street, Low Top of Road = 88.2
	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	

4.5(7)

	20.559			89.06	89.53	89.2	90.7	
692	20.608			89.12	89.59	89.4	90.8	
	20.651			89.17	89.65	89.2	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	89.3	91	
703	20.815			89.29	89.8	89.3	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			Brown Road, Low Top of Road = 90.5
	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	91.3	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	Lindsay Road, Low Top of Road = 91.2 (Overtops Bank)
	21.603			91.35	91.87	90.6	91.5	
216	21.665			91.35	91.87	91	92.3	
	21.716			91.35	91.87	91.3	92.3	
	21.774			91.35	91.87	91.3	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	91.2	91.1	
218	21.963			91.35	91.87	91.1	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			McKellips Road, Low Top of Road = 92.8
	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	Ridge
	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	94	95.3	
333	22.488			94.01	94.52	94	95.2	
	22.541	215	305	94.02	94.53	94.7	95.3	

(8) 5.4

	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	94.1	94.5
	22.744	94.12	~~91.87~~	94.63	94.2	94.6
273	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: Eastern Canal
Baseline Rd, Culvert

DESIGNER: JP.

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

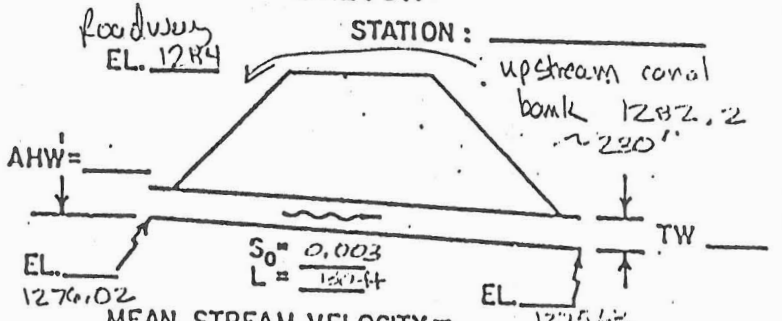
HYDROLOGIC AND CHANNEL INFORMATION

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})

SKETCH



MEAN STREAM VELOCITY = _____
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	INLET CONT. HW	OUTLET CONTROL HW = H + h_o − LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Sqr 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 CONT.
	105	48"	1.5	6.18	0.5	3.0	3.2	3.6		3.6	0.37	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 CONT. Q = 80

4.5(10)

HEC2 RESULTS
TW = 79.97
HW = 81.71

SUMMARY & RECOMMENDATIONS:

Multiply X2 = 200 cfs. Trash rack effect on entrance loss assumed negligible.

HEC 2 Results X 2 = 160 cfs

PROJECT: Eastern Canal
Greenfield Rd.

DESIGNER: DB

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

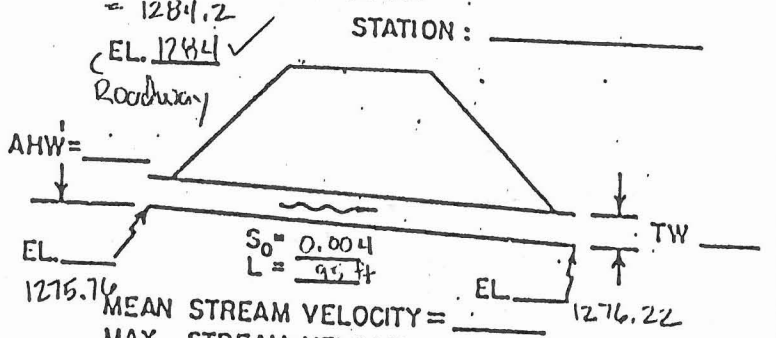
HYDROLOGIC AND CHANNEL INFORMATION

4' RCP

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



MEAN STREAM VELOCITY = _____
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW=H+h_o-LS_o											
			HW/D	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
Sqr edge-HW	145	48"	2.06	8.24	0.5	3.8	3.45	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.

HEC 2
Profile 1
HW = 83.35
TW = 82.68

4.5(11)

Q = 140 cfs

SUMMARY & RECOMMENDATIONS:

Q_{max} = 145 cfs.

PROJECT: U.S. 60

DESIGNER: A.S.

DATE: 4/2/97

HYDROLOGIC AND CHANNEL INFORMATION

48" RCP – Square edge (HW)

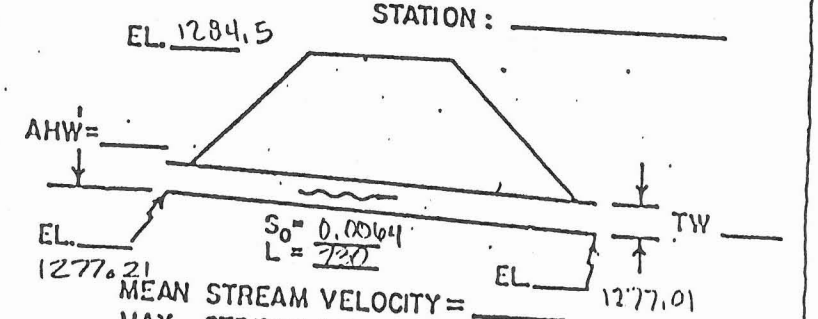
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

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

SKETCH

STATION: _____



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	INLET CONT. HW	OUTLET CONTROL $HW = H + h_o - LS_o$: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Sqr. edge HW	130	4'	1.82	7.29	0.5	7.56	3.4	3.7		3.7	0.2	11.06	11.06			OUTLET CONT – Increase Q
	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			INLET CONT. Increase Q
	95	4	1.82	7.29	0.5	4.0	2.9	3.45		3.45	0.2	7.25	7.29			~max Q
→	57	4	1.76	7.05	0.5	0.91	—	—	6.34	6.34	0.2	7.05				OUTLET CONT / INLET C

4.5(12)

HEC 2
Profile 1
HW = 84.26
TW = 83.35

SUMMARY & RECOMMENDATIONS:

Q_{max} = 95 cfs

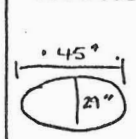
ADOT · Culvert

PROJECT: _____ DESIGNER: BB

ADOT Culvert Under Eastern Canal along U.S. 60 N, S, E DATE: 9/3

HYDROLOGIC AND CHANNEL INFORMATION

D = 2.42'



29"X45" X 196' Elliptical RCP (Horizontal)

Equiv. Dia = 36"

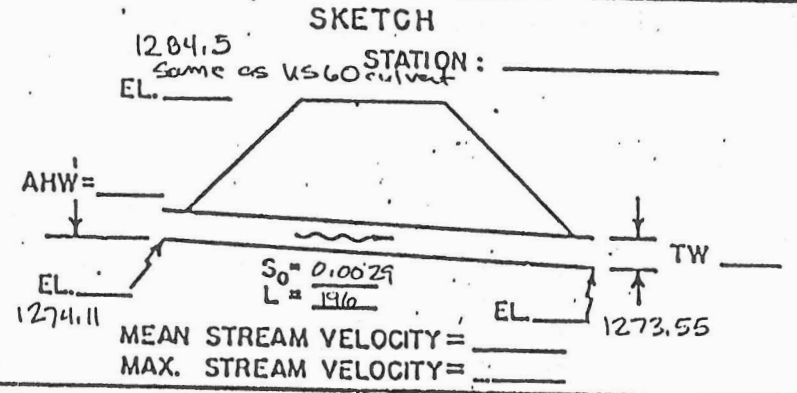
Mitered.

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



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

ELEVATIONS ARE NOT BASED ON SAME DATUM REFERENCE AS SITE/FIT SURVEY (OTHER CULVERTS) ± 0.6 ft

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW = H + h_o − LS_o											
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
Mitered, HW	110	29X45	4.29	10.39	0.5	9.16	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 CONT (decrease Q)
	102					8.2	2.42	2.42	1.99	2.42	0.56	10.06	10.39			Inlet cont. ≈ Qmax

SUMMARY & RECOMMENDATIONS:

TW determined from flowmaster, n = 0.012, trapezoidal channel 2:1 sideslope, 0.00125 watercourse slope

Qmax ≈ 102 cfs.

4.5(13)

PROJECT: Southern Ave.

DESIGNER: HB

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

HYDROLOGIC AND CHANNEL INFORMATION

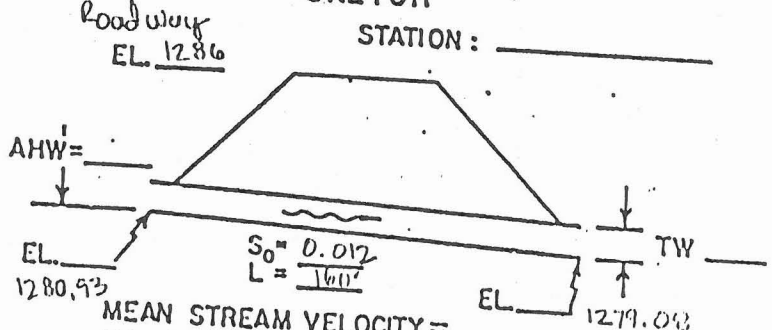
(2) 24" RCP

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



CULVERT DESCRIPTION (ENTRANCE TYPE)	Q (cfs)	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW=H + h_o − LS_o											
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
Bell	29	2	2.5	5.07	0.2	3.9	1.8	1.9		1.9	1.92	3.88	5.07			INLET CONT.
→	16	2	1.86	4.65	0.2	1.29	—	—	5.21	5.21	1.92	4.58	4.65			INLET CON

4.5(4) HEC 2 Profile 1
TW = 84.29
HW = 85.58

Q = 25 cfs
x2 = 50 cfs

SUMMARY & RECOMMENDATIONS:

Multiply X2 Q_{max} = 58 cfs. HEC 2 Profile 1 : Q_{max} = 34 cfs ✓

PROJECT: Broadway Rd.

