

FEASIBILITY STUDY

For The

LA FERIA IRRIGATION DISTRICT CAMERON COUNTY NO. 3

PROPOSED 6.0B-2



Prepared For:

LA FERIA IRRIGATION DISTRICT CAMERON COUNTY NO. 3

Under The Auspices Of:

**TEXAS WATER DEVELOPMENT BOARD AND
TEXAS STATE ENERGY CONSERVATION OFFICE
WATER AND ENERGY CONSERVATION PROJECT
TEXAS WATER DEVELOPMENT PROJECT NO. 2002-484-0004**

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EXHIBITS

Exhibit A	Project Study Area
Exhibit B	LFIDCC3 Pipeline Layout
Exhibit C	LFIDCC3 Existing Service Area Map 6.0B Pipeline and Clements-Thompson Ditch
Exhibit D	LFIDCC3 Proposed Service Area Map 6.0B and 6.0B-2 Pipelines

APPENDIX

Appendix A	EPANET Input and Output
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1 INTRODUCTION

The following provides a feasibility study for the construction of a 24,266-foot irrigation pipeline in the La Feria Irrigation District. The pipeline begins near the intersection of the 6.0 Canal and the 13.0/6.0 Feeder and extends north 24,266 feet running east and parallel to Thompson Road. The pipeline serves approximately 1,009 acres of farmland in the northeastern portion of the District. Sigler, Winston, Greenwood and Associates, Inc. originally identified the pipeline as part of a potential distribution system improvement project in a 1993 engineering study. The study was performed to update rehabilitation work performed in the District in the 1960's by the Bureau of Reclamation under Public Law 86-357 to include adequate irrigation facilities to newly annexed farmland to the north. This feasibility study includes a hydrologic and hydraulic analysis used to design the proposed pipeline as well as a preliminary construction cost estimate. The proposed pipeline is referred to in this report as the 6.0B-2 Pipeline. Refer to Exhibit A for the general location of the proposed pipeline.

2 HYDRAULIC ANALYSIS

The proposed pipeline will be modeled in this analysis using EPANET. EPANET is a computer program that performs extended period simulation of hydraulic and water quality behavior within pressurized pipe networks. The creation of the EPANET model involves defining the pipeline layout, the water supply source, the amount of available hydraulic head, the service area, the design flow rates, and the pipeline material and size. These parameters are described in the following sections.

2.1 Water Supply Source

The proposed pipeline will receive irrigation water directly from the 6.0 Canal. The 6.0 Canal conveys water from La Feria's main 2,000 acre-feet storage facility 8.3 miles to the check gate located at the intersection of the 6.0 Canal and the 13.0/6.0 Feeder Canal. The 6.0B-2 Pipeline will connect to the 6.0 Canal just west of the check gate on the 13.0/6.0 Feeder Canal. The calculations provided in this feasibility analysis assume an ample water supply from the 6.0 Canal.

The *Engineering Report for the 6.0 Canal in Appendix 1 of the SECO Project Report* outlines required improvements to a mile-long concrete-lined section of the 6.0 Canal in order to provide adequate irrigation service to the proposed 6.0B-2 Pipeline and remaining areas to the east. The remaining 7.2 miles of earthen canal on the 6.0 Canal were designed under *The 1963 Lower Rio Grande Rehabilitation Project* to convey 74 cfs. A detailed analysis of the earthen section was not conducted in this report.

2.2 Pipeline Layout

The 6.0B-2 Pipeline layout was delineated in the 1993 Sigler, Winston, Greenwood and Associates, Inc. engineering study. The pipeline will consist of approximately 24,266 feet of irrigation pipeline generally located east and running parallel to Thompson Road. The pipeline will be connected to the 13.0/6.0 Feeder Canal near its intersection with the 6.0 Canal. From this point, the proposed pipeline will run north approximately 5,600 feet bisecting the Synder Subdivision to Highway 107, then jog west approximately 540 feet along Highway 107 before making a final turn north and extending approximately 18,100 feet along the eastern boundary of

the Morrison Subdivision. No easements exist for the proposed layout. Refer to Exhibit B for a depiction of the pipeline layout.

