

## **Lateral 4.7 Pipeline**

## **Lateral 4.7-Pipeline 2, Glendive Unit**

### **Buffalo Rapids Project-Montana**

SE1/4NW1/4, Section 14, T13N, R53E, Dawson County

Lateral 4.7-Pipeline 2 delivers irrigation water from the Glendive Main Canal to farmlands located along the north side of the Yellowstone River. The irrigation season normally runs from May 1<sup>st</sup> through September 30<sup>th</sup> of each year.

The Buffalo Rapids Irrigation District converted the original open lateral into a pipeline. Reclamation currently does not have any engineering data on the existing pipeline. Exhibit A shows the proposed pipeline crossing with respect to the pipeline.

#### Construction requirements:

- XL pipeline must coordinate with Mr. Larry Heimbuch, Manager, Buffalo Rapids District No. 1 at 406-939-1750 to obtain information concerning the Lateral pipeline
- The XL pipeline must be installed to ensure the minimum clearances shown on Drawing 40-600-51.
- The Lateral pipeline must remain in operation during the irrigation season.
- When the XL pipeline crossing is made, the existing Lateral pipeline will be carefully located to prevent damage. The Lateral pipeline shall be supported to prevent damage. All backfill under the pipe and for 10 feet on either side shall be compacted to 95% density in accordance with specifications Section 02302 – Compacting Earth Materials.
- All disturbed areas shall be shaped to facilitate natural drainage and reseeded in accordance with Section 02924 – Seeding and Soil Supplements.
- Pipeline markers and signs shall be installed on both sides of the Lateral pipeline or as directed by Mr. Larry Heimbuch, Manager, Buffalo Rapids District No. 1.
- Provide 5 days prior notice work on the Government easement. No work shall be done without the presence of a Government Representative. Contact Mr. Larry Heimbuch, Manager, Buffalo Rapids District No. 1 at 406-939-1750 and Mr. Steve Davies, Bureau of Reclamation, Montana Area Office at 406-247-7622.

## **Glendive Open Drain**

## **Glendive Open Drain**

### **Buffalo Rapids Project-Montana**

SE1/4NW1/4, Section 14, T13N, R53E, Dawson County

Glendive Open Drain carries surface and subsurface water off of farmlands to the Yellowstone River. Flows occur year round, however they increase during the irrigation season which normally runs from May 1st through September 30<sup>th</sup> of each year.

Exhibit A shows the proposed pipeline crossing with respect to the drain. A plan and profile drawing is not available for the drain. Keystone XL Pipeline is responsible for verifying actual field conditions.

#### **Construction requirements:**

- The pipeline must be installed to ensure the minimum clearances shown on Drawing 40-600-51.
- The drain must remain in operation and the pipe must be bored under the drain.
- All disturbed areas shall be shaped to facilitate natural drainage and reseeded in accordance with Section 02924 – Seeding and Soil Supplements.
- Pipeline markers and signs shall be installed on both sides of the drain.
- Provide 5 days prior notice work on the Government easement. No work shall be done without the presence of a Government Representative.
- Contact Mr. Larry Heimbuch, Manager, Buffalo Rapids District No. 1 at 406-939-1750 and Mr. Steve Davies, Bureau of Reclamation, Montana Area Office at 406-247-7622.

## **Fullerton Canal**

## **Fullerton Canal**

### **North Loup Division, Pick-Sloan Missouri Basin Program-Nebraska**

NE1/4 of the SE1/4, Section 28, T16N, R7W, Nance County

The Fullerton Canal delivers irrigation water from Davis Creek Dam to farmlands located along the North Loup and Loup Rivers. The canal is approximately 49 miles long and has a diversion capacity of 440 cubic feet per second. The irrigation season normally runs from May 1<sup>st</sup> through September 30<sup>th</sup> of each year. Depending on the year, the irrigation season can be run from April 1<sup>st</sup> through November 15<sup>th</sup>.

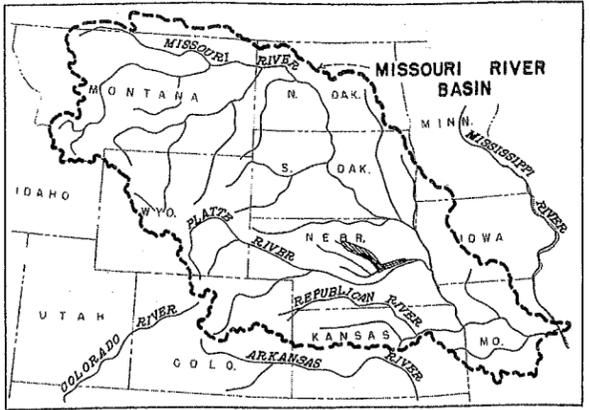
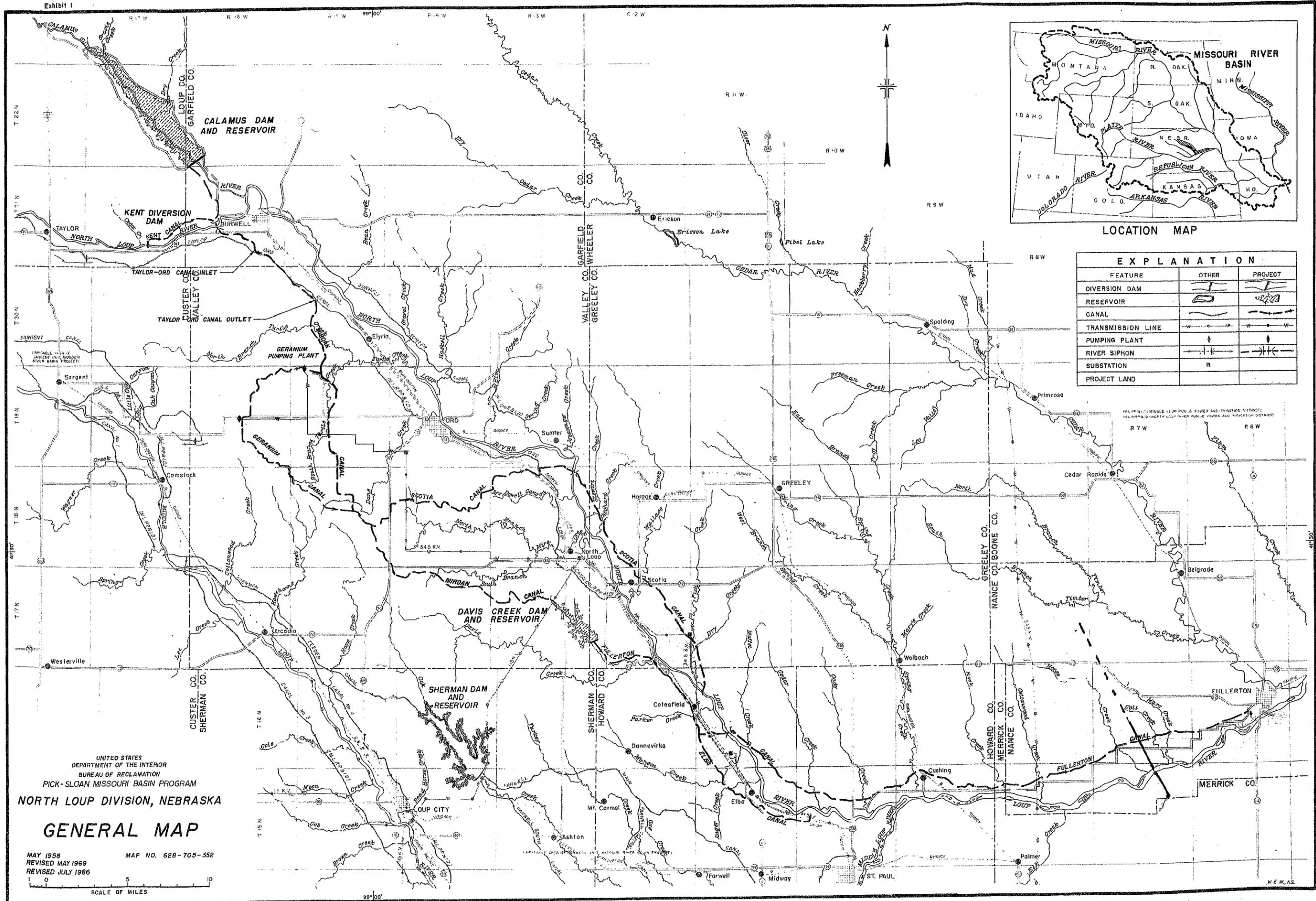
The proposed XL pipeline will cross the canal at approximate Station 2291+00±30. Exhibit A shows the proposed pipeline crossing with respect to the canal. Exhibit B shows the plan view and the right of way widths. Exhibit C shows the profile of the canal in the vicinity of the pipeline crossing. Exhibit D shows the typical cross section of the canal.

The following are the dimensions of the canal in the vicinity of the proposed pipeline crossing:

- Bottom width—10.00 feet
- Side slopes—1.5:1
- Water depth—3.10 feet
- Downhill bank height—5.00 feet
- Easement width—125 feet total (75 feet left of centerline and 50 feet right of centerline)

#### Construction requirements:

- The pipeline must be installed to ensure the minimum clearances shown on Drawing 40-600-51.
- The canal must remain in operation during the irrigation season. If the pipeline crossing is made during the irrigation season, the pipe must be bored under the canal.
- If the pipeline crossing is made during the non-irrigation season, the canal may be open cut. If the canal is open cut, all backfill within the easement boundaries shall be compacted to 95% density in accordance with specifications Section 02302 – Compacting Earth Materials.
- All disturbed areas shall be shaped to facilitate natural drainage and reseeded.
- Pipeline markers and signs shall be installed on both sides of the canal.
- Provide 5 days prior notice work on the Government easement. No work shall be done without the presence of a Government Representative. Contact Mr. Terry Seitz, McCook Field Office at 308-345-6470.



