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**Water Loss Test Results for the Pipeline Units:
I-19/I-18, I-7A and I-22
Hidalgo County Irrigation District No. 2**

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**Water Loss Test Results for the Pipeline Units: I-19/I-18, I-7A, and I-22
Hidalgo County Irrigation District No.2**

Summary

This report summarizes three water loss tests conducted on parts of pipeline units I-19/I-18, I-7A (see figure 2), and I-22 for Hidalgo County Irrigation District No.2 (HCID2) that took place on February 15, 2007. The pipelines were tested using the ponding method, measuring the total water loss rates (see next section). The test results are summarized in Table 1.

Table 1. Pipeline Water Loss Test Results for HCID2 conducted February 15, 2007.						
Test ID	Pipeline Unit	Length (miles)	Avg. Δ in Total Depth (ft/hour)	Total Volume Loss (ft ³)	Water Loss Rates*	
					gal/mi/day	ac-ft/mi/yr
SJ16	I-19/I-18	3.6	11.6	1157	57,900	64.9
SJ17	I-7A	1.5	6.8	466	55,800	62.5
SJ18	I-22	2.7	5.0	605	40,500	45.4

* Water loss rates given are based on an in-service use of 24 hours/day and 365 days/year.

Test SJ16 included a 1 mile segment of pipeline Unit I-19 and 2.59 miles of pipeline Unit I-18; running north from Nolana Loop, then east from Col. Rowe Blvd, and ending near US Hwy 281 (see figure 3).

- Unit I-19: 1 mile of 48 inch FJRC (Flexible-Joint Reinforced Concrete) pipeline;
- Unit I-18: 0.25miles of 48 inch FJRC pipe, and 2.34 miles of 48 inch MJC (Mortar-Joint Concrete) pipeline.

Test SJ17 tested 1.5 miles of the mortar-joint pipeline Unit I-7A, consisting of 1 mile of 36 inch pipe, and 0.5 miles of 30 inch pipe. Test the section began east of Cesar Chavez Rd and ending just east of Tower Rd, north of El Dora Rd. (see figure 4).

Test SJ18 tested 2.68 miles of Unit I-22, beginning from the North Alamo Main canal, running east towards Tower Rd, just north of Gas Line Rd. (see figure 5).

- Mortar-Joint: 1.25 miles of 48 inch pipe, and 0.75 miles of 42 inch pipe;
- Flexible-Joint: 0.18 miles of 42 inch pipe, and 0.5 miles of 30 inch pipe.

Table 2 shows the water loss rates with a $\pm 10\%$ estimated error range due to error in measurements and surface water level stability.