DESIGNER: MB

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

HYDROLOGIC AND CHANNEL INFORMATION

(1) 6' Sqr Edge HW

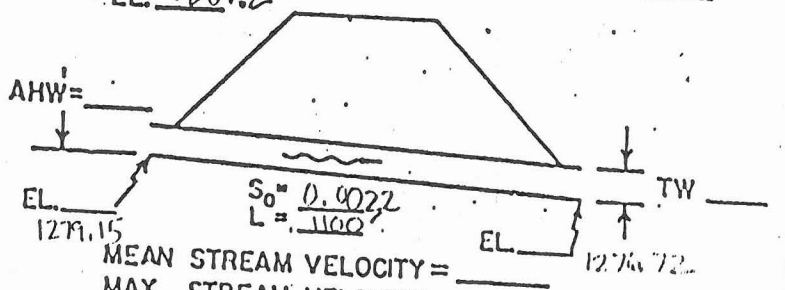
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

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

SKETCH

STATION: _____



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING H.W.	OUTLET VELOCITY	COST	COMMENTS
Sqr-edge HW	280	6	1.34	8.05	0.5	6.4*	4.7	5.35		5.35	2.42	9.33	9.33			Outlet Cont.
↓	250	↓	↓	↓	↓	5.1*	4.3	5.15		5.15	2.42	7.83	8.05			Inlet Cont.
↓	260	↓	↓	↓	↓	5.5*	4.4	5.2		5.2	2.42	8.28	8.28			Outlet Cont.
	255	6	1.34	8.05	0.5	5.3*	4.35	5.18		5.18	2.42	8.06	8.06			Inlet Cont.
	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 Q
Increase
Increase 6

Broadway Rd.

DESIGNER: MB

DATE: 4/2/97

HYDROLOGIC AND CHANNEL INFORMATION

(1) 4.5'. Groove end.

Q_1 = ______

Q_2 = ______

TW_1 = ______

TW_2 = ______

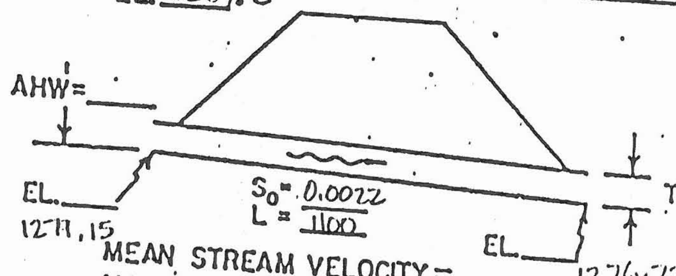
(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

Roadway = 1288

STATION: ______

canal bank EL. 1287.2



MEAN STREAM VELOCITY = ______

MAX. STREAM VELOCITY = ______

4.5(16)

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	HW	OUTLET CONTROL $HW=H+h_o-LS_o$: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Groove end - HW	180	4.5.	1.79	8.05	0.2	10.2	3.85	4.18		4.18	2.42	11.96	11.96			Outlet Cont
↓	150	↓	↓	↓	↓	7.1	3.55	4.03		4.03	2.42	8.71	8.71			" "
↓	135	↓	↓	↓	↓	5.7	3.4	3.95		3.95	2.42	7.23	8.05			Inlet Cont
↓	140	↓	↓	↓	↓	6.2	3.45	3.98		3.98	2.42	7.76	8.05			" "
↓	145.	↓	↓	↓	↓	6.6	3.5	4.0		4.0	2.42	8.18	8.18			Outlet Cont
→	142	4.5	1.79	8.05	0.2	6.3	3.47	3.99		3.99	2.42	7.87	8.05			Inlet Cont
HEC-2 Profile 1 → HW= TW= } same	57	4.5	1.74	7.82	0.2	1.01	–	–	9.24	9.24	2.42	7.83	7.83			Outlet Cont – Q=57

Decr...
Decr...
Incr...
Incr...
Decr...

SUMMARY & RECOMMENDATIONS:

*By excel spreadsheet:

$Q_{max} \simeq 142$ cfs

Main Street Culvert.

PROJECT: Main Street Culvert

DESIGNER: AB

DATE: 4/3/97 Rev. 4/24/97

HYDROLOGIC AND CHANNEL INFORMATION

(1) 30" RCP with another culvert joining to form 8'X3' RCB.

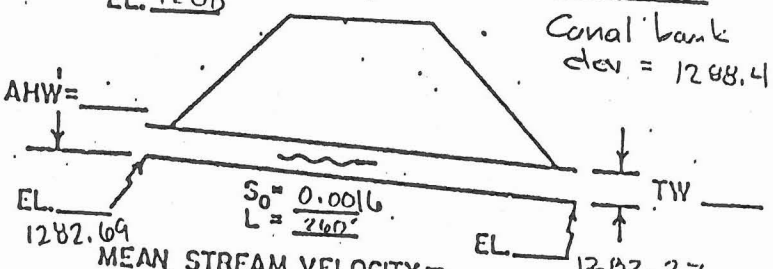
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

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

SKETCH

STATION: _____



MEAN STREAM VELOCITY= _____

MAX. STREAM VELOCITY= _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL $HW = H + h_o - LS_o$											
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
groove (11W)	45	2.5	2.12	5.31	0.2	1.3	2.25	2.38		2.38	0.42	6.26	6.26			OUTLET CONT.
	40	2.5	2.12	5.31	0.2	3.4	2.2	2.35		2.35	0.42	5.33	5.32			~INLET CONT.
	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

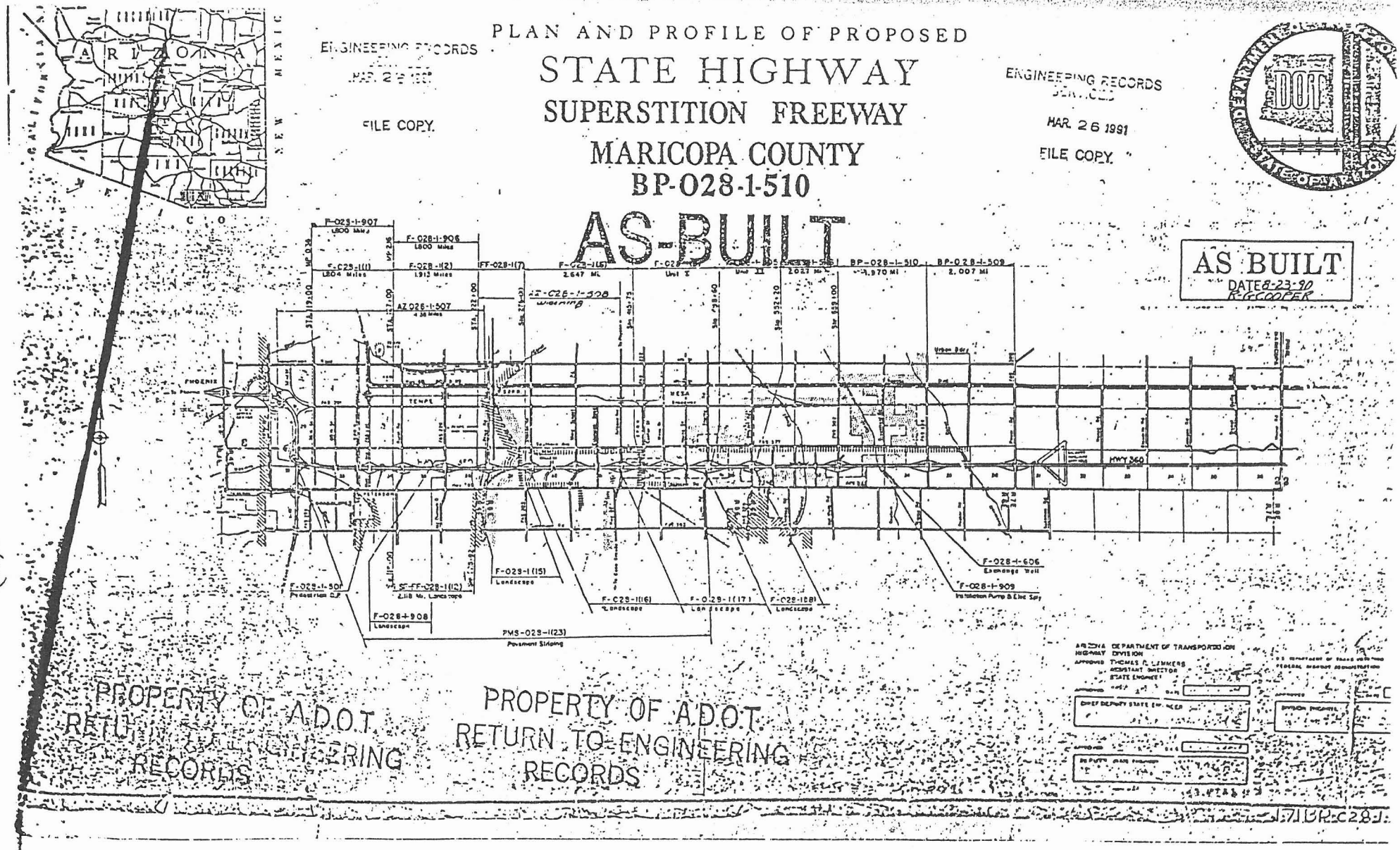
SUMMARY & RECOMMENDATIONS:

Q_{max} = 40 cfs.