LOCATION MAP

EXPLANATION		
FEATURE	OTHER	PROJECT
DIVERSION DAM		
RESERVOIR		
CANAL		
TRANSMISSION LINE		
PUMPING PLANT		
RIVER SIPHON		
SUBSTATION		
PROJECT LAND		

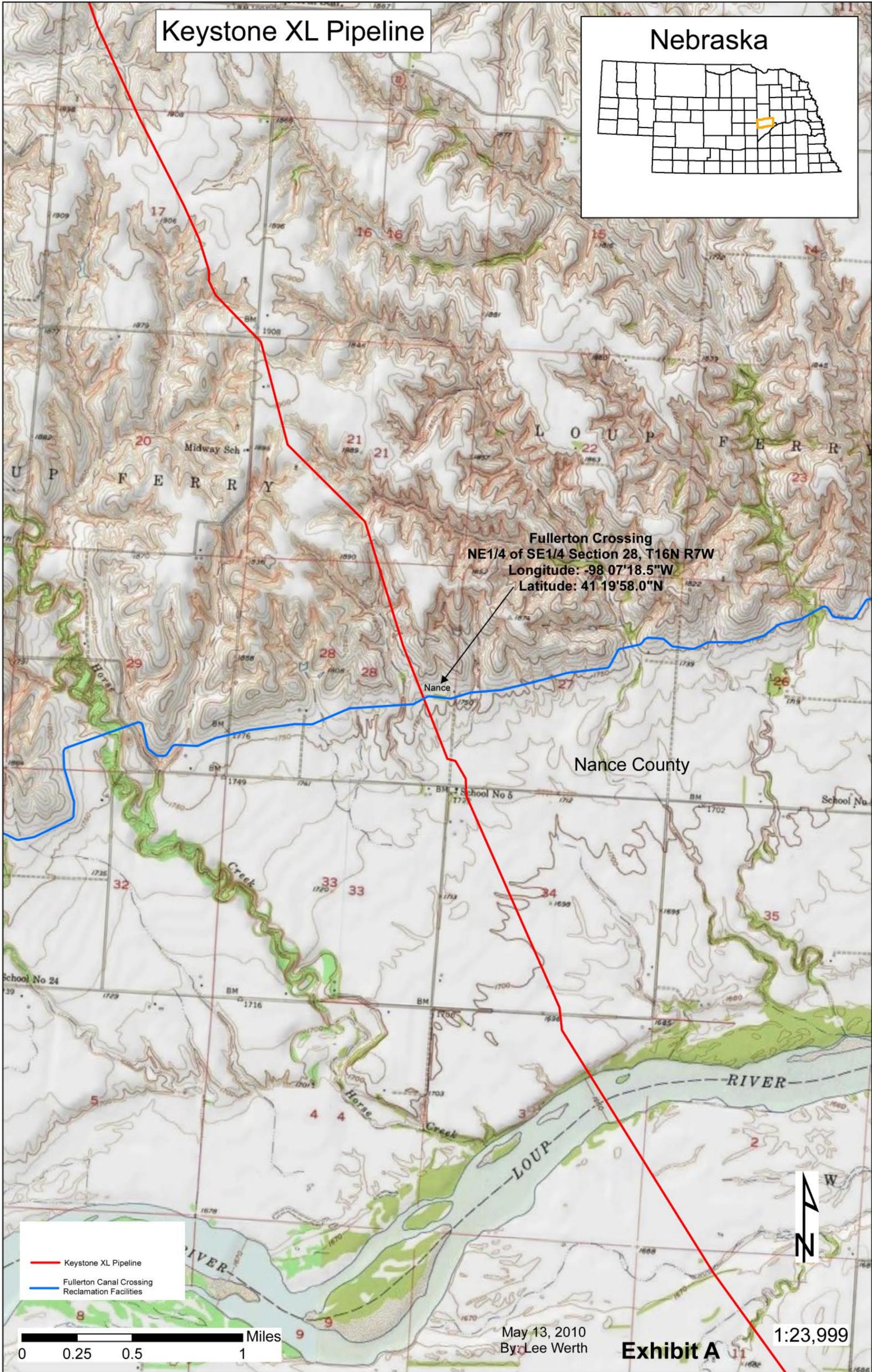
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
PICK-SLOAN MISSOURI BASIN PROGRAM  
**NORTH LOUP DIVISION, NEBRASKA**  
**GENERAL MAP**

MAY 1958  
REVISED MAY 1969  
REVISED JULY 1986

MAP NO. 628-705-352

SCALE OF MILES  
0 5 10

# Keystone XL Pipeline



— Keystone XL Pipeline  
— Fullerton Canal Crossing Reclamation Facilities

0 0.25 0.5 1 Miles

May 13, 2010  
By: Lee Werth

**Exhibit A**

1:23,999



**Plan View - Keystone Pipeline  
Crossing Fullerton Main Canal**

HORN, et ux

R - 104.17  
E = 4.82  
NO 307

POT 2294+98  
DRAIN

CTR BUILDING  
70 17

POT 2298+38  
FENCE COR  
130' RT

POT 2298 + 72 38  
SECTION LINE  
TIE = AZ 369°14'49"  
519 28'

F-435 D-LT  
DIVERT DRAIN  
1628-D-1598

C L

ROW

2295  
627  
615  
691

AZ 91°43'57"

ROW

AZ 96°30'

AZ 57°32'36"

Sta. 2291+00 +/- 30

O B M ACCESS ROAD  
(628-D-1606)

POT 2292+50  
FENCE COR  
398 11

POT 2297+40  
FENCE COR  
80' RT

POT 2297+60  
FENCE

POT 2297+96  
FENCE COR  
48 LT

POT 2298+18  
FENCE COR  
106 11

POT 2298+32  
FENCE COR / 190 LT  
FENCE COR / 132 RT

NO 306  
PI 2288+1601  
N 608 231 30  
E 2 379 054 65  
PC 2287+6600  
PT 2288+6447  
Δ 24°37'02" LT  
D = 25°00'00"  
T = 50 01'  
L = 98 47'

DAN E HORN, et ux

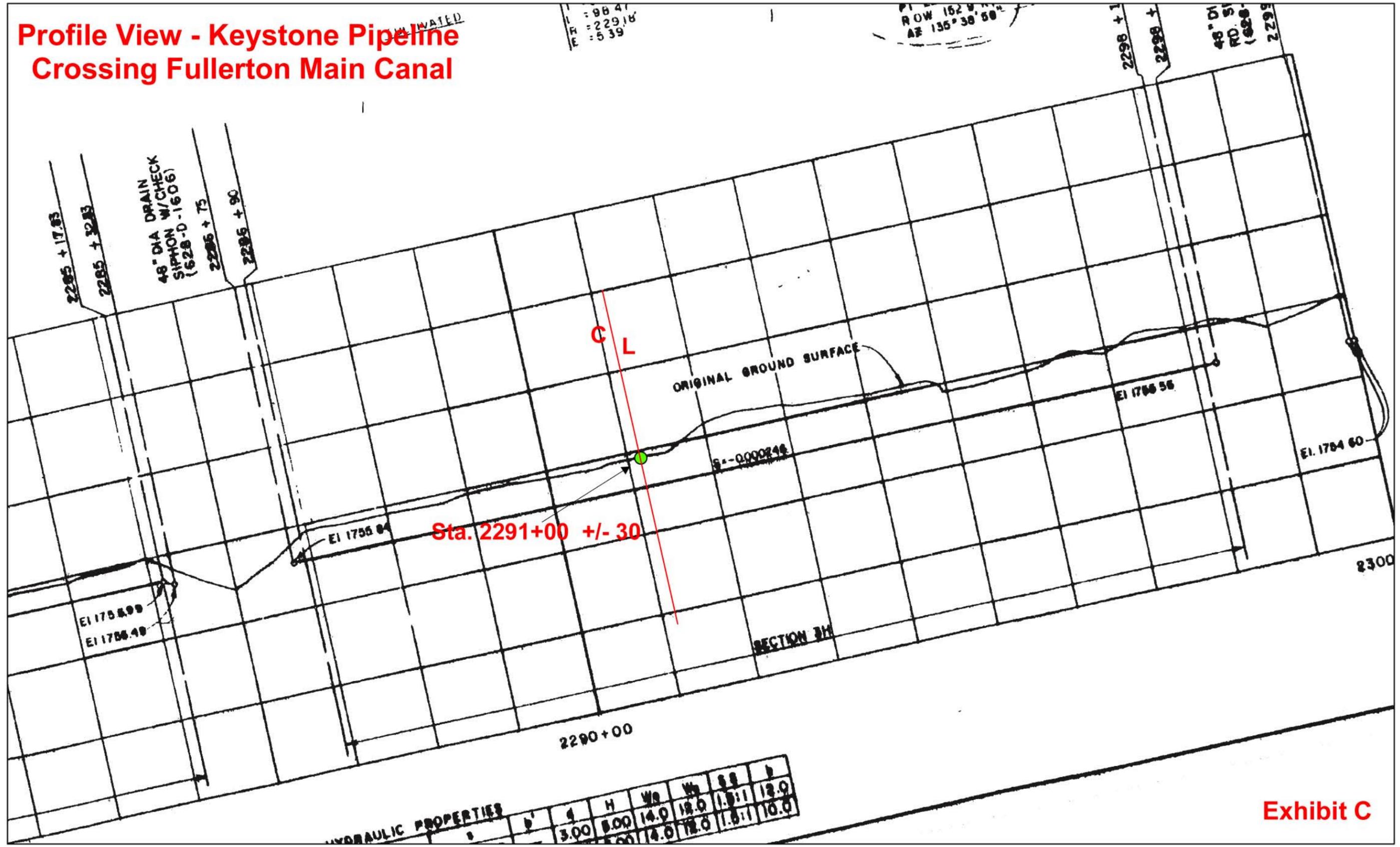
NO 308  
PI 2297+6078  
N 608 436 36  
E 2 379 918 00  
PC 2297+4018  
PT 2297+8086  
Δ = 22°22'20" LT  
D = 65°00'00"  
T = 20 60'  
L = 40 68'  
E = 104 17'  
E = 202'