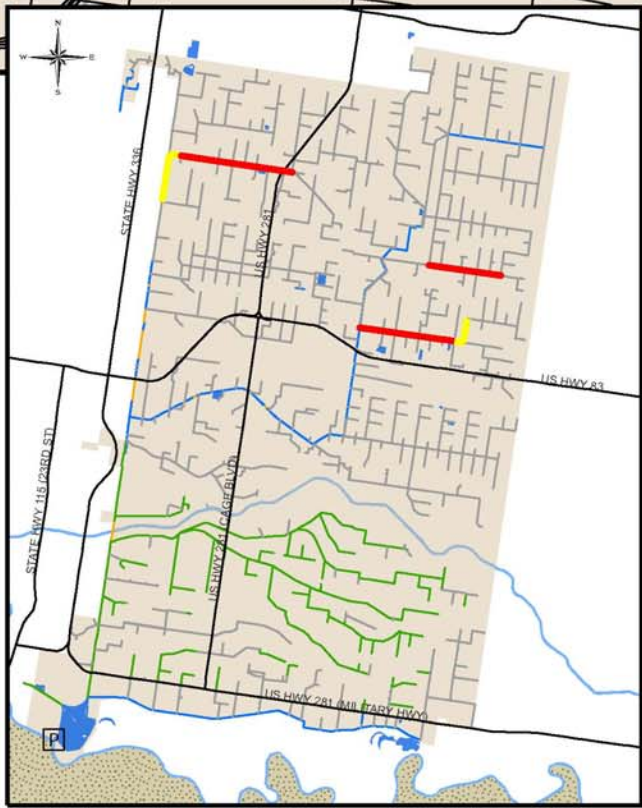
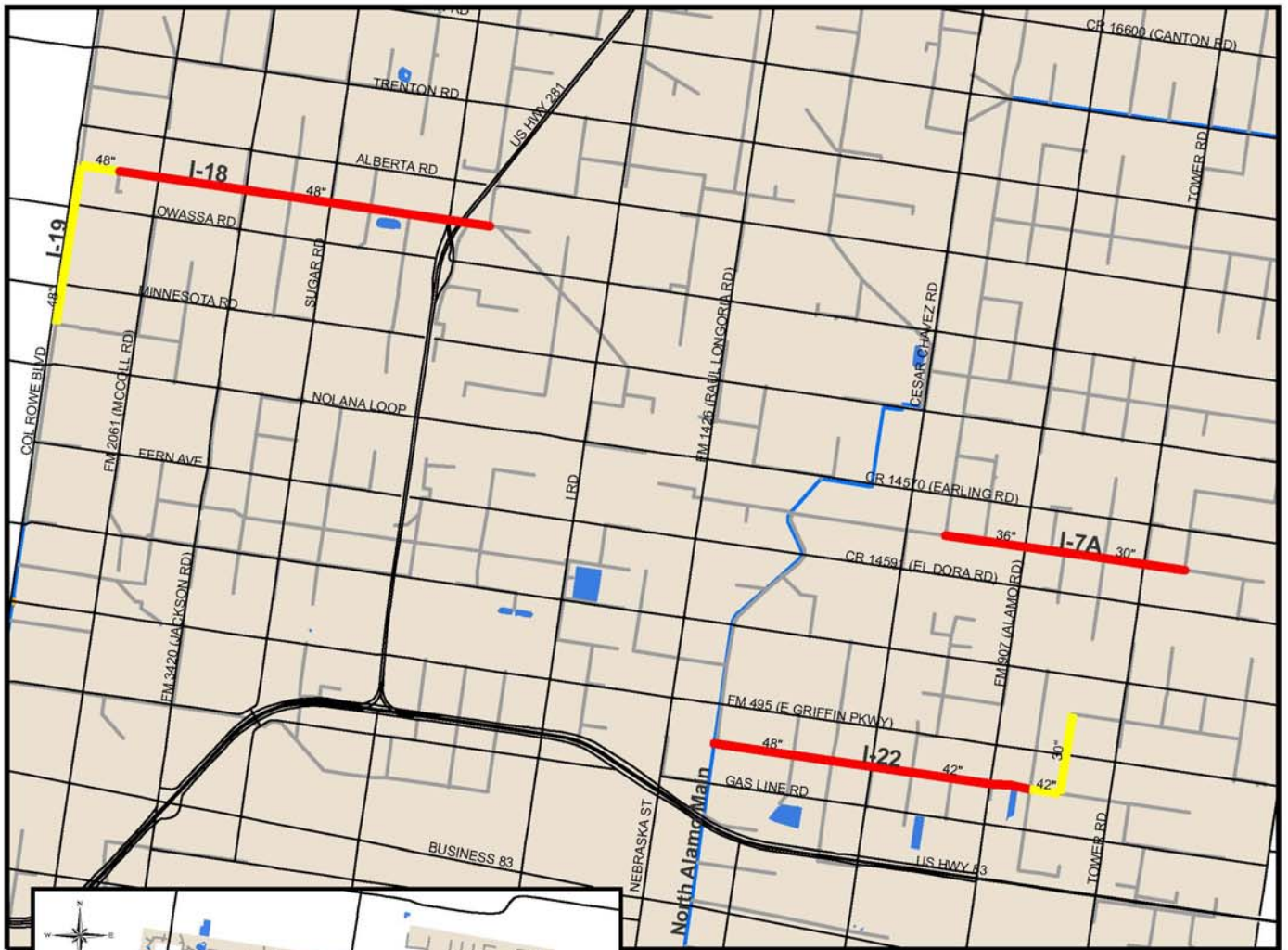
Table 2. Water Loss Results with 10% Estimated Error Range					
Test ID	Pipeline Units	Water Loss Rates*			
		gal/mile/day		ac-ft/mile/year	
		Low	High	Low	High
SJ16	I-19/I-18	52080	63653	58.4	71.3
SJ17	I-7A	50193	61347	56.2	68.7
J18	I-22	36490	44599	40.9	50.0