4.5(7)

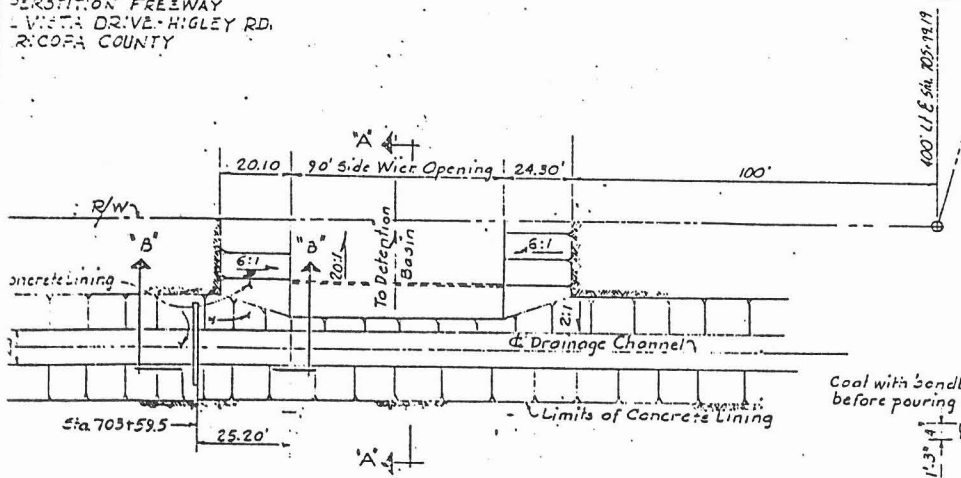
HEC-2 RESULTS TW= 11W

max. Q

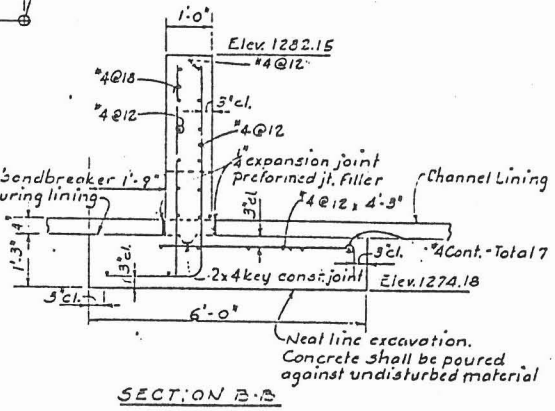

ARIZONA
CALIFORNIA
NEW MEXICO
PLAN AND PROFILE OF PROPOSED
STATE HIGHWAY
SUPERSTITION FREEWAY
MARICOPA COUNTY
BP-028-1-510
AS-BUILT
ENGINEERING RECORDS
MAR 26 1991
FILE COPY.
ENGINEERING RECORDS
MAR 26 1991
FILE COPY.
AS BUILT
DATE 8-23-90
R. COOPER
F-023-1-907
F-028-1-906
F-023-1(11)
F-028-1(2)
FF-028-1(7)
F-023-1(15)
F-028-1-508
AZ 028-1-507
BP-028-1-510
BP-028-1-509
PHOENIX
TEMPE
MESA
HWY 360
F-028-1-606
F-028-1-909
F-023-1-505
SF-FF-028-1(12)
F-023-1(15)
F-023-1(16)
F-023-1(17)
F-028-1(8)
F-028-1-908
PMS-028-1(23)
Pavement Striping
PROPERTY OF A.D.O.T.
RETURN TO ENGINEERING
RECORDS
PROPERTY OF A.D.O.T.
RETURN TO ENGINEERING
RECORDS
ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
APPROVED THOMAS R. LEMMERS
ASSISTANT DIRECTOR
STATE ENGINEER
DEPUTY STATE ENGINEER
DIVISION ENGINEER
FEDERAL HIGHWAY ADMINISTRATION
71 UR-028-1

PERSTITION FREEWAY
- VISTA DRIVE - HIGLEY RD.
RICOPA COUNTY

DIST. REGION	STATE	PROJECT NO.	FED. AID PROJECT NO.	SHEET NO.	TOTAL SHEETS
5	ARIZONA	BP-028-1-510	55	2 EE & 33	

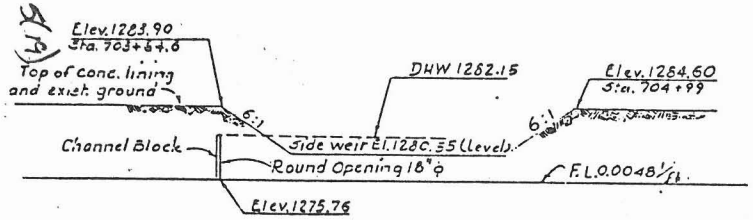


PLAN
No Scale

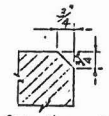


SECTION B-B

4.5(4)

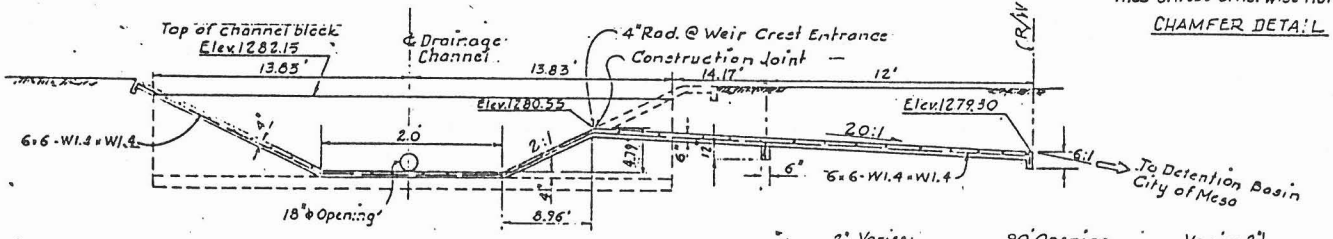


ELEVATION

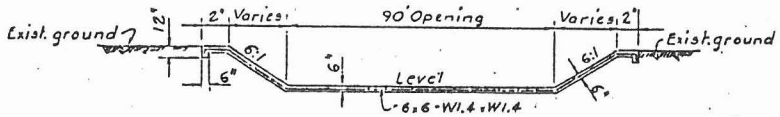


Chamfer all exposed corners thus unless otherwise noted.

CHAMFER DETAIL



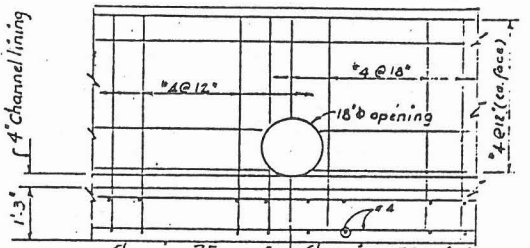
SECTION A-A



WING SECTION

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 = 2500psi - Class B concrete
f_s = 20,000psi - Class 40 reinforcing steel.
All concrete shall be Class B, f_c = 2500psi
Reinforcing steel shall conform to ASTM Specification A615, Grade 40
Welded wire fabric shall conform to ASTM Specifications 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.