CULTIVATED

Exhibit B

CULTIVATED

# Profile View - Keystone Pipeline Crossing Fullerton Main Canal



I = 98.41  
 H = 2291.6  
 E = 5.39

ROW 162.0'  
 AZ 135° 38' 58"

2298 + 1  
 2298 +  
 48" DIA  
 RD. 51  
 (928-  
 2299

48" DIA DRAIN  
 SIPHON W/CHECK  
 (628-0-1606)  
 2295 + 75  
 2295 + 90

2285 + 17.63  
 2285 + 32.83

C L

ORIGINAL GROUND SURFACE

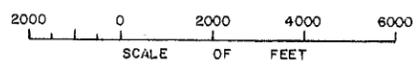
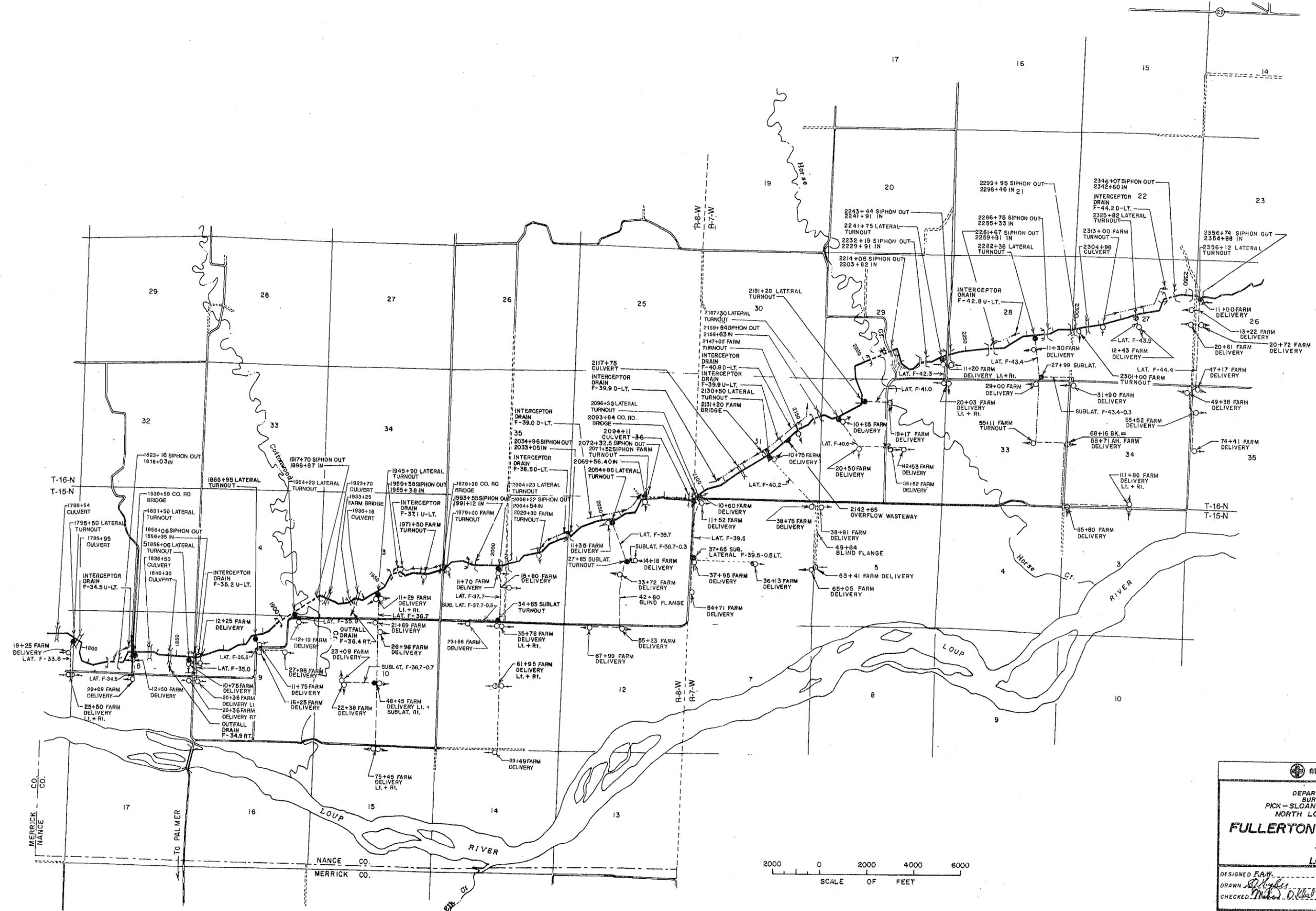
S = -0.000246

Sta. 2291+00 +/- 30

HYDRAULIC PROPERTIES

b'	d	H	W <sub>8</sub>	W <sub>5</sub>	SS	b
3.00	5.00	14.0	12.0	1.5:1	12.0	
	5.00	14.0	12.0	1.5:1	10.0	

Exhibit C



**ALWAYS THINK SAFETY**

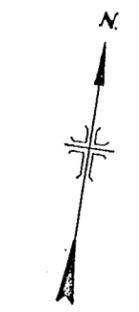
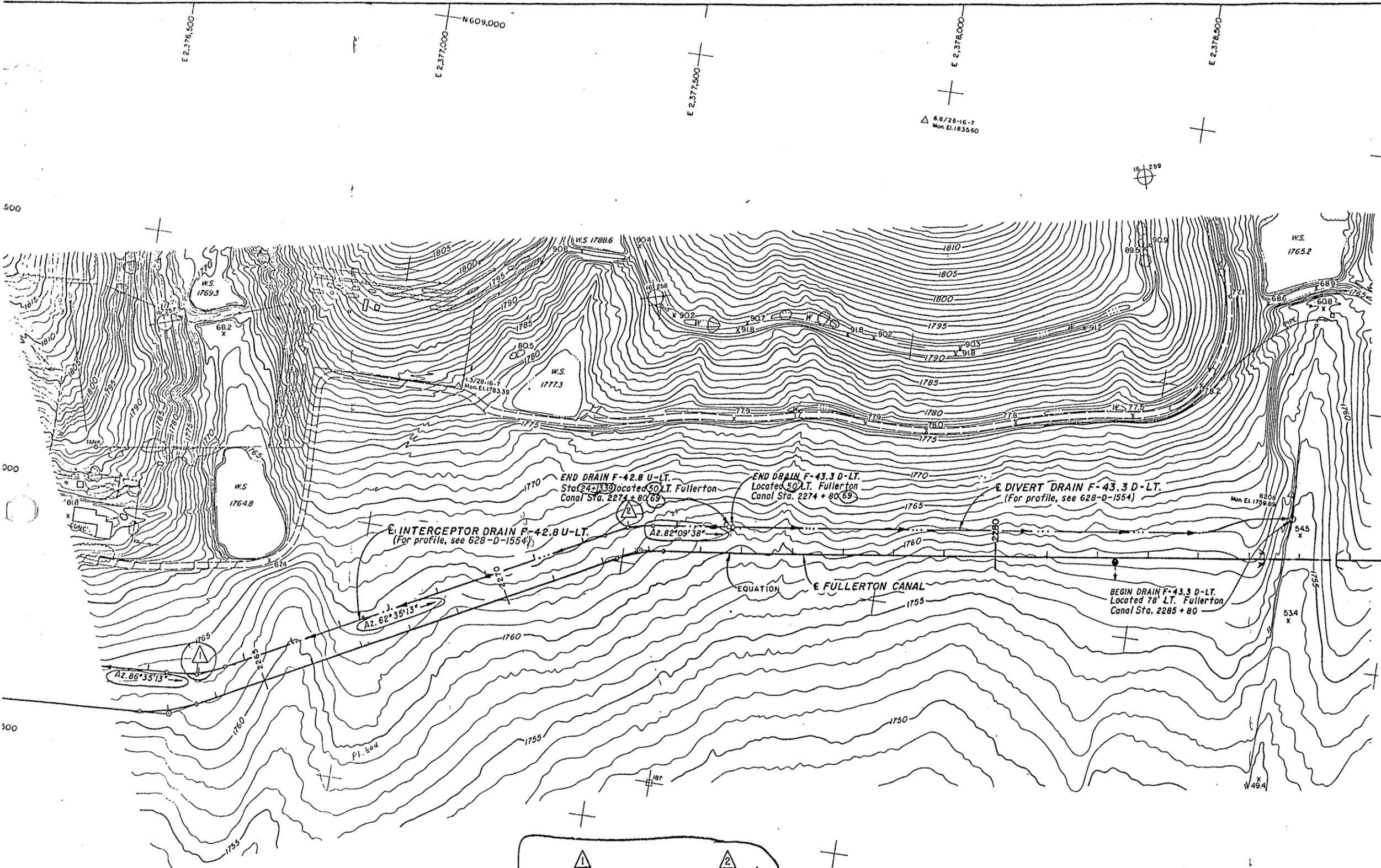
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
PICK-SLOAN MISSOURI BASIN PROGRAM  
NORTH LOUP DIVISION - NEBRASKA

**FULLERTON CANAL & LATERALS**  
SECTION 2 & 3  
LOCATION MAP

DESIGNED F.A.W.	SUBMITTED
DRAWN <i>[Signature]</i>	RECOMMENDED <i>[Signature]</i>
CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>

ACTING ASST. COMM. ENGINEERING AND RESEARCH

GRAND ISLAND, NEBRASKA DECEMBER 5, 1988 SHEET 3 OF 4 **628-705-2953**



SEC. 28-T16N,R7W

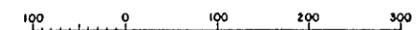
SHEET INDEX

The data shown on this map sheet has been checked and found to be correct. Final map prepared at 1" = 100'. Date of Certification December 15, 1984

*M.E. Erfle*  
M.E. ERFLE RE. & PLS. (# 7034)  
Engineer in responsible charge.