2.3 Hydraulic Head

The amount of hydraulic head available from the water source is an important variable in determining if the proposed pipeline can be designed and operated using gravity flow. The available hydraulic head represents the difference between the normal irrigation water surface elevation in the water supply and the natural ground elevations at the individual turnouts. A Trimble 5700 receiver was used to determine these elevations. The elevations are based on the NAD 1983 (Conus) datum.

The water surface elevation during irrigation in the 6.0 Canal was assumed to be 0.5 feet below the top of concrete providing a water surface elevation of 51.6 feet during irrigation. The elevations at the turnouts along the proposed 6.0B-2 Pipeline gradually decrease as you move north and ranged from 48.3 feet to 41.7 providing between 3.3 and 9.9 feet of available head. This gradual fall of the land to the northeast allows for the design of a gravity flow system and eliminates the need for a pump station.

2.4 Service Area

2.4.1 Existing Service Area

The approximate 1,000 acres of farmland north of the 13.0/6.0 Feeder Canal and east of Thompson Road is currently being inadequately served by the 6.0B-1 Pipeline (The Thompson Pipeline) and the Clements-Thompson Ditch. The 6.0B-1 Pipeline currently services approximately 460 acres in the southern portion of this area by way of three small laterals while the Clements-Thompson Ditch services 503 acres in the northern portion. Refer to *Exhibit C* for a depiction of the current service area map.

2.4.2 Proposed Service Area

The proposed service area consists of 1,009 acres bounded by the 13.0/6.0 Feeder Canal to the south, Thompson Road to the west, the North Floodway to the north, and the District boundary to the east. Refer to Exhibit D for a depiction of the proposed service area.

2.5 Design Flow Rates

The design flow rates for the various sections of the proposed 6.0B-2 Pipeline will be determined using the criteria outlined in Section 2 of the Engineering Report for the 6.0 Canal. The criteria summarized below are based on the extent of the service area, the required water demand, and the percentage of simultaneous irrigations.

- Every 40 acres of irrigated farmland requires service of 3 cfs per irrigation with a maximum of
 - 1/3 of farmland irrigated at any given time for areas less than 360 acres,
 - 1/4 of farmland irrigated at any given time for areas between 360 and 1,000 acres,
 - 1/5 of farmland irrigated at any given time for areas between 1,000 and 2,000 acres, and
 - 1/6 of farmland irrigated at any given time for areas greater than 2,000 acres.

The 6.0B-2 Pipeline has a service area of 1,009 acres requiring a flow rate of 21 cfs at the beginning of the pipeline. The required flow rates for various locations along the pipeline are provided in Exhibit D.

2.6 Pipeline Design Guidelines

The pipeline material will consist of either PVC (poly-vinyl chloride) or RCP (re-enforced concrete pipe). PVC will be used for sizes up to and including 30 inches and RCP will be used for pipe sections equal to or greater than 36 inches and less than or equal to 72 inches. For pipelines requiring pipe diameters larger than 72 inches, open flow canals will be used.

2.7 Pipeline Design

The EPANET model was used to design the proposed 6.0B-2 Pipeline to provide each turnout with a minimum of 3 cfs per irrigation, assuming a typical turnout services 40 acres and a maximum of ¼ of farmers irrigate simultaneously. Table 2.1 below provides the resulting gravity flow pipe network design to serve 1,009 acres. Refer to Appendix A for the detailed EPANET input and output report.