OPENING ELEVATION

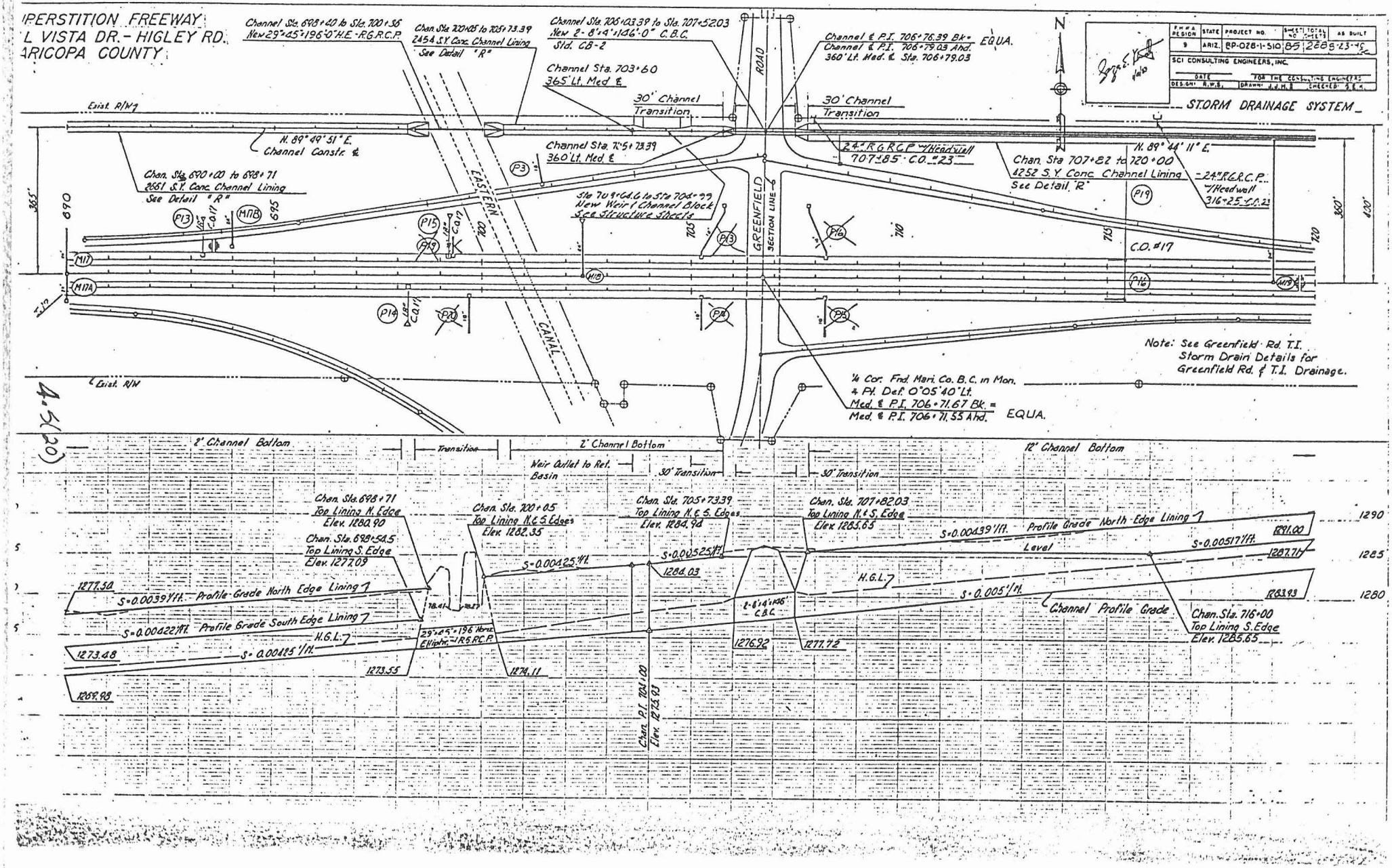
APPROX. QUANTITIES (for informational purposes only)

	Concrete	Reinforcing - Steel	6x6-W1.4xW1.4 Wire Fabric	Str. Excav.
Chan Block	14.6 C.Y.	760 lbs.	" -	15 C.Y
- Wier	38 C.Y.	-	38 S.Y.	-

		DATE
LAYOUT		
DESIGN	T.R.	7-83
DESIGN CK'D		
DRAWN	A.A.	7-83

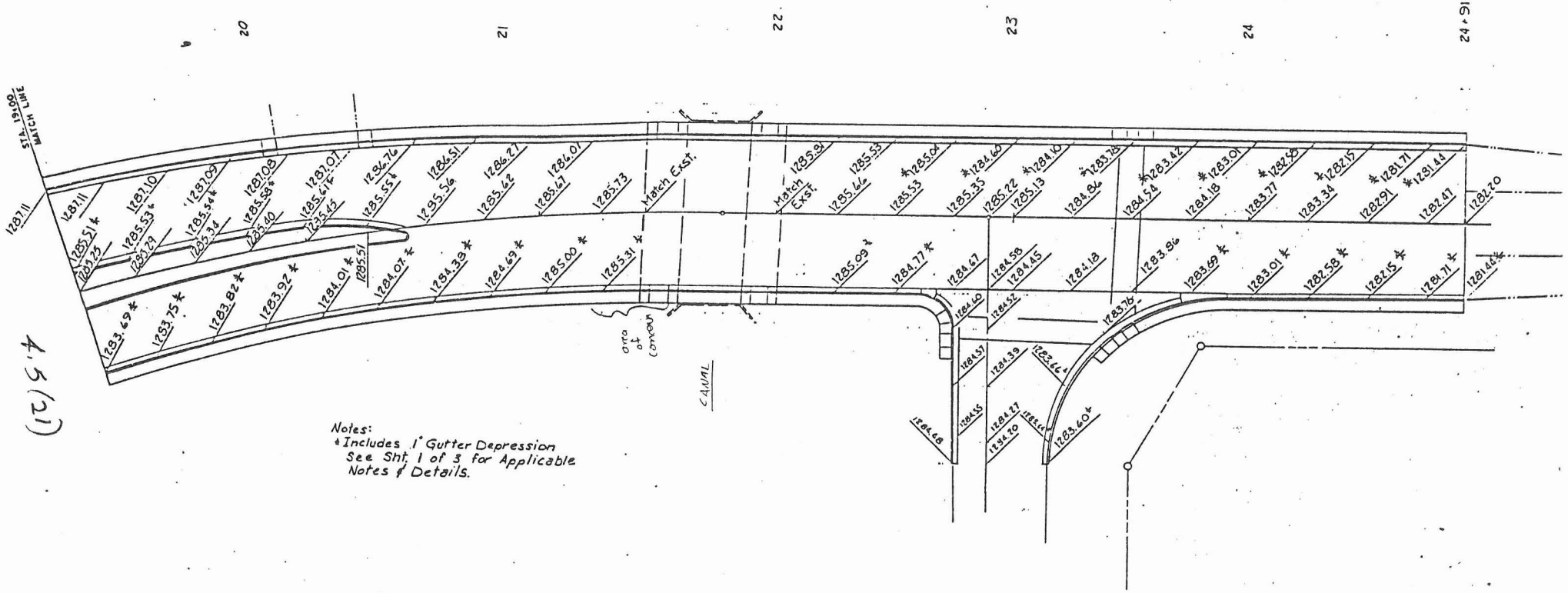
ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRUCTURES SECTION

STA. 703+59.5


IPERSTITION FREEWAY
L VISTA DR. - HIGLEY RD.
ARICOPA COUNTY
STORM DRAINAGE SYSTEM
FHWA REGION 9
STATE ARIZ.
PROJECT NO. BP-028-1-510
SHEET NO. 85
TOTAL SHEETS 228
AS BUILT
SCI CONSULTING ENGINEERS, INC.
DES. BY R.W.B.
DRAWN J.J.H.
CHECKED R.K.M.
Channel Sta. 698+40 to Sta. 700+36
New 29"x45"x196"0"H.E.-R.G.R.C.P.
Chan Sta 700+05 to 705+73.39
2454 S.Y. Conc. Channel Lining
See Detail "R"
Channel Sta. 705+03.39 to Sta. 707+52.03
New 2-8'x4'x146'-0" C.B.C.
Std. CB-2
Channel Sta. 703+60
365' Lt. Med. ℄
30' Channel Transition
Channel ℄ P.I. 706+76.39 Bk.=
Channel ℄ P.I. 706+79.03 Ahd.
360' Lt. Med. ℄ Sta. 706+79.03
EQUA.
Exist. R/W
N. 89°49'51" E.
Channel Constr. ℄
Chan. Sta 690+00 to 698+71
2651 S.Y. Conc. Channel Lining
See Detail "R"
Channel Sta. 704+73.39
360' Lt. Med. ℄
Sta 704+64.6 to Sta 704+99
New Weir / Channel Block
See Structure Sheets
24" R.G.R.C.P. w/Headwall
707+85 C.O. #23
Chan. Sta 707+82 to 720+00
1252 S.Y. Conc. Channel Lining
See Detail "R"
N. 89°44'11" E.
24" R.G.R.C.P. w/Headwall
316+25 C.O. #23
C.O. #17
GREENFIELD ROAD
SECTION LINE
EASTERN CANAL
Note: See Greenfield Rd. T.I. Storm Drain Details for Greenfield Rd. & T.I. Drainage.
¼ Cor. Fnd. Mari. Co. B.C. in Mon.
& P.I. Def. 0°05'40" Lt.
Med. ℄ P.I. 706+71.67 Bk. =
Med. ℄ P.I. 706+71.55 Ahd. EQUA.
Exist. R/W
2' Channel Bottom
Transition
2' Channel Bottom
Weir Outlet to Ret. Basin
30' Transition
30' Transition
12' Channel Bottom
Chan. Sta. 698+71
Top Lining N. Edge
Elev. 1280.90
Chan. Sta. 698+54.5
Top Lining S. Edge
Elev. 1277.09
Chan. Sta. 700+05
Top Lining N.&S. Edges
Elev. 1282.35
Chan. Sta. 705+73.39
Top Lining N.&S. Edges
Elev. 1284.96
Chan. Sta. 707+82.03
Top Lining N.&S. Edge
Elev. 1285.65
S=0.00439'/ft.
Profile Grade North Edge Lining
Level
S=0.00517'/ft.
1291.00
1287.76
1277.50
S=0.00391'/ft. Profile Grade North Edge Lining
S=0.00525'/ft.
1284.03
S=0.00425'/ft.
H.G.L.
S=0.005'/ft.
1283.93
Channel Profile Grade
Chan. Sta. 716+00
Top Lining S. Edge
Elev. 1285.65
S=0.00422'/ft. Profile Grade South Edge Lining
H.G.L.
S=0.00485'/ft.
29"x45"x196' Horiz. Elliptic. R.C.P.
2-8'x4'x146' C.B.C.
1273.48
1273.55
1269.98
1274.11
1276.92
1277.72
Chan. P.I. 704+00
Elev. 1273.93
1290
1285
1280