NEBRASKA STATE PLANE COORDINATES SOUTH ZONE



SCALE OF FEET  
U.S.C. & G.S. Datum

Delta Aerial Surveys, Inc.  
2345 SOUTH FEDERAL BLVD., SUITE 106  
DENVER, COLORADO 80219 (303) 834-8000

<p>▲</p> <p>P.I. 12+95.00 P.C. 12+37.01 P.T. 13+51.29 Δ = 24°00'00" LT. D = 20°59'59.18" T = 57.99' L = 114.29' R = 272.84'</p>	<p>▲</p> <p>P.I. 21+92.67 P.C. 21+45.60 P.T. 22+38.81 Δ = 19°34'25" RT. D = 20°59'59.18" T = 47.06' L = 93.21' R = 272.84'</p>
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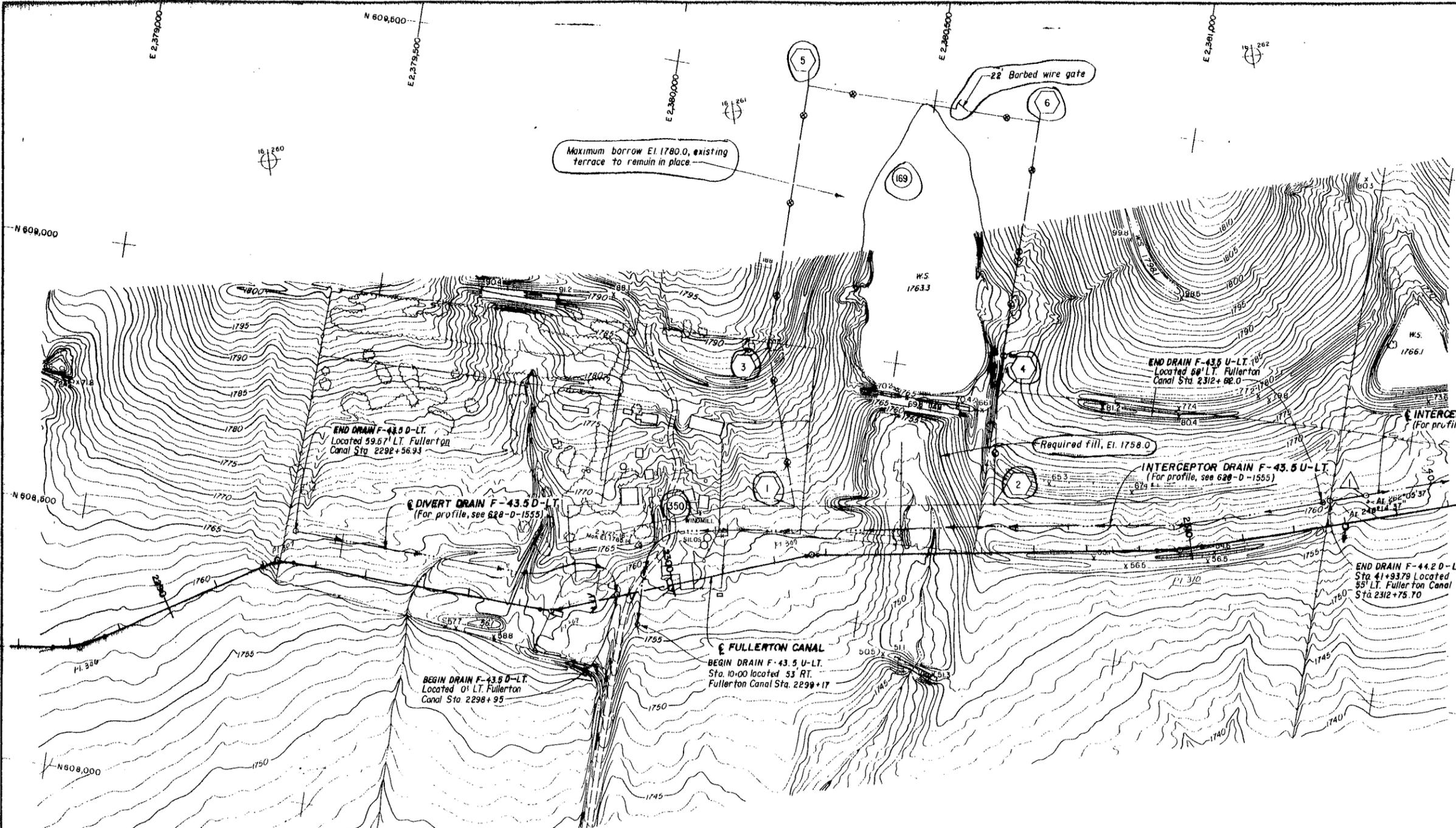
8-31-91	REVISED END STATION AND OFFSET ON INTERCEPTOR DRAIN F-42.8
D-2-91	U-LT. AND DIVERT DRAIN F-43.3 D-LT. ADDED CURVE DATA.
6-12-91	ADDED SIGNATURES, CHANGED DIVERT DRAIN F-42.8U-LT. TO
D-2-91	INTERCEPTOR DRAIN F-42.8U-LT.
4-22-91	REALIGNED CANAL.
D-2-91	

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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
PICK-SLOAN MISSOURI BASIN PROGRAM  
NORTH LOUP DIVISION-NEBRASKA

**FULLERTON CANAL-SECTIONS 2 AND 3**  
STRIP TOPOGRAPHY  
STA. 2262+00 TO 2287+00

DESIGNED *Robert D. Hoff* FIELD APPROVAL *Robert D. Hoff*  
DRAWN *M.R.S. - G.L.S.* TECHNICAL APPROVAL *Robert D. Hoff*  
CHECKED *MDL* APPROVED *W.R. Poca*  
CHIEF, WATER CONVEYANCE BRANCH  
GRAND ISLAND, NEB. DEC. 20, 1990  
SHEET 67 OF 69 SHEETS **628-705-2862**



SEC. 27,28-T16N,R7W

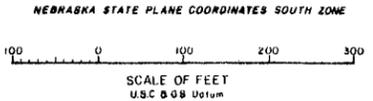
SHEET INDEX

- (350) Temporary easement (Access)
- (169) Temporary easement (Borrow Area)

The data shown on this map sheet has been checked and found to be correct.  
 Final map prepared at 1" = 100'  
 Date of Certification December 10, 1984



*ME ERLE RE*  
 ME ERLE RE (#7034)  
 Engineer in responsible charge.



Delta Aerial Surveys, Inc.  
 2546 SOUTH FEDERAL BLVD., SUITE 100  
 DENVER, COLORADO 80219 (303) 931-8400

1 PI 2302 + 72.09 ROW. 99.6' LT. AZ. 333°21'22"	2 PI 2302 + 72.09 ROW. 365.5' LT. AZ. 65°42'44"	3 PI 2302 + 72.09 ROW. 397.1' LT. AZ. 337°51'19"
4 PI 2302 + 72.09 ROW. 463.2' LT. AZ. 40°24'50"	5 PI 2302 + 72.09 ROW. 890.4' LT. AZ. 350°19'19"	6 PI 2302 + 72.09 ROW. 927.7' LT. AZ. 18°53'21"

PI 41+24.12  
 Δ = 03°50'59" LT.  
 No Curve

1-31-88	ADDED EASEMENTS 169 AND 350 ADDED MAXIMUM BORROW ELEVATION AND REQUIRED FILL ELEVATION.
8-31-91	REVISED END OFFSETS ON DIVERT DRAIN F-43.5 D-LT. AND INTERCEPTOR DRAINS F-43.5 U-LT. AND F-44.2 D-LT.
5-12-91	ADDED SIGNATURES, CHANGED DIVERT DRAIN F-43.5 U-LT. TO INTERCEPTOR DRAIN F-43.5 U-LT.

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UNITED STATES  
 DEPARTMENT OF THE INTERIOR  
 BUREAU OF RECLAMATION  
 PICK-SLOAN MISSOURI BASIN PROGRAM  
 NORTH LOUP DIVISION-NEBRASKA  
**FULLERTON CANAL-SECTIONS 2 AND 3**  
 STRIP TOPOGRAPHY  
 STA. 2287+00 TO 2315+00

DESIGNED <i>[Signature]</i>	FIELD APPROVAL <i>[Signature]</i>
DRAWN <i>[Signature]</i>	TECHNICAL APPROVAL <i>[Signature]</i>
CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>

BRAND ISLAND, NEB. DEC. 20, 1990  
 SHEET 63 OF 62 SHEETS **628-705-2863**

E 2,377,500

N 608,500

STA 2275+00  
MATCH LINE

DIVERT DRAIN F-43.3 D-LT  
(628-D-1504)

POT 2282 + 35.88  
L.T.O. F-43.4 RT.

FULLERTON CANAL  
DAN E. HORN, et ux.

O.B.M. ACCESS ROAD  
(628-D-1608)

PI 2292 + 26.81  
N 608,482.44  
E 2,379,382.44  
PC 2291 + 94.77  
PT 2292 + 56.93  
Δ: 34°11'21" H  
D: 55°00'00"  
T: 32.04  
L: 62.16  
R: 104.17  
E: 4.82  
HQ 307

ROT. 2296 + 00  
BEGIN MURAL  
SAFETY FENCE  
90' LT.

UNCULTIVATED  
N 609,000

POT 2299 + 20  
(CO. RD. IGRAVEL)

POT 2298 + 198  
FENCE COR.  
180' LT.

POT 2298 + 194  
POLI 245' LT.  
CTR. BLDNG - 365' LT.

POT 2298 + 175  
POLI 248' LT.

POT 2298 + 143  
CTR. BLDNG - 70' LT.

POT 2298 + 130  
FENCE COR.  
150' RT.

POT 2298 + 72.30  
SECTION LINE  
TIE: AZ 368°14'49"  
519.26'

PI 2302 + 72.09  
R.O.W. 357.08' LT.  
AZ 278°38'28"

POT 2299 + 17  
CORNHUSKER PUBLIC  
POWER DISTRICT  
2 WIRE LINE, POLES 92' LT. & 248' RT.  
CLEARANCE 23.9'  
TO BE RELOCATED  
BY OWNER

POT 2299 + 154  
CTR. BLDNG  
180' LT.

