AgriLIFE RESEARCH & EXTENSION
Texas A&M System

TEXAS A&M UNIVERSITY

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

TR-372
2011

Measured Seepage of the Main Canal Brownsville Irrigation District

By:
Eric Leigh, Extension Associate and Guy Fipps, P.E., Extension Agricultural Engineer
Department of Biological and Agricultural Engineering, Texas A&M University, College Station, TX.

April 2011

Texas Water Resources Institute Technical Report No. 372
Texas A&M University System
College Station, Texas 77843-2118

Texas Water Resources Institute
make every drop count

TR-372
2011
TWRI

AgriLIFE EXTENSION
Texas A&M System

MEASURED SEEPAGE OF THE MAIN CANAL BROWNSVILLE IRRIGATION DISTRICT

Rio Grande Basin Initiative
Irrigation Technology Center
Texas Water Resources Institute
Texas AgriLife Extension Service

MEASURED SEEPAGE OF THE MAIN CANAL OF BROWNSVILLE IRRIGATION DISTRICT[1]

by

Eric Leigh and Guy Fipps, P.E.[2]

October 17, 2003

---

[1]A portion of this study was funded by Texas Cooperative Extension through the Rio Grande Basin Initiative administered by the Texas Water Resources Institute of the Texas A&M University System with funds provided through a grant from Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Agreement No. 2001-001-45049-01149.

[2]Extension Associate, and Professor and Extension Agricultural Engineer, respectively, Biological and Agricultural Engineering, 2117 Texas A&M University, College Station, TX 77843-2117

CONTENTS

Measured Seepage of the Main Canal of Brownsville Irrigation District

SUMMARY

This report summarizes the results of a seepage loss test conducted on a segment of the "Main Canal" of the Brownsville Irrigation District, June 17 - 19, 2003.

The Main Canal test segment is at the southwest tip of the district and extends from Milpa Verde Road to just down stream of the district's river pumping plant, terminating at the check gate (Fig. 1). The test segment is an unlined canal, approximately 1,502 ft long, and varies from 36 to 43 feet in water-span (width).

Seepage was measured at 3.14 gal/ft^2/day (Table 1). Annual water loss is estimated at 794.6 ac-ft/mi/yr based on an in-service period of 365 days per year. Table 2 lists the seepage rate in terms of water level change.

Table 1. Seepage loss rate of the Main Canal of Brownsville Irrigation District. The test measured seepage loss only.

Test ID	Segment	Soil	Length (ft)	Seepage Rate (gal/ft^2/day)	Total Loss in Canal (ac-ft/mile) per day	per year*
BR1	Main Canal	Silt loam**	1501.9	3.14	2.17	794.6

*Based on 365 days per year

** Soil type of the surrounding area from the Soil Survey for Cameron County (USDA 1977)

Table 2. Seepage rate of the Main Canal in terms of change in water level.