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

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	F-023-1-510	20		

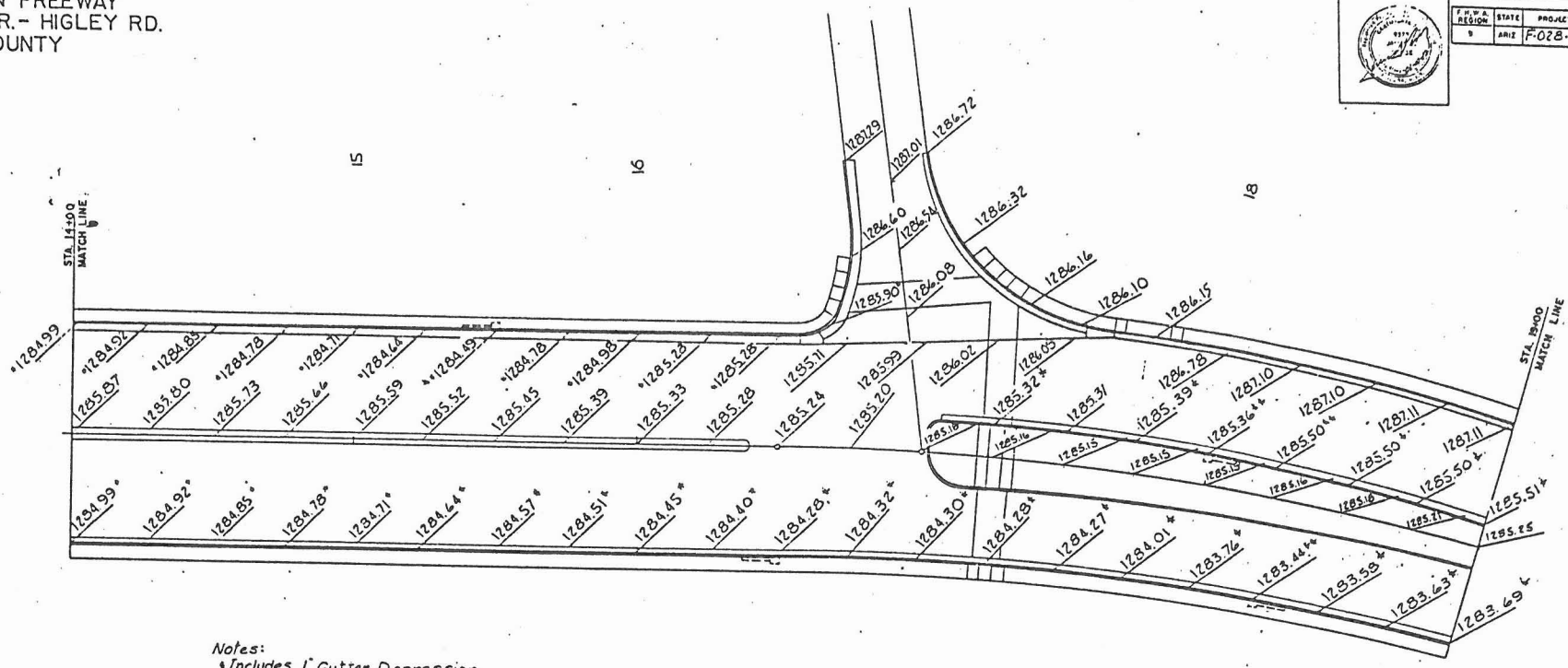


4.5(21)

GREENFIELD RD. T.I.
STAKING DIAGRAM

UPERSTITION FREEWAY
AL VISTA DR.- HIGLEY RD.
1ARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	F-028-1-510 SC	25	25	



Notes:
* Includes 1" Gutter Depression
** Includes 2" Gutter Depression
See Sht. 1 of 3 for Applicable Notes & Details.

4.5(22)