POT 2299 + 150  
POLI 86' LT.

INTERCEPTOR DRAIN F-43.5 U-LT  
(628-D-1556)

POT 2299 + 194  
POLI 165' LT.

POT 2299 + 63  
FENCE COR.  
86' LT.

POT 2299 + 154  
CTR. BLDNG  
180' LT.

POT 2299 + 150  
POLI 86' LT.

POT 2299 + 17  
POLI 165' LT.

POT 2299 + 63  
FENCE COR.  
86' LT.

POT 2299 + 154  
CTR. BLDNG  
180' LT.

POT 2299 + 150  
POLI 86' LT.

POT 2299 + 17  
POLI 165' LT.

POT 2299 + 63  
FENCE COR.  
86' LT.

POT 2299 + 154  
CTR. BLDNG  
180' LT.

POT 2299 + 150  
POLI 86' LT.

POT 2299 + 17  
POLI 165' LT.

POT 2299 + 63  
FENCE COR.  
86' LT.

POT 2299 + 154  
CTR. BLDNG  
180' LT.

POT 2299 + 150  
POLI 86' LT.

POT 2299 + 17  
POLI 165' LT.

POT 2299 + 63  
FENCE COR.  
86' LT.

POT 2299 + 154  
CTR. BLDNG  
180' LT.

POT 2299 + 150  
POLI 86' LT.

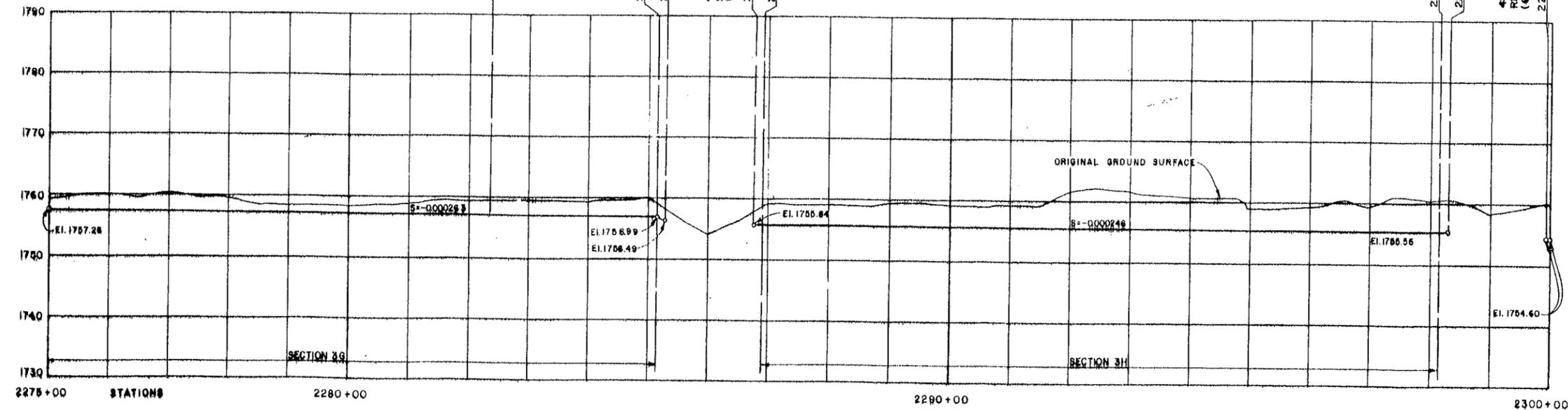
NOTES

FOR NOTES, SEE DWG. NO. 628-705-2870.  
O.B.M. ROAD ON RIGHT SIDE.  
BUILDINGS WITHIN THE RIGHT-OF-WAY TO BE CLEARED  
SUBJECT TO REMOVAL BY OWNER.

E 2,377,500  
N 607,800

NO. 306  
PI 2288 + 116.01  
N 608,231.30  
E 2,379,054.66  
PC 2287 + 66.00  
PT 2288 + 64.47  
Δ: 24°37'02" LT  
D: 25°00'00"  
T: 50.01  
L: 98.47  
R: 229.14  
E: 5.39

PI 2297 + 60.78  
R.O.W. 152.9' RT.  
AZ 135°38'58"



HYDRAULIC PROPERTIES

SECTION	A	V	Q	r	n	s	b'	q	H	W <sub>0</sub>	W <sub>0.50</sub>	b
3G	49.50	1.62	90	2.17	.025	0.000263	—	3.00	5.00	14.0	12.0	12.0
3H	48.42	1.54	70	2.14	.025	0.000243	—	3.10	5.00	14.0	12.0	10.0

NEBRASKA STATE PLANE COORDINATES SOUTH ZONE  
SEC 28 - 116N, R 7W  
SCALE OF FEET  
USC & US Datum

Delta Aerial Surveys, Inc.  
294 SOUTH FEDERAL BLVD., SUITE 106  
DENVER, COLORADO 80219 (303) 534-8600

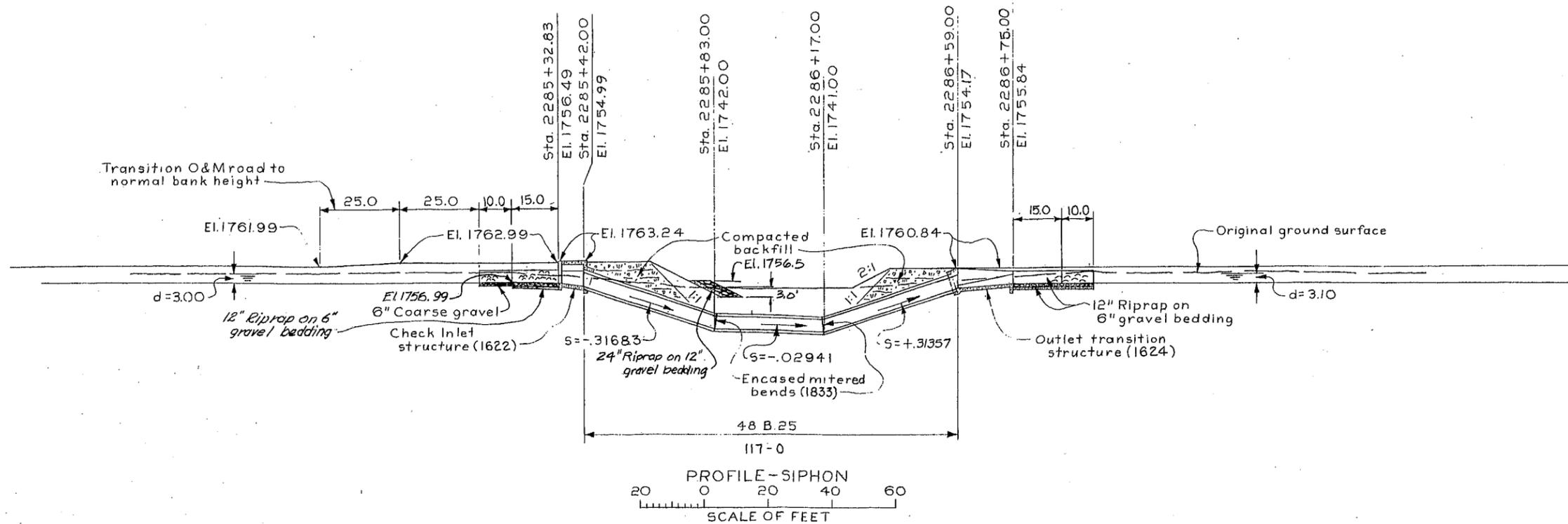
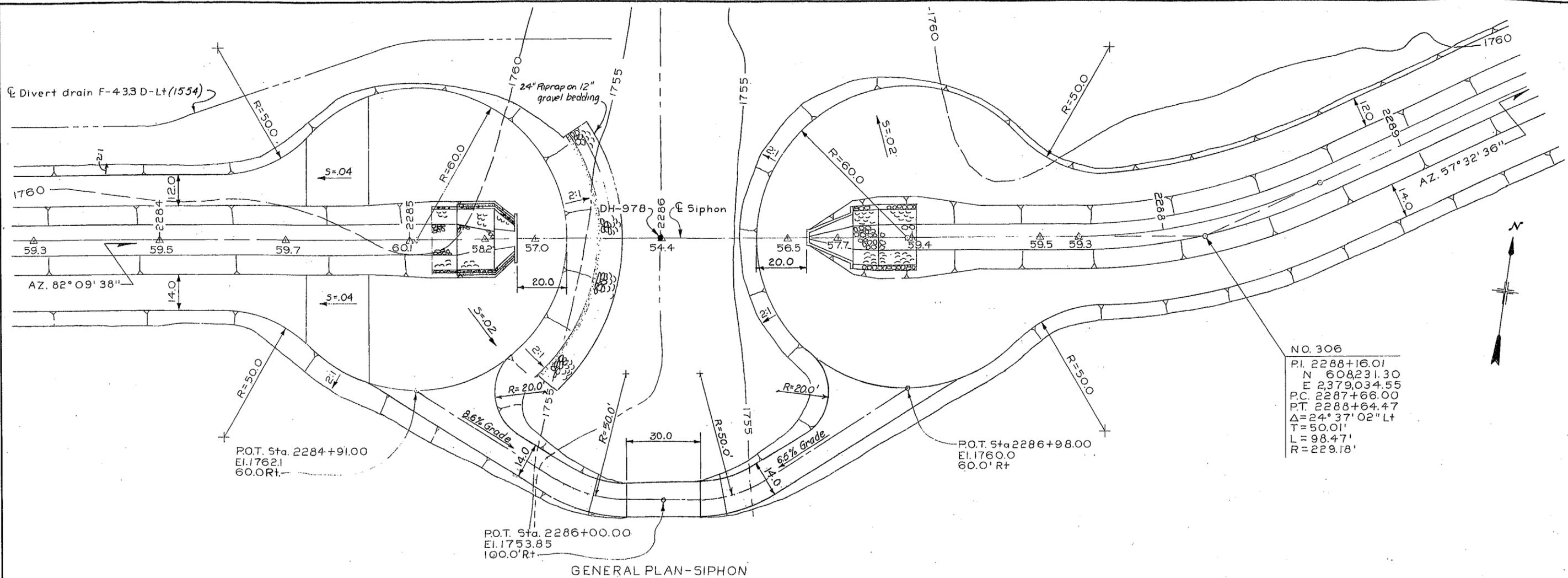
**BLUMVE THINK SAFETY**