* Water loss rates given are based on an in-service use of 24 hours/day and 365 days/year.

Figure 1 shows a leaking pipeline control structure and standpipe with lateral gates that were shut-off during the test.



Figure 1. Leaking pipeline control structure



Pipeline Test Locations

- Legend**
- | | |
|--|--|
| Pipeline Test Sections | Other Features |
| — Mortar-Joint Concrete | P River Pumpstations |
| — Flexible-Joint Reinforced Concrete | ■ Reservoir / Resaca |
| Distribution System | — Roads |
| — Lined Canal | ~ River & Drainage System |
| — Unlined Canal | |
| — Pipeline | |
| — Siphon | |

**Hidalgo County Irrigation District No. 2
San Juan, Texas**

Figure 2. Hidalgo County Irrigation District No.2 pipeline test locations.



Figure 3. Detailed map of Test SJ16



Figure 4. Detailed map of Test SJ17



Figure 5. Detailed map of Test SJ18

Pipeline Testing Procedures

The pipelines were tested using the ponding method. These tests accounted for all the leaks occurring from gates, valves, and pipeline joints that are either undetectable or are difficult to measure (figures 6 and 7), classified as *total loss* tests; thus, measuring the total water loss rate.



Figure 6. Leaking from standpipe



Figure 7. Leaking from turnout valve

These tests were performed under the district's normal operating water levels, with all downstream check-gates and turnout valves closed. Once the pipeline was filled, the head gates were shut and water surface elevations were measured at selected standpipe stations with measuring tapes and a water sounding meter and referenced to the inside top rim of the standpipe (Figure 8). Each test lasted between 1.0 to 1.5 hours, recording water level measurements at 10 minute intervals (8-10 measurements per test).



Figure 8. Askar Karimov, Extension Associate, is shown taking the measurement from the top inside rim of a standpipe.

Appendix A: Water Level Measurements & Pipeline Information

HCID2 provided our team with basic pipeline size and attribute information on the pipeline units test. Table 3, 5, and 7 contains the test measurements and times. Tables 4, 6, and 8 contain the type of structures and diameter sizes used for test calculations.

Test SJ16

2/15/2007	Standpipe #1	Standpipe #2
Time	WL-Reading (ft)	Reading (ft)
11:50	6.6	3.6
12:00	11.4	8.9
12:10	15.2	12.3
12:20	17.4	13.8
12:30	17.8	14.7
12:40	18.5	15.1
12:50	18.2	15.2
13:00	18.5	15.3

Structure	Air Vent	Air Vent	Air Vent	Air Vent	Air Vent	Standpipe	Standpipe #1
Diameter (in):	15	15	21	15	15	48	48
Area (ft ²):	1.23	1.23	2.41	1.23	1.23	12.57	12.57
Vol Loss (ft ³):	14.2	14.24	27.91	14.24	14.24	145.80	145.80
US GALs:	106.5	106.5	208.75	106.51	106.51	1090.63	1090.63

Structure	Standpipe	Standpipe	Standpipe	Standpipe	Standpipe #2	Air Vent	Air Vent
Diameter (in)	48	30	36	42	72	21	21
Area (ft ²):	12.57	4.91	7.07	9.62	28.27	2.41	2.41
Vol Loss (ft ³)	145.80	56.95	82.01	111.63	328.04	27.91	27.91
US GALs:	1090.63	426.03	613.48	835.01	2453.91	208.75	208.75