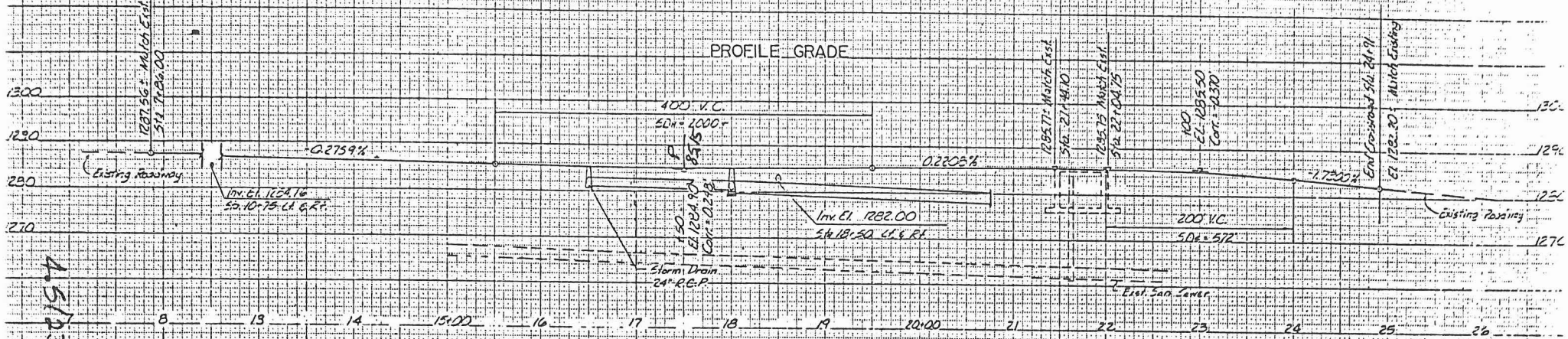
GREENFIELD RD. T.I.
STAKING DIAGRAM

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

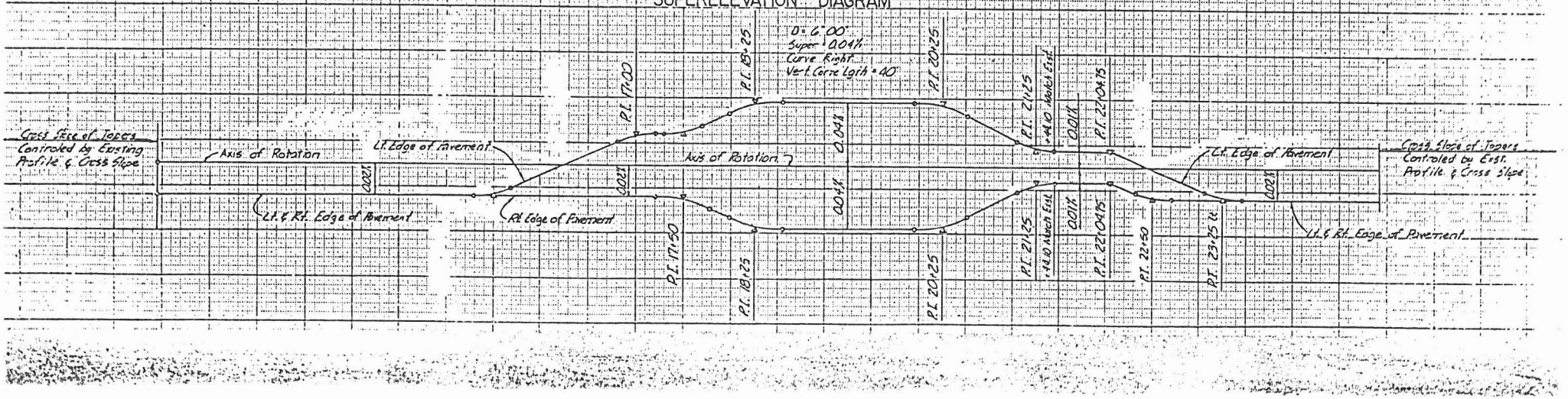
GREENFIELD ROAD

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	IEP-028-1-510	57		

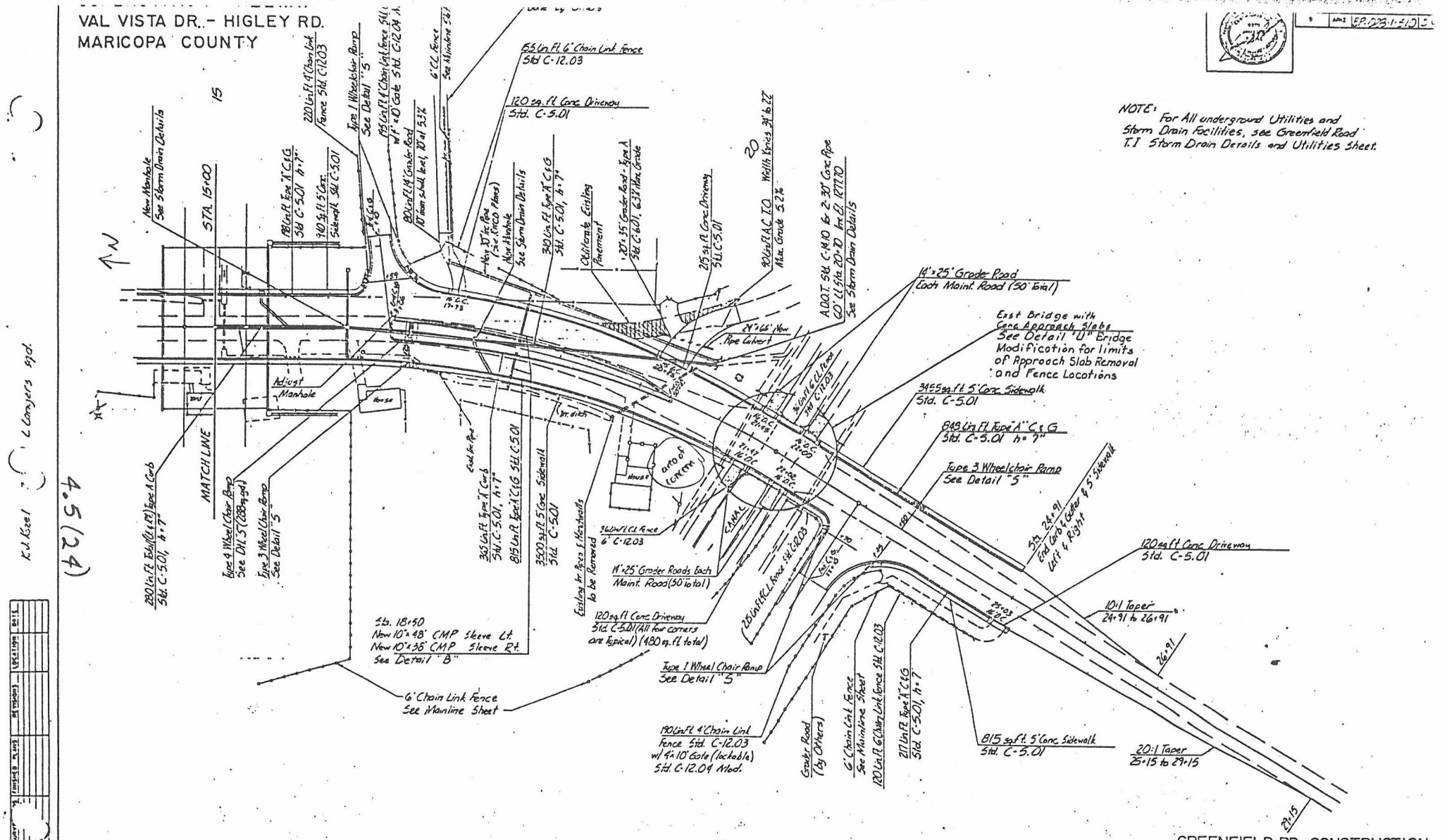
PROFILE GRADE



SUPERELEVATION DIAGRAM

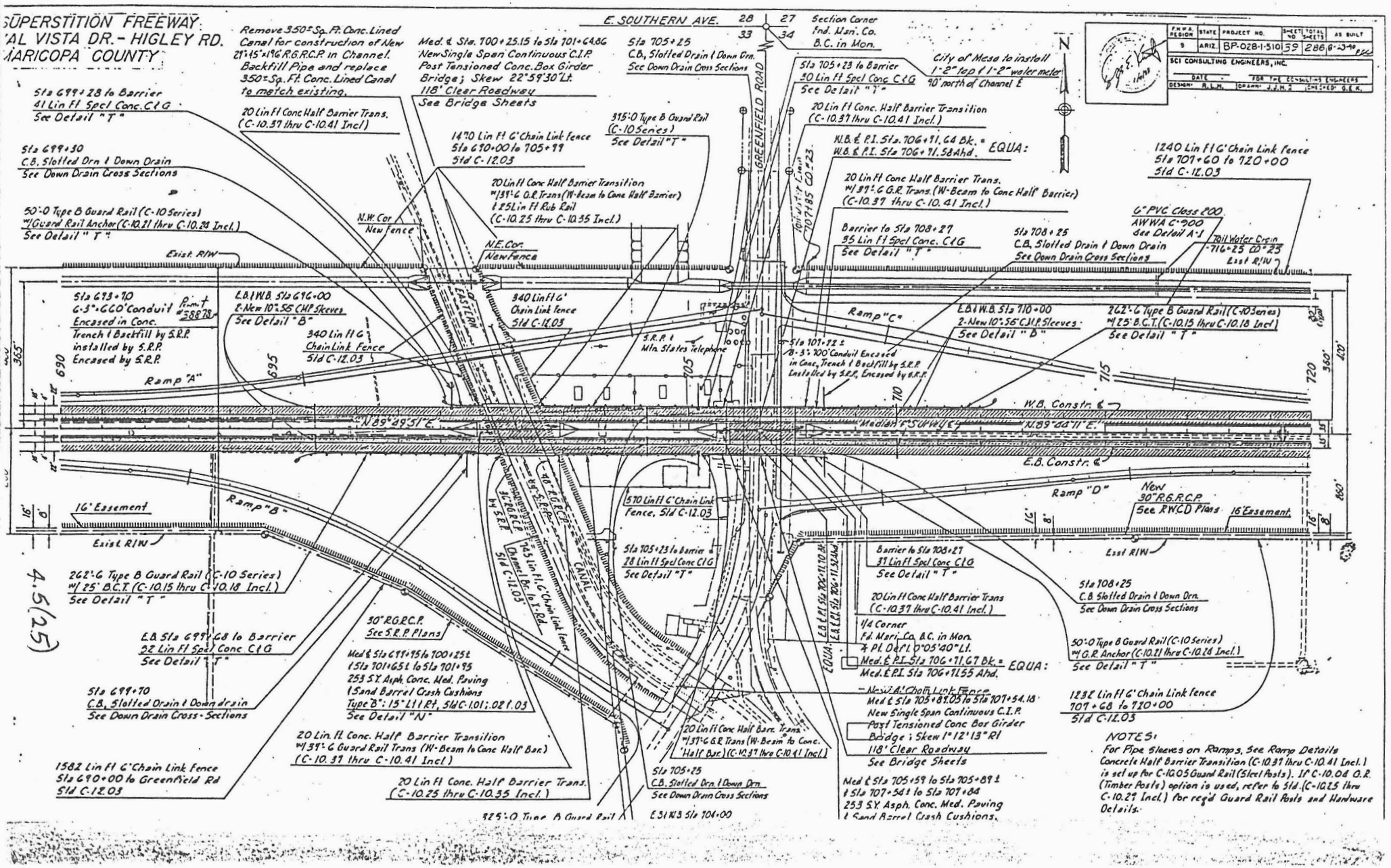


VAL VISTA DR. - HIGLEY RD.
MARICOPA COUNTY



GREENFIELD RD. CONSTRUCTION

ITBP-028-1-51C


SUPERSTITION FREEWAY
AL VISTA DR. - HIGLEY RD.
MARICOPA COUNTY
E. SOUTHERN AVE.
GREENFIELD ROAD
Section Corner Fnd. Mari. Co. B.C. in Mon.
City of Mesa to install 1-2" tap & 1-2" water meter 90' north of Channel E
Remove 350± Sq. Ft. Conc. Lined Canal for construction of New 21'-15"x196 R.G.R.C.P. in Channel. Backfill Pipe and replace 350± Sq. Ft. Conc. Lined Canal to match existing.
Med. & Sta. 700+25.15 to Sta 701+64.86 New Single Span Continuous C.I.P. Post Tensioned Conc. Box Girder Bridge; Skew 22°59'30" Lt. 118' Clear Roadway See Bridge Sheets
Sta 705+25 C.B., Slotted Drain & Down Drn. See Down Drain Cross Sections
Sta 705+23 to Barrier 20 Lin Ft Spcl Conc C1G See Detail "T"
20 Lin Ft Conc. Half Barrier Transition (C-10.37 thru C-10.41 Incl.)
N.B. & P.I. Sta. 706+71.64 Bk. = W.B. & P.I. Sta 706+71.58 Ahd. EQUA:
1240 Lin Ft G'Chain Link fence Sta 707+60 to 720+00 Std C-12.03
Sta 699+28 to Barrier 41 Lin Ft Spcl Conc. C1G See Detail "T"
20 Lin Ft Conc Half Barrier Trans. (C-10.37 thru C-10.41 Incl)
315'-0 Type B Guard Rail (C-10 Series) See Detail "T"
1470 Lin Ft G'Chain Link fence Sta 690+00 to 705+99 Std C-12.03
Sta 699+30 C.B. Slotted Drn & Down Drain See Down Drain Cross Sections
20 Lin Ft Conc Half Barrier Transition w/ 31'-6 G.R. Trans (W-Beam to Conc Half Barrier) & 25 Lin Ft Rub Rail (C-10.25 thru C-10.35 Incl.)
20 Lin Ft Conc Half Barrier Trans. w/ 31'-6 G.R. Trans. (W-Beam to Conc Half Barrier) (C-10.37 thru C-10.41 Incl.)
50'-0 Type B Guard Rail (C-10 Series) w/ Guard Rail Anchor (C-10.21 thru C-10.28 Incl.) See Detail "T"
N.W. Cor New Fence
N.E. Cor. New Fence
Barrier to Sta 708+27 95 Lin Ft Spcl Conc. C1G See Detail "T"
Sta 708+25 C.B. Slotted Drain & Down Drain See Down Drain Cross Sections
6" PVC Class 200 AWWA C-900 See Detail A-1
Toll Water Cr. in 707+16.25 CO=23
Exist R/W
Sta 693+10 6-3"-GCO Conduit Encased in Conc. Trench & Backfill by S.R.P. installed by S.R.P. Encased by S.R.P.
Pmt # 58878
L.B. & W.B. Sta 696+00 2-New 10"-56 CMP Sleeves See Detail "B"
340 Lin Ft G' Chain Link Fence Std C-12.03
Ramp "A"
Ramp "C"
L.B. & W.B. Sta 710+00 2-New 10"-56 C.M.P. Sleeves See Detail "B"
262'-6 Type B Guard Rail (C-10 Series) w/ 25' B.C.T. (C-10.15 thru C-10.18 Incl.) See Detail "T"
S.R.P. & Mtn. States Telephone
Sta 707+72 ± 8-3" 700 Conduit Encased in Conc. Trench & Backfill by S.R.P. Installed by S.R.P. Encased by S.R.P.
W.B. Constr. ℄
Median ℄ Survey ℄
N.89°-49'-51" E.
N.89°-44'-11" E.
E.B. Constr. ℄
Ramp "D"
New 30" R.G.R.C.P. See R.W.C.D. Plans
16' Easement
Exist R/W
Ramp "B"
16' Easement
370 Lin Ft G' Chain Link Fence, Std C-12.03
Sta 705+23 to Barrier 28 Lin Ft Spcl Conc C1G See Detail "T"
Barrier to Sta 708+27 31 Lin Ft Spcl Conc C1G See Detail "T"