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
PICK-SLOAN MISSOURI BASIN PROGRAM  
NORTH LOUP DIVISION-NEBRASKA  
**FULLERTON CANAL - SECTION 3**  
PLAN AND PROFILE  
STA. 2275+00 to 2300+00

DESIGNED: *[Signature]* FIELD APPROVAL: *[Signature]*  
DRAWN: M.A.S. TECHNICAL APPROVAL: *[Signature]*  
CHECKED: *[Signature]* APPROVED: *[Signature]*  
GRAND ISLAND, NEB.  
SHEET 82 OF 12 SHEETS

628-705-2934

ONE OVERLAY - INFORMATION



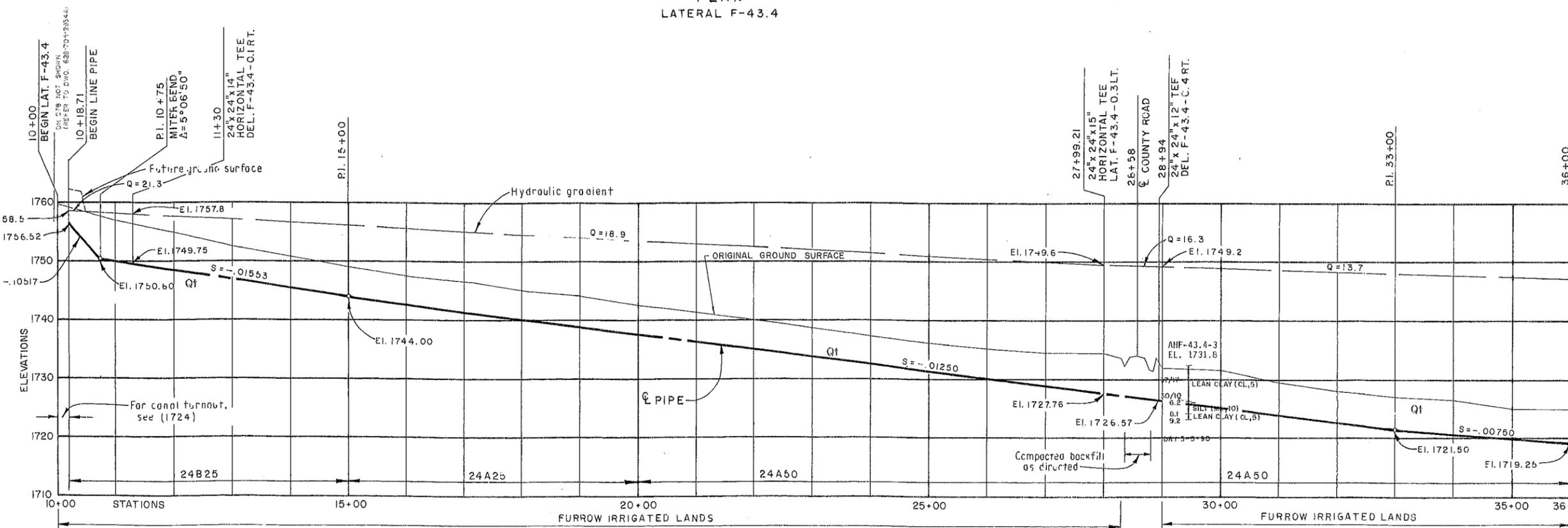
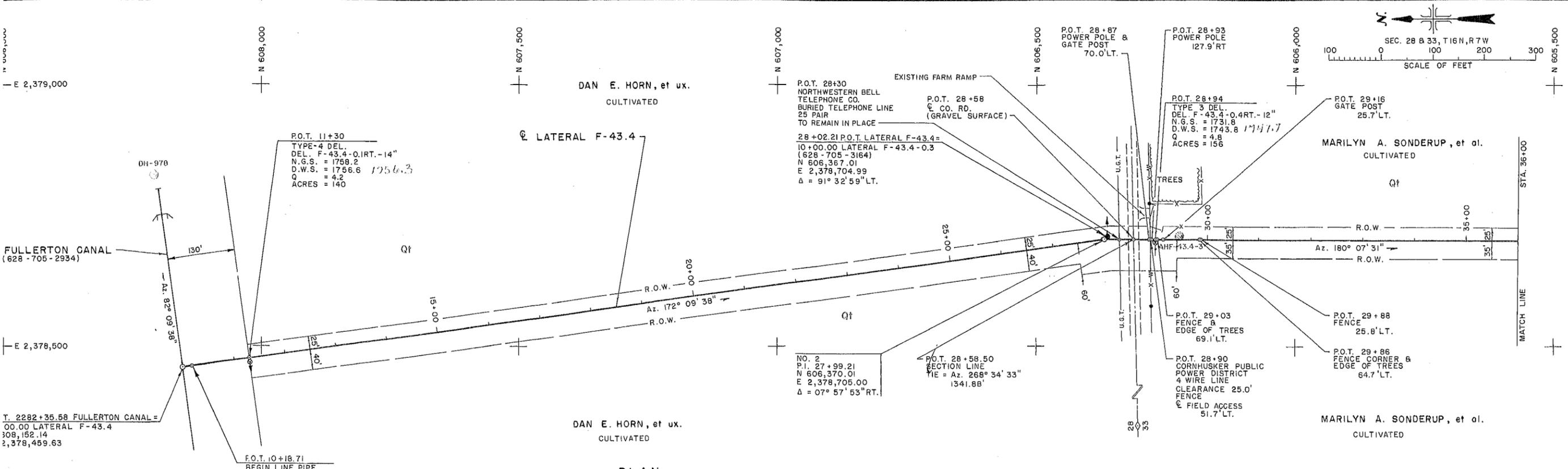
NOTES  
 For general notes, see 628-D-1512.  
 Design flow of siphon is 70 cfs  
 For details of safety cable and safety fence see 628-D-1731.

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UNITED STATES  
 DEPARTMENT OF THE INTERIOR  
 BUREAU OF RECLAMATION  
 PICK-SLOAN MISSOURI BASIN PROGRAM  
 NORTH LOUP DIVISION-NEBRASKA  
 FULLERTON CANAL-SECTIONS 2 AND 3  
 STA. 2285+32.83  
 48" DIA. SIPHON  
 GENERAL PLAN AND PROFILE

DESIGNED *M. D. [Signature]* TECHNICAL APPROVAL *[Signature]*  
 DRAWN *M. D. [Signature]* SUBMITTED *[Signature]*  
 CHECKED *[Signature]* APPROVED *[Signature]*  
 CHIEF WATER CONVEYANCE BRANCH

DENVER, COLORADO AUGUST 13, 1990



**GEOLOGIC NOTE**  
 For General Geologic Legend, Explanation and Notes, see Dwg. No. 628-705-2621A

NOTES  
 FOR GENERAL NOTES AND AN EXPLANATION OF THE PLAN AND PROFILE SYMBOLS, SEE DWG. NO. 628-705-3001.

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UNITED STATES  
 DEPARTMENT OF THE INTERIOR  
 BUREAU OF RECLAMATION  
 PICK-SLOAN MISSOURI BASIN PROGRAM  
 NORTH LOUP DIVISION - NEBRASKA

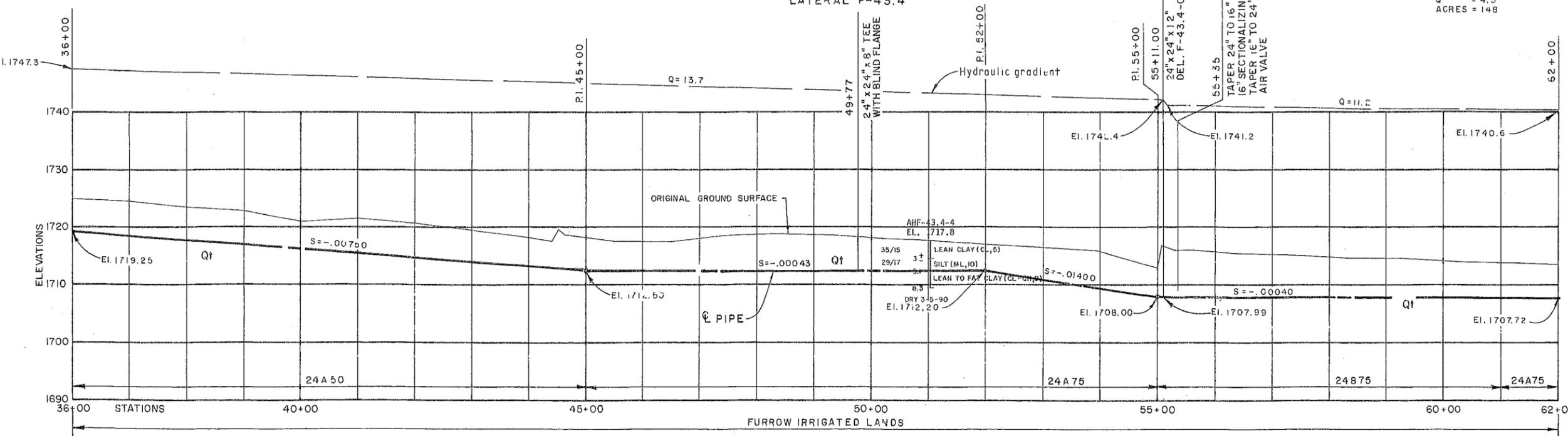
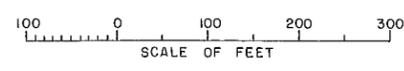
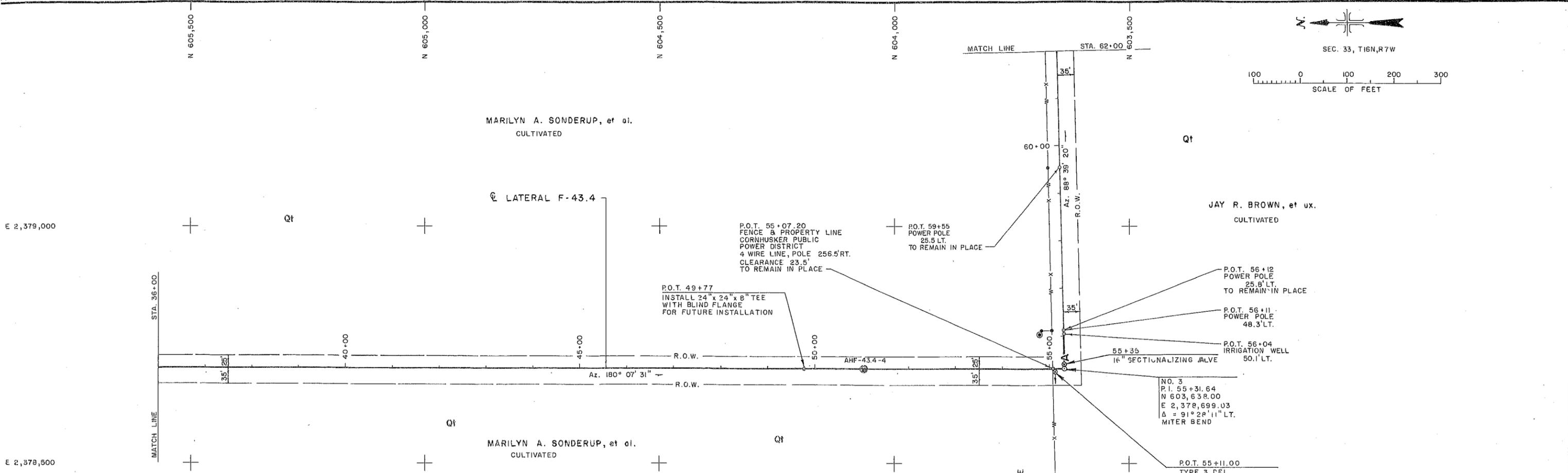
**FULLERTON SECTION 3 PIPE LATERALS  
 LATERAL F-43.4 STA. 10+00 TO 36+00  
 PLAN AND PROFILE**