Figure 2.1: Schematic of the 6.0B-2 Pipeline

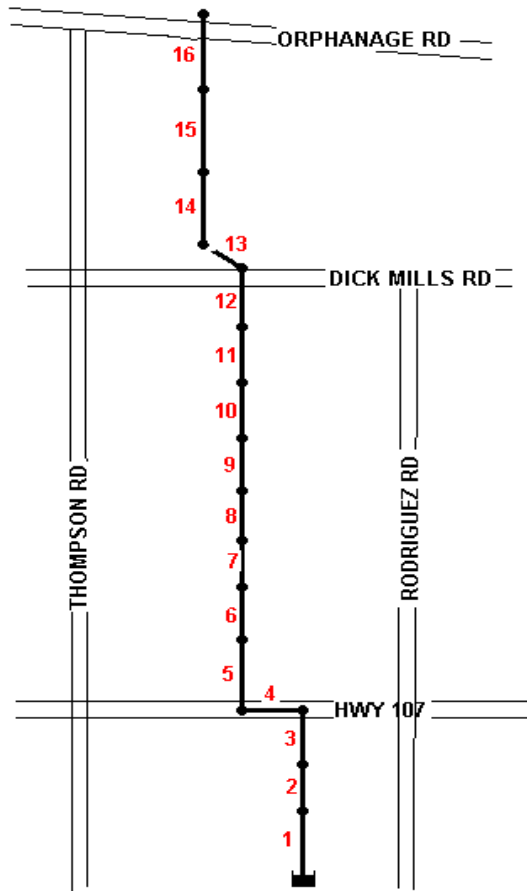


Table 2.1: 6.0 B-2 Pipeline Design

Segment I.D.	Segment Length (ft)	Pipe Diameter (inches)	Pipe Material	Manning's "n"	Cumulat. Service Area (acres)	Design Q (cfs)	# of Simult. Irrigations
1	2,813	42	RCP	0.012	1009	21	7
2	921	42	RCP	0.012	935	18	6
3	1,883	42	RCP	0.012	872	18	6
4	536	42	RCP	0.012	872	18	6
5	1,089	42	RCP	0.012	872	18	6
6	1,400	36	RCP	0.012	750	15	5
7	674	30	PVC	0.009	653	15	5
8	2,148	30	PVC	0.009	604	12	4
9	1,215	30	PVC	0.009	576	12	4
10	1,522	30	PVC	0.009	503	12	4
11	1,674	30	PVC	0.009	426	9	3
12	2,116	30	PVC	0.009	326	9	3
13	125	24	PVC	0.009	282	9	3
14	1,848	24	PVC	0.009	244	9	3
15	2,495	24	PVC	0.009	189	6	2
16	1,807	18	PVC	0.009	152	3	1

24,266

3 COST ESTIMATE

The cost estimate consists of the hard construction costs and the soft cost, including land costs, surveying, and engineering costs. The acquisition and installation of the RCP and PVC pipes represents approximately 80% of the total cost. The proposed pipeline would consist of 15,624 feet of PVC pipe ranging from 18 to 30 inches and 8,642 feet of RCP pipe ranging from 36 to 42 inches. Financing costs were not included.

Table 3.1: 6.0B-2 Pipeline Cost Estimate

Item Description	Number	Unit	Unit Cost	Total Cost
Construction Cost				
Mobilization	1	EA	\$ 3,000.00	\$ 3,000.00
Clearing and Grubbing	24,266	LF	\$ 0.25	\$ 6,066.50
Field Engineering	1	EA	\$ 1,000.00	\$ 1,000.00
Traffic Control	1	EA	\$ 1,500.00	\$ 1,500.00
Location of Existing Utilities	1	EA	\$ 1,000.00	\$ 1,000.00
42" RCP	7,242	LF	\$ 46.10	\$ 333,856.20
36" RCP	1,400	LF	\$ 36.00	\$ 50,400.00
30" PVC	9,349	LF	\$ 23.00	\$ 215,027.00
24" PVC	4,468	LF	\$ 17.00	\$ 75,956.00
18" PVC	1,807	LF	\$ 9.00	\$ 16,263.00
Pipeline Inlet Boxes	1	EA	\$ 2,000.00	\$ 2,000.00
Turnout Connection Boxes	20	EA	\$ 1,250.00	\$ 25,000.00
Siphon Adapter Box	2	EA	\$ 3,500.00	\$ 7,000.00
Line Gates	2	EA	\$ 425.00	\$ 850.00
QC for Preparation	24,266	LF	\$ 0.10	\$ 2,426.60
QC for Pipeline Installation	24,266	LF	\$ 0.10	\$ 2,426.60
Contingencies	5	%		\$ 37,188.60
Construction Cost Total				\$ 780,960.50
Easement Acquisition Costs				
Land Acquisition	11.1	AC	\$ 5,000.00	\$ 55,500.00
Condemnation	4	EA	\$ 5,000.00	\$ 20,000.00
Subtotal				\$ 75,500.00
Design Costs				
Survey	4.6	MI	\$ 8,000.00	\$ 36,800.00
Engineering (% of Constr. cost)	10	%		\$ 78,096.05
Subtotal				\$ 114,896.05
Total Cost				\$ 895,856.54