262'-6 Type B Guard Rail (C-10 Series) w/ 25' B.C.T. (C-10.15 thru C-10.18 Incl.) See Detail "T"
Sta 708+25 C.B. Slotted Drain & Down Drn. See Down Drain Cross Sections
1/4 Corner Fd. Mari. Co. B.C. in Mon. & P.I. Dist. 0°05'40" Lt.
Med. & P.I. Sta 706+71.67 Bk. = Med. & P.I. Sta 706+71.55 Ahd. EQUA:
50'-0 Type B Guard Rail (C-10 Series) w/ G.R. Anchor (C-10.21 thru C-10.28 Incl.) See Detail "T"
30" R.G.R.C.P. See S.R.P. Plans
Sta 699+95 to Sta 700+25 Sta 701+65± to Sta 701+95 253 S.Y. Asph. Conc. Med. Paving & Sand Barrel Crash Cushions Type "B": 15'-L11 Ft, Std C-1.01; .02 & .03 See Detail "N"
E.B. Sta 699+68 to Barrier 32 Lin Ft Spcl Conc C1G See Detail "T"
Sta 699+70 C.B. Slotted Drain & Down drain See Down Drain Cross Sections
20 Lin. Ft. Conc. Half Barrier Transition w/ 31'-6 Guard Rail Trans (W-Beam to Conc Half Bar.) (C-10.37 thru C-10.41 Incl.)
20 Lin Ft Conc. Half Barrier Trans. (C-10.25 thru C-10.35 Incl.)
1582 Lin Ft G' Chain Link Fence Sta 690+00 to Greenfield Rd Std C-12.03
325'-0 Type B Guard Rail
Sta 705+25 C.B. Slotted Drn & Down Drn. See Down Drain Cross Sections
E.B. & W.B. Sta 704+00
20 Lin Ft Conc Half Barr. Trans. w/ 31'-6 G.R. Trans (W-Beam to Conc. Half Bar.) (C-10.37 thru C-10.41 Incl.)
New A.C. Chain Link Fence Med & Sta 705+89.05 to Sta 707+54.18
New Single Span Continuous C.I.P. Post Tensioned Conc Box Girder Bridge; Skew 1°12'13" Rt 118' Clear Roadway See Bridge Sheets
Med & Sta 705+59 to Sta 705+89 ± & Sta 707+54 ± to Sta 707+84 253 S.Y. Asph. Conc. Med. Paving & Sand Barrel Crash Cushions.
1232 Lin Ft G' Chain Link fence 707+68 to 720+00 Std C-12.03
NOTES:
For Pipe Sleeves on Ramps, See Ramp Details
Concrete Half Barrier Transition (C-10.37 thru C-10.41 Incl.) is set up for C-10.05 Guard Rail (Steel Posts). If C-10.04 O.R. (Timber Posts) option is used, refer to Std. (C-10.25 thru C-10.29 Incl.) for req'd Guard Rail Posts and Hardware Details.
FHWA REGION 9
STATE ARIZ.
PROJECT NO. BP-028-1-510
SHEET NO 59
TOTAL SHEETS 286
AS BUILT
SCI CONSULTING ENGINEERS, INC.
FOR THE CONSULTING ENGINEERS
DESIGN: R.L.M. DRAWN: J.H.M. CHECKED: G.E.K.
4.5(25)

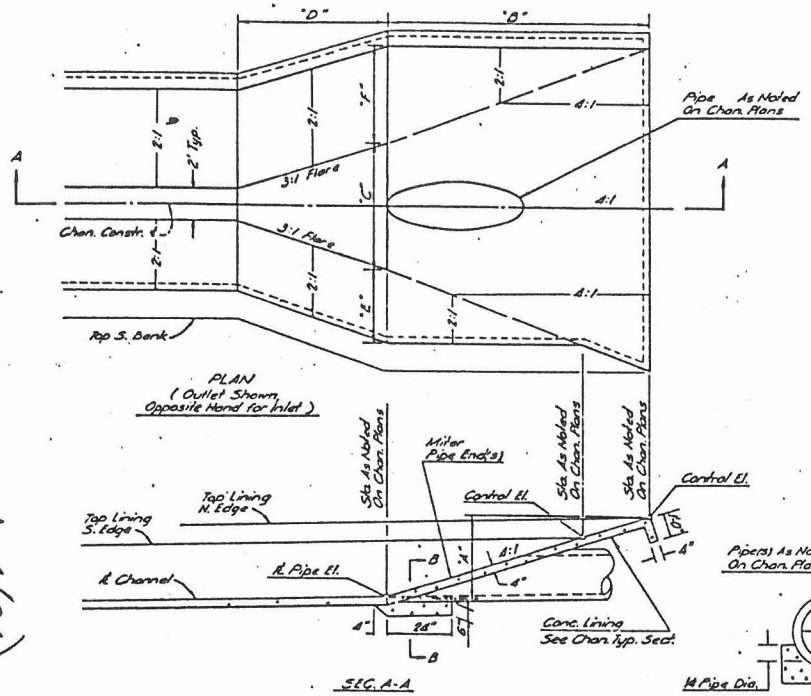
PERSTITION FREEWAY
4 VISTA DR. - HIGLEY RD.
'RICOPA COUNTY

F.A.P. REGION	STATE	PROJECT NO.	SHEET NO	TOTAL SHEETS	AS BUILT
9	ARIZ.	BP-028-1-510	26	28	

SCI CONSULTING ENGINEERS, INC.

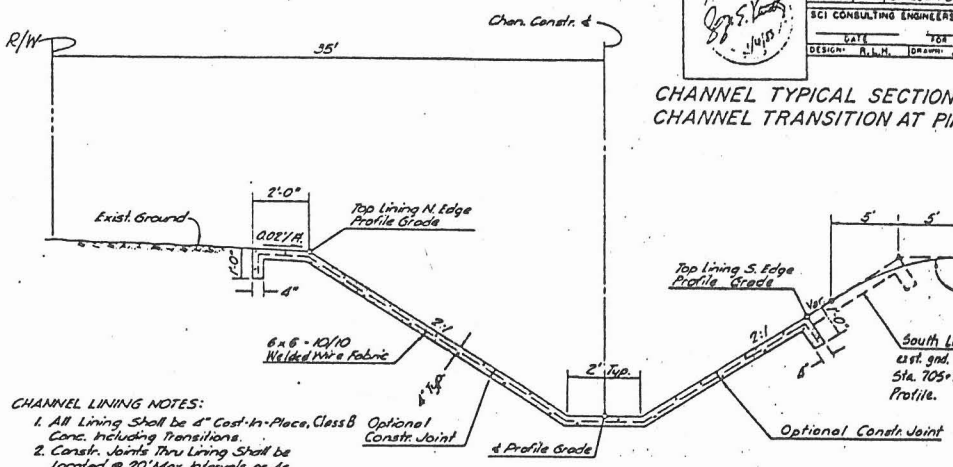
DATE 6/4/93 FOR THE CONSULTING ENGINEERS

DESIGN: R.L.M. DRAWN: J.J.H.R. CHECKED: G.E.K.



CHANNEL TRANSITION DIMENSION SCHEDULE							
		A	B	C	D	E	F
39TH STREET 36" R.G.R.C.P.	Inlet	5.44'	21.9'	5.0'	4.5'	6.86'	11.14'
	Outlet	5.47'	22.1'	5.0'	4.5'	6.56'	10.78'
EASTERN CANAL 29" x 45" RCP Arch	Inlet	7.97'	31.0'	5.0'	4.5'	16.20	16.20'
	Outlet	7.35'	31.0'	5.0'	4.5'	6.96'	14.46'
	Inlet						
	Outlet						
	Inlet						
	Outlet						

DETAIL OF CHANNEL TRANSITION AT PIPE CULV(S).

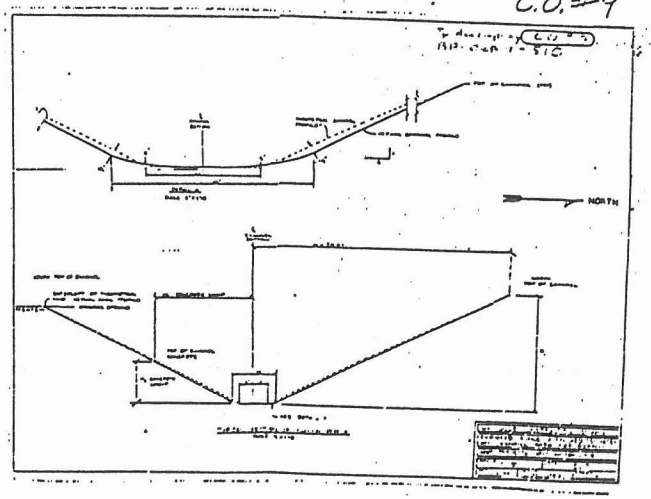


CHANNEL TYPICAL SECTION & CHANNEL TRANSITION AT PIPE CULVERT(S)

CHANNEL LINING NOTES:
1. All Lining Shall be 4" Cast-In-Place, Class B Conc. Including Transitions.
2. Constr. Joints Thru Lining Shall be located @ 20' Max. Intervals or As Directed by the Engineer.