DESIGNED: L.M. SAS FIELD APPROVAL: [Signature]  
 DRAWN: P.S.L. [Signature] TECHNICAL APPROVAL: R.R. [Signature]  
 CHECKED: P.S.L. [Signature] APPROVED: [Signature]  
 CHIEF, WATER CONVEYANCE BRANCH

GRAND ISLAND, NEBRASKA OCTOBER 4, 1989  
 SHEET 1 OF 5 **628-705-3160A**

TECHNICAL APPROVAL: [Signature]  
 SUBMITTED: [Signature]  
 APPROVED: [Signature]  
 Chief, Geology Branch

TECH APPROVAL: [Signature]  
 SUBMITTED: [Signature]  
 APPROVED: [Signature]



NOTES FOR GENERAL NOTES AND AN EXPLANATION OF THE PLAN AND PROFILE SYMBOLS, SEE DWG. NO. 628-705-3001.

**GEOLOGIC NOTE**

For General Geologic Legend, Explanation and Notes, see Dwg. No. 628-705-2621A.

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UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION PICK-SLOAN MISSOURI BASIN PROGRAM NORTH LOUP DIVISION-NEBRASKA

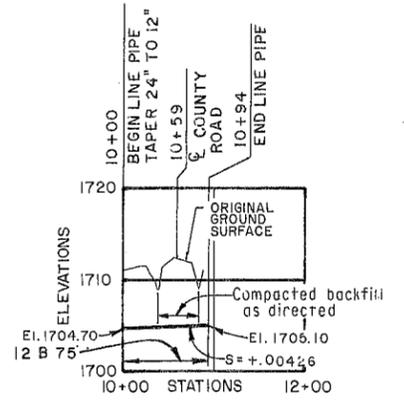
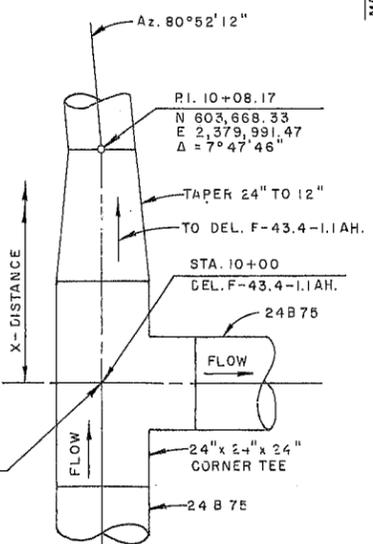
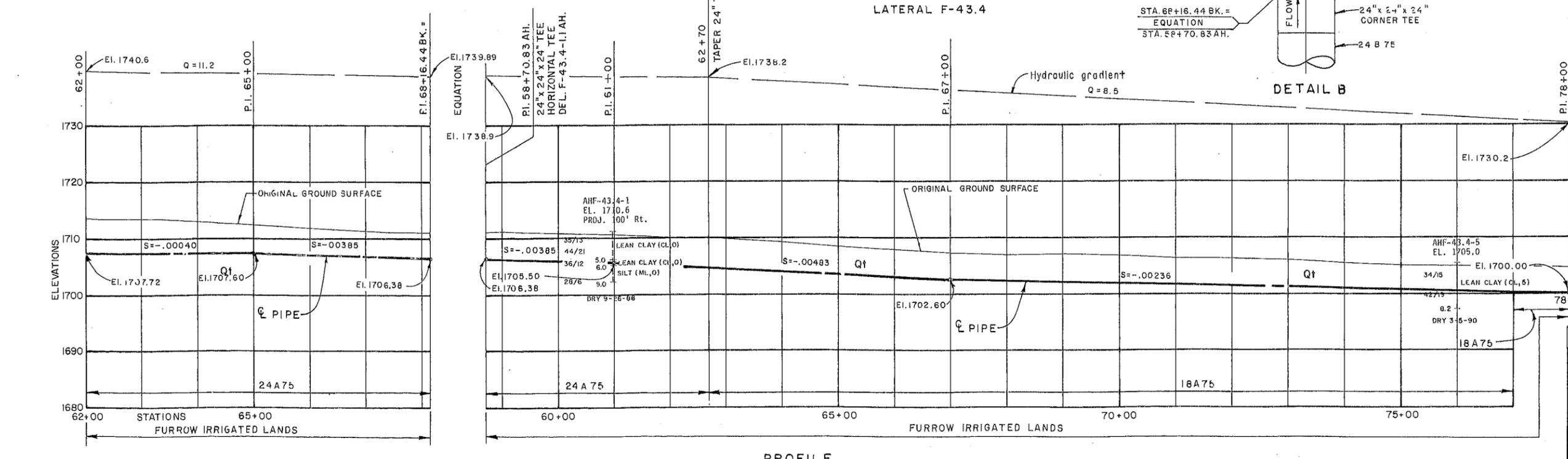
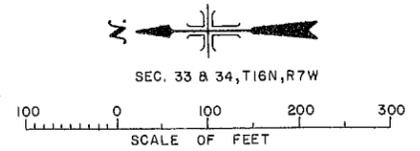
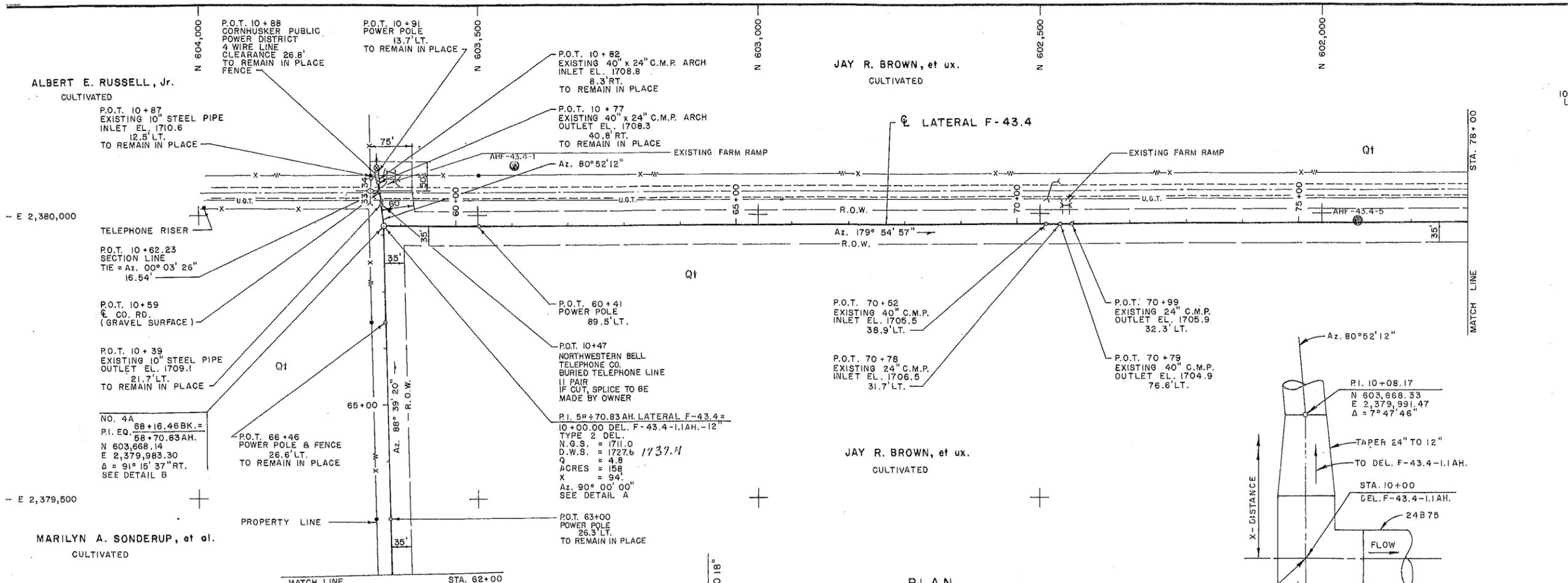
**FULLERTON SECTION 3 PIPE LATERALS LATERAL F-43.4 STA. 36+00 TO 62+00 PLAN AND PROFILE**

DESIGNED: L.J.M. SAS FIELD APPROVAL: \_\_\_\_\_  
 DRAWN: P.S.L. P.S.L. TECHNICAL APPROVAL: R.L. Zuercher / J. Allen  
 CHECKED: P.S.L. JB APPROVED: W.D. [Signature]  
 SUBMITTED: \_\_\_\_\_  
 APPROVED: D.B. [Signature] For Chief, Geology Branch

TECH. APPROVAL: \_\_\_\_\_  
 SUBMITTED: \_\_\_\_\_  
 APPROVED: \_\_\_\_\_

CHIEF, WATER CONVEYANCE BRANCH

GRAND ISLAND, NEBRASKA OCTOBER 4, 1999 SHEET 2 OF 8 628-705-3161A



DEL. F-43.4-1.1AH.  
**DETAIL A**  
**GEOLOGIC NOTE**  
 For General Legend, Explanation and Notes, see Dwg. No. 62B-705-2621A.