Test SJ17

Table 5. Test SJ17: Unit I- Test Measurements		
2/15/2007	Standpipe #1	Standpipe #2
Time	Reading (ft)	Reading (ft)
13:40	6.5	6.2
13:50	10.7	13.1
14:00	11.5	13.6
14:10	11.7	13.7
14:20	11.8	13.9
14:30	12.0	13.9
14:40	12.2	14.0
14:50	11.9	14.1
15:00	12.0	14.1
15:10	12.0	14.2

Table 6. Test SJ17: Unit I-7A – Test Structures and Attributes								
Structure:	Standpipe #1	Air Vent	Air Vent	Standpipe	Standpipe	Standpipe	Standpipe #2	Standpipe
Diameter:	48	15	12	48	48	48	42	36
Area (ft ²):	12.57	1.23	0.79	12.57	12.57	12.57	9.62	7.07
Vol Loss (ft ³):	84.90	8.29	5.31	84.90	84.90	84.90	65.00	47.76
US GALs:	635.11	62.02	39.69	635.11	635.11	635.11	486.25	357.25

Test SJ18

Table 7. Test SJ18: Unit I- Test Measurements		
2/15/2007	Standpipe #1	Standpipe #2
Time	Reading (ft)	Reading (ft)
13:50	4.0	6.6
14:00	5.6	8.8
14:10	6.7	9.9
14:20	7.5	10.6
14:30	8.0	11.1
14:40	8.3	11.6
14:50	8.6	11.8
15:00	8.9	12.0
15:10	9.1	12.2

Table 8. Test SJ18: Unit I-22 – Test Structures and Attribute											
Structure:	Standpipe #1	Standpipe	Standpipe	Standpipe	Standpipe	Standpipe	Standpipe # 2	Air Vent	Air Vent	Air Vent	Air Vent
Diameter:	60	60	60	48	60	42	48	21	21	18	21
Area (ft ²):	19.63	19.63	19.63	12.57	19.63	9.62	12.57	2.41	2.41	1.77	2.41
Vol Loss (ft ³):	97.15	97.15	97.15	62.18	97.15	47.60	62.18	11.90	11.90	8.74	11.90
US GALs:	726.75	726.75	726.75	465.12	726.75	356.11	465.12	89.03	89.03	65.41	89.03

Appendix B: Other Reported Seepage Rates and Water Loss Test Results

Texas Cooperative Extension has conducted over 70 total loss tests and seepage loss tests in canals and pipelines the Lower Rio Grande River Basin since 1998. Most of these results are summarized in Tables 9 – 12. Table 13 gives seepage rates versus lining type as reported in the scientific literature.

Table 9. Results of pipeline seepage loss test conducted by Texas Cooperative Extension in the lower Rio Grande River Basin					
Test ID	Year	Type*	Pipeline Test Diameter (in) (Wt. Avg.)	Water Loss Rates**	
				gal/mi/day	ac-ft/mi/yr
UN4	04	FJRC	70	26,402	30.0
UN5	04	FJRC	70	40,940	46.0
UN6	04	FJRC	70	1,119	1.3
UN8	05	FJRC	70	1,839	2.1
UN9	06	FJRC	70	1,407	1.6

* Type: FJRC (Flexible Joint Reinforced Concrete Pipeline)

** Water loss rates given are based on an in-service use of 24 hours/day and 365 days/year.

Table 10. Results of total loss tests in unlined canals (leaking gates and valves may have contributed to measured loss rates) conducted by Texas Cooperative Extension in the Lower Rio Grande River Basin.						
Test ID	Year	Canal Width (ft)	Canal Depth (ft)	Class*	Water Loss Rate**	
					gal/ft ² /day	ac-ft/mi/yr
BV3	99	55	8	M	0.15	53.4
ED5	02	105	7	M	2.39	1213.2
MA1	99	50	10	M	1.98	227.1
MA2	99	20	5	S	4.32	371.4
SB1	00	29	7	S	1.27	215.5
SJ2	00	23	6	M	2.74	293.2
SJ3	00	30	5	S	0.95	132.6

* Classification of canal: M = main, S = secondary

** Water loss rates given are based on an in-service use of 24 hours/day and 365 days/year.

Table 11. Results of total loss tests in lined canals (leaking gates and valves may have contributed to measured loss rates) conducted by Texas Cooperative Extension in the Lower Rio Grande River Basin.