CHANNEL TYPICAL SECTION

C.O. #9



4.5 (26)

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 bluelines 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 delination 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

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

GS/dh

cc: Peter Knudson, City of Mesa

4.5(27)

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

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 Profile 1	Estimated Capacity cfs Profile 2	WSEL Profile 1	WSEL Profile 2	Upslope Top of Bank	Downslope Top of Bank	Low Top of High Canal Bank Elev.	Floodplain Width From Hydraulic Baseline (ft)	Remarks
	16.422	190	215	79.84	79.94	83.1	82	83.1	990	
	16.458			79.97	80.07	84.1	82.6	83.6	1000	Baseline Road Culvert Q 200 WSE 82.2
897	16.493			81.71	82.41	*83.7		83.6	925	Baseline Road Culvert, Low Top of Road 83.6
	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	
	16.662			82.48	82.63	82.9	82.3	82.8	618	
	16.723	60	75	82.6	82.73	82.8	82.5	82.6	440	
869	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	Greenfield Road Culvert, Low Top of Road = 85.0
	16.939			83.35	83.86	85.1	84.1			Greenfield Road Culvert
	17.014			83.35	83.86	83.4	83	83.4	414	U.S. 60 Culvert
	17.16	45	50	84.26	84.98	84.7	83.3	83.4	555	U.S. 60 Culvert
1206	17.183			84.26	84.98	84.7	82.9	84.3	692	Holmes Park Detention Basin
	17.256			84.26	84.98	84.3	83	84.3	731	Holmes Park Detention Basin
1081	17.277			84.26	84.98	84.8	83	84.3	347	
	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	32	190	84.29	85	*86.1	84.7	84.7	307	Southern Avenue Culvert, Low Top of Road = 85.5
	17.608			85.58	85.89	87	86.6	86.1	625	Southern Avenue Culvert
1097	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	
1108	17.872			85.58	85.94	87	86.3	87	795	
	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	Greenfield Park Detention Basin
	18.101	162	170	85.59	86.09	86.4	87.1	86.9	763	Greenfield Park Detention Basin
1487	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

	18.428			85.95	86.38	*87.3	86.7	87.3	589	
1326	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	87.1	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	*88.7	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	88.5	88.9	88.9	438	
	19.716			88.48	88.99	88.5	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	88.2	88.9	88.7	520	Overtops Bank
	20.082			88.85	89.29	88.7	89.1	88.9	440	
	20.139			88.85	89.29	88.7	89.2	89.1	490	
	20.179			88.85	89.29	89.2	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	

* East Canal bank elevation based on higher field surveyed value

4.5(29)

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	89.2	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	89.2	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	89.3	91	90.4	405	
703	20.815			89.29	89.8	89.3	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	
	20.963	130	330	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	91.3	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	
	21.492	1	1	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	90.6	91.5	91.5	439	
216	21.665			91.35	91.87	91	92.3	91.5	405	
	21.716			91.35	91.87	91.3	92.3	91.7	345	
	21.774			91.35	91.87	91.3	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	91.2	91.1	91.2	80	
218	21.963			91.35	91.87	91.1	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	22.208	100	275	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	

4.5/30)

* 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

	22.444			94	94.49	94	95.3	94.6	502
333	22.488			94.01	94.52	94	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	*94.7	94.5	94.6	771
	22.744			94.12	94.63	94.2	94.6	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
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TABLE OF CONTENTS

FIGURES

TABLES

EXHIBITS

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 Primatech 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 on 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

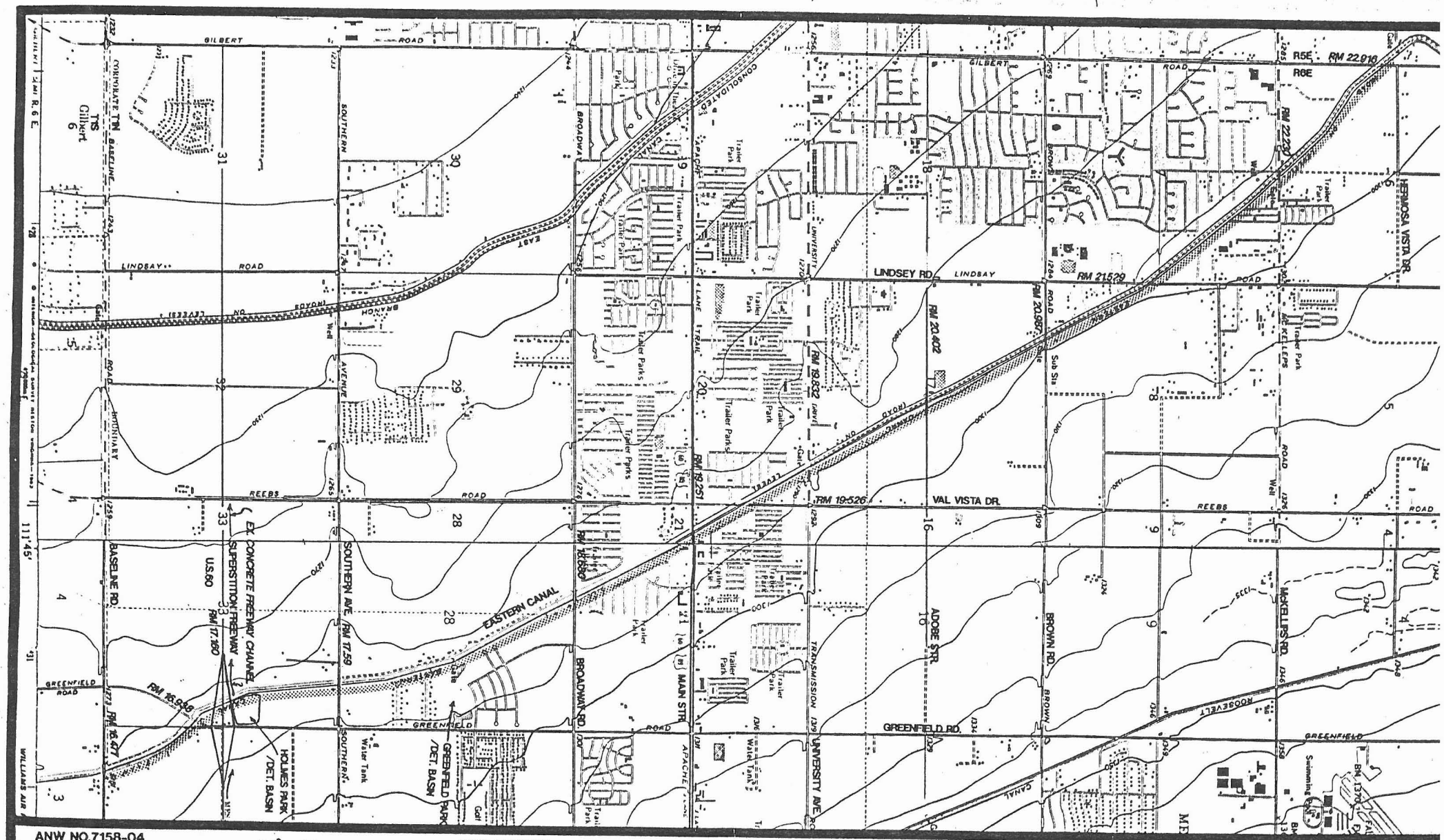
2.1 Scope of Study

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

0 2000
SCALE:1"=2000'

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 c 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 in an un-lined channel/swale with a detention basin/par 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 summary 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 (5)	U.S. 60 Culvert Under Canal	Culvert along channel under canal	1-45" x 29" x 196" long HECP, mitered inlet
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 Primatech 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 area between 1.0 and 3.0 feet; depths are shown, but no FHFs 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.

FEDERAL EMERGENCY MANAGEMENT AGENCY REVISION REQUESTER AND COMMUNITY OFFICIAL FORM	O.M.B No. 3067-0148 Expires July 31, 1997

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 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 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
☐ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☒ Shallow Flooding (e.g. Zones AO and AH)Zone A	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ 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**	***Note:*** **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**
_____ Signature of Revision Requester	_____ Signature of Community Official
_____ Printed Name and Title of Revision Requester	_____ Printed Name and Title of Community Official
_____ Company Name	_____ Community Name
_____ Telephone No. Date	_____ 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 .....
☐ Hydrologic (3)	new or revised discharges
☐ Hydraulic (4)	new or revised water-surface elevations
☐ Mapping (5)	floodplain/floodway changes
☐ Channelization (6)	channel is modified
☐ Bridge/Culvert (7)	addition/revision of bridge/culvert
☐ Levee/Floodwall (8)	addition/revision of levee/floodwall
☐ Coastal (9)	new or revised coastal elevations
☐ Coastal Structures (10)	addition/revision of coastal structure
☐ Dam (11)	addition/revision of dam
☐ Alluvial Fan (12)	structures proposed on alluvial fan