NOTES  
 FOR GENERAL NOTES AND AN EXPLANATION OF THE PLAN AND PROFILE SYMBOLS, SEE DWG. NO. 62B-705-3001.

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 BUREAU OF RECLAMATION  
 PICK-SLOAN MISSOURI BASIN PROGRAM  
 NORTH LOUP DIVISION - NEBRASKA

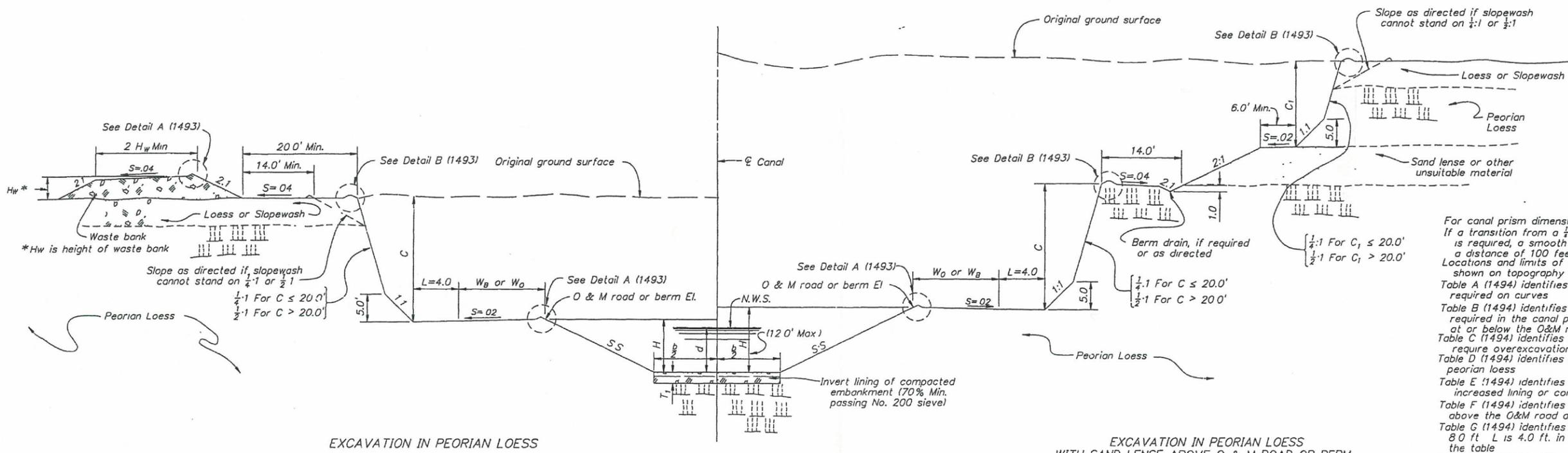
**FULLERTON SECTION 3 PIPE LATERALS**  
 LATERAL F-43.4 STA. 62+00 TO 78+00

**PLAN AND PROFILE**

DESIGNED: L.J.M. SAS FIELD APPROVAL: [Signature]  
 DRAWN: P.S.L. [Signature] TECHNICAL APPROVAL: R.P. [Signature]  
 CHECKED: P.S.L. APPROVED: W.B. [Signature]  
 APPROVED: [Signature] CHIEF, WATER DIVISION RANGE BRANCH

GRAND ISLAND, NEBRASKA OCTOBER 4, 1988  
 SHEET 3 OF 5 **62B-705-3162A**

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EXCAVATION IN PEORIAN LOESS

EXCAVATION IN PEORIAN LOESS WITH SAND LENSE ABOVE O & M ROAD OR BERM

TYPICAL CANAL SECTION IN PEORIAN LOESS

(See Table D dwg. 628-D-1494)

NOTES

For canal prism dimensions and properties, see 628-D-1494

If a transition from a 1/4:1 or a 1/2:1 slope to a 1:1 or 2:1 slope is required, a smooth transition shall be constructed over a distance of 100 feet

Locations and limits of waste banks and waste areas are shown on topography drawings or will be as directed

Table A (1494) identifies reaches where a gravel blanket is required on curves

Table B (1494) identifies reaches where full compacted lining is required in the canal prism because either sand is at or below the O&M road or sinkholes exist

Table C (1494) identifies reaches of canal embankment which require overexcavation of the foundation

Table D (1494) identifies reaches of canal excavation in peorian loess

Table E (1494) identifies reaches of canal which require increased lining or compacted embankment freeboard

Table F (1494) identifies reaches where the sand formation is above the O&M road and slope modifications are required

Table G (1494) identifies reaches where dimension L is 8.0 ft. L is 4.0 ft. in all areas not listed in the table

Table H (1494) identifies reaches where invert lining is not required

Table J (1494) identifies reaches of canal with embankment which is expected to be constructed of sandy material

All limiting stations and elevations shown in Tables B, C, D, F, H, and J are approximate and may be adjusted as directed to meet actual field conditions. Reaches not defined in the above tables may be discovered during construction, and the proper treatment shall be utilized where directed

For details of interceptor drains, divert drains and protective drains parallel to the canal, see 628-D-1495, -1496, and -1497

Reaches of low density material may exist along the canal alignment. If a culvert or siphon is located in the reach of low density material, the low density material must be overexcavated

If a siphon or culvert is not located in the reach of low density material either of the following two treatment methods will be used for the canal embankment:

1. Overexcavate the foundation Or
2. Overbuild the canal embankment 1.0'

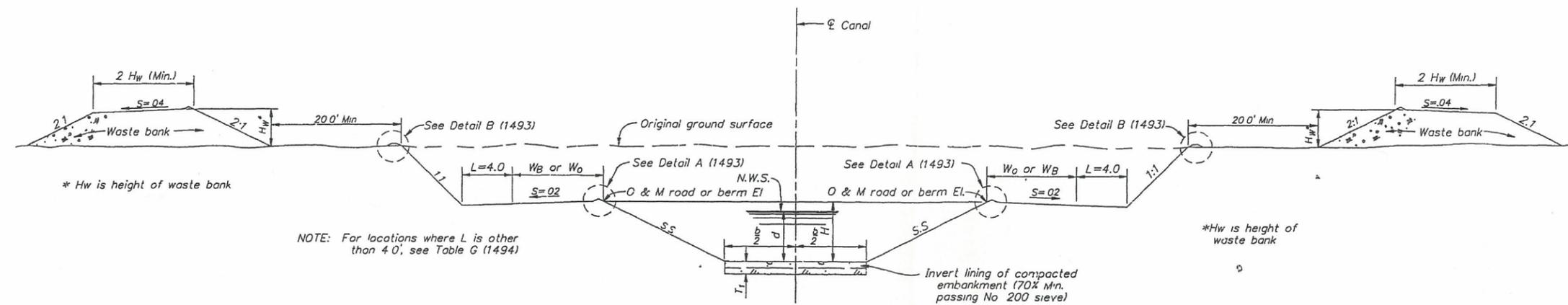
Low density material is defined as any material having a dry unit weight of 85 lbs/ft<sup>3</sup> or less

Reaches of low density foundation material which are identified during construction, to be overexcavated, shall be overexcavated according to the following criteria:

1. Fill (Y) greater than 15 feet  
Excavate low density material up to 10 feet deep
2. Fill (Y) less than 15 feet.  
Excavate low density material up to 5 feet deep

When going into and out of overexcavation for low density areas, use a 6:1 ramp

For details of gravel blanketing at curves, see 628-D-1493. W<sub>o</sub> is 14.0 ft. and is O & M road width and W<sub>B</sub> is 12.0 ft and is width of berm, unless otherwise noted on drawings.



NOTE: For locations where L is other than 4.0', see Table G (1494)

TYPICAL CANAL SECTION

(EXCAVATION IN ALL AREAS OTHER THAN THOSE NOTED IN TABLES FOR PEORIAN LOESS AND SAND)

4 - 16 - 91 DELETE "MODIFICATIONS OF" FROM 32<sup>ND</sup> AND 33<sup>RD</sup> LINES OF NOTES.

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UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

PICK-SLOAN MISSOURI BASIN PROGRAM NORTH LOUP DIVISION-NEBRASKA

FULLERTON CANAL - SECTIONS 2 AND 3

TYPICAL CANAL SECTIONS

DESIGNED *A. Stelman* TECHNICAL APPROVAL *A. Stelman*

DRAWN *C. Kramer* SUBMITTED *David R. Dworkin*

CHECKED *J. B. Starbuck* APPROVED *D. S. Bracka*

DEVELOPER, COLORADO DIVISION OF WATER CONSERVATION

DECEMBER 20, 1990

SHEET 1 OF 4

628-D-1491

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