Test ID	Year	Canal Width (ft)	Canal Depth (ft)	Class*	Loss Rate**	
					gal/ft ² /day	ac-ft/mi/yr
<u>Lined</u>						
16HC1	03	14	5	M	1.89	192.4
BV1	99	10	5	M	7.97	510.5
BV2	99	9	4	M	8.53	451.5
DL1	00	20	6	M	0.16	18.8
DL2	00	7	4	S	4.12	236.2
DO1	03	5	3	S	1.68	65.2
DO2	03	6	4	S	2.18	121.5
DO3	03	6	3	S	2.71	107.2
ED1	00	6	4	S	34.32	1519.6
ED2	00	6	4	S	21.5	858.2
ED3	00	3	2	T	10.22	308.2
ED4	00	4	3	S	18.72	567.7
ED6	99	9	4	M	8.53	451.5
HA2	00	10	4	M	2.26	135.2
HA3	98	15	2	S	0.64	45.5
ME1	98	38	7	M	1.26	281.9
ME2	98		4	M	1.88	163.5
SJ1	99	12	5	M	2.58	126.8
SJ6	03	12	3	M	1.88	1.63
SJ7	03	19	4	M	1.98	227.1
UN3	02	12	6	M	2.02	154.3

* Classification of canal: M = main, S = secondary, T = tertiary

** Water loss rates given are based on an in-service use of 24 hours/day and 365 days/year.

Table 12. Results of seepage loss tests conducted by Texas Cooperative Extension in the Lower Rio Grande River Basin.

Test ID	Year	Canal Width (ft)	Canal Depth (ft)	Class*	Loss Rate**	
					gal/ft ² /day	ac-ft/mi/yr
<u>Lined</u>						
16HC2	03			M		
LF1	03	12	5	M	1.77	152.9
LF2	03	10	6	M	4.61	369.1
MA4	03	12	5	S	8.85	529.7
SJ4	00	15	4	M	1.17	111.2
SJ5	02	14	5	M	1.38	145.5
UN1	01	12	6	M	2.32	217.7
UN2	01	8	3	M	2.09	121.2
<u>Unlined</u>						
BR1	03	60	11	M	3.14	794.6
MA3	03	19	5	S	13.9	1690.1
RV1	03	38	4	M	0.15	23.0
SB4	02	16	4	S	0.64	68.3
SB5	02	18	3	S	1.67	188.3
SB6	02	20	5	S	1.44	189.0
SB7	02	16	4	S	0.42	47.4
SB8	02	20	5	S	0.83	104.0

* Classification of canal: M = main, S = secondary

** Water loss rates given are based on an in-service use of 24 hours/day and 365 days/year.

Table 13. Canal seepage rate reported in published studies.	
Lining/soil type	Seepage rate (gal/ft ² /day)
Unlined ¹	2.21-26.4
Portland cement ²	0.52
Compacted earth ²	0.52
Brick masonry lined ³	2.23
Earthen unlined ³	11.34
Concrete ⁴	0.74 - 4.0
Plactic ⁴	0.08-3.74
Concrete ⁴	0.06-3.22
Gunite ⁴	0.06-0.94
Compacted earth ⁴	0.07-0.6
Clay ⁴	0.37-2.99
Loam ⁴	4.49-7.48
Sand ⁴	4.0-19.45

¹ DeMaggio (1990). Technical Memorandum: San Luis unit drainage program project files. US Bureau of Reclamation, Sacramento.

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Hidalgo County Irrigation District No.2

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