4 SUMMARY

The proposed 6.0B-2 Pipeline would consist of 24,266 feet of PVC and RCP pipe ranging from 18 to 42 inches. The pipeline would replace inadequate irrigation service to 1,009 acres in the northeast portion of the District with a new service of 3 cfs per individual turnout. The new service is based on the assumptions that a typical turnout services 40 acres and ¼ of farmers irrigate simultaneous. Improvements to the 6.0 Canal are required as specified in the Engineering Report for the 6.0 Canal to supply an adequate water source for the proposed pipeline. The proposed pipeline was designed under gravity flow conditions and will not require

a pump station. The total cost of \$880,000 for the 6.0B-2 Pipeline includes construction costs, easement acquisition costs, and design/survey costs.

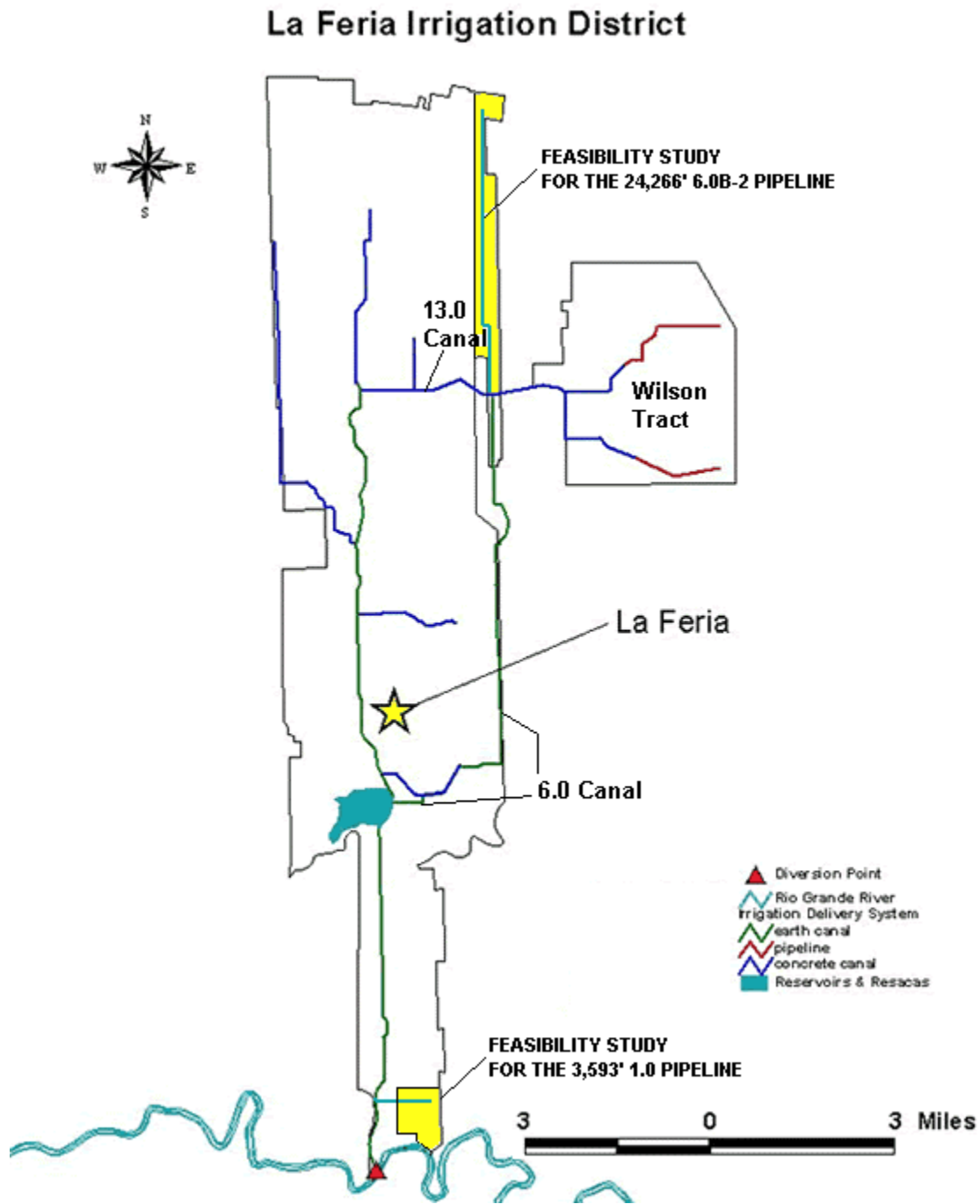
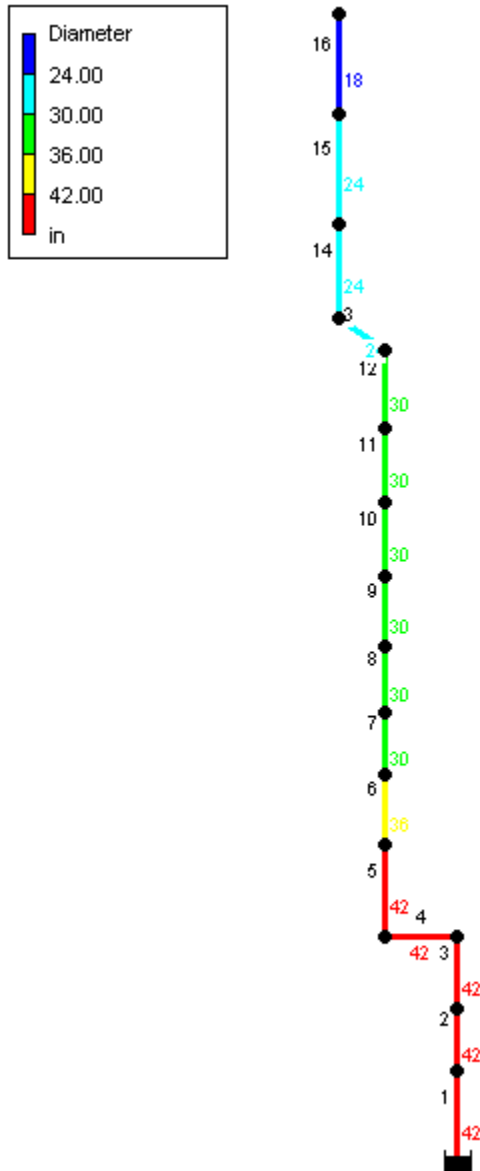


EXHIBIT A: PROJECT STUDY AREA

APPENDIX A EPANET INPUT AND OUTPUT



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Node Results: (continued)

Node ID	Demand CFS	Head ft	Pressure psi	Quality
16	3.00	42.44	0.15	0.00
C6.0	-21.00	51.60	0.00	0.00 Reservoir

Link Results:

Link ID	Flow CFS	Velocity fps	Unit Headloss ft/Kft	Status
1	21.00	2.18	0.37	Open
2	18.00	1.87	0.27	Open
3	18.00	1.87	0.27	Open
4	18.00	1.87	0.27	Open
5	18.00	1.87	0.27	Open
6	15.00	2.12	0.43	Open
7	15.00	3.06	0.64	Open
8	12.00	2.44	0.41	Open
9	12.00	2.44	0.41	Open
10	12.00	2.44	0.41	Open
11	9.00	1.83	0.23	Open
12	9.00	1.83	0.23	Open
13	9.00	2.86	0.75	Open
14	9.00	2.86	0.75	Open
15	6.00	1.91	0.34	Open
16	3.00	1.70	0.39	Open