Test ID	ft/hr	ft/day	in/hr	in/day
BR1	0.017	0.409	0.21	5.04

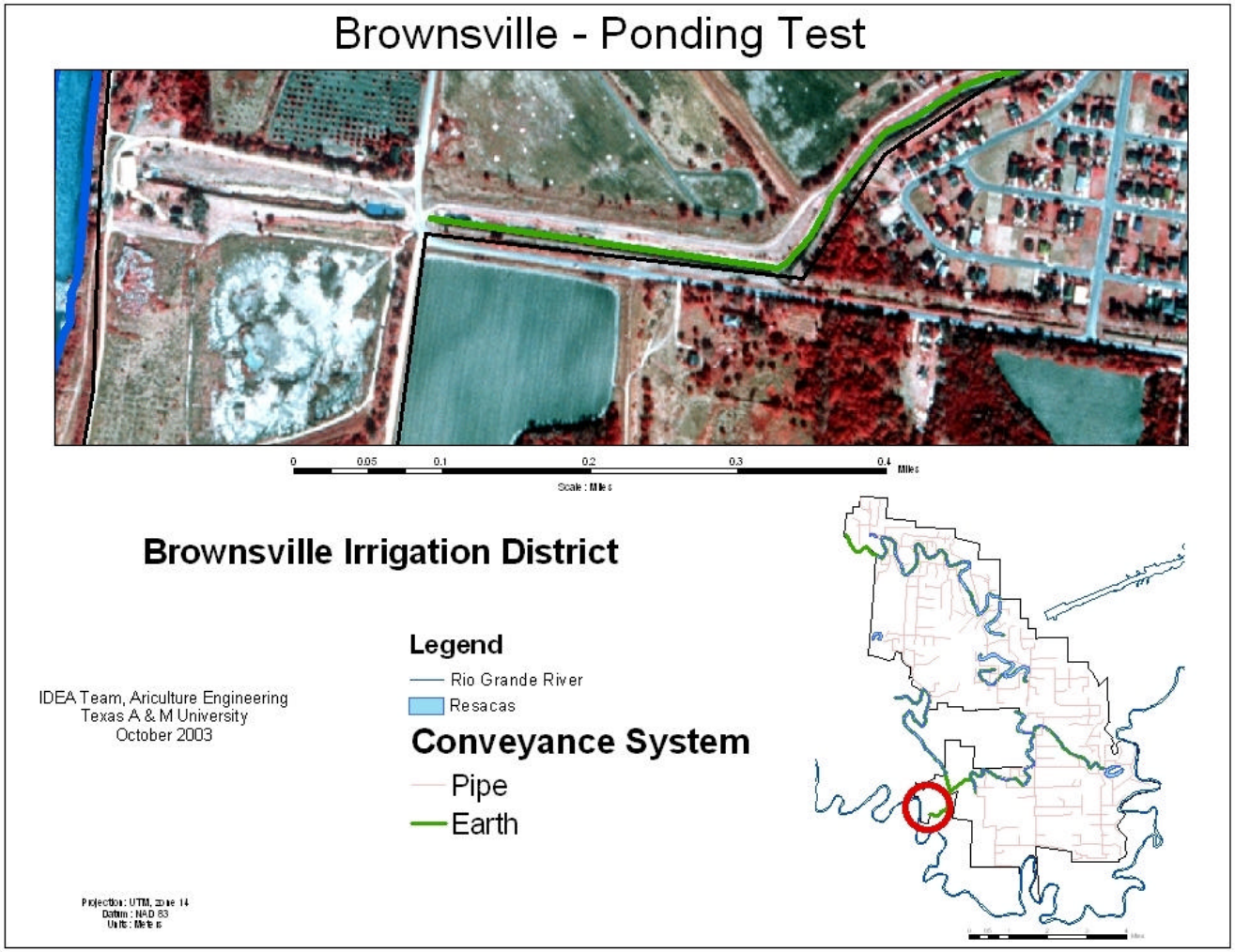

Figure 1. Map and aerial photograph of the Main Canal segment tested.

MATERIALS AND METHODS

Seepage was measured using the ponding method. In this method, the two ends of a canal segment are closed or sealed with earthen dams. Once sealed, water elevations are taken for approximately 48 hours. Four continuous-stage level recorders were placed in the test segment to supplement the four locations where stage levels are recorded manually (however, data from the continuous stage recorders was not used in this analysis). Canal dimensions and water spans were also surveyed during the test. The segment did not contain valves or gates within the canal; thus, the seepage rate was measured. The location of the test segment is shown in Figure 1.

Figure 2. Downstream test dam being removed by the Brownsville Irrigation District.

Table 3. Data for Test BR1: Main Canal.

District: Brownsville Irrigation District	**Test ID:** BR1
Canal: Main Canal	**Lining Type:** Unlined
Water Span Width: 36 - 43 feet	**Date:** June l7-19, 2003
Test Segment Length: 1501.9 feet	**Start Time:** 1:03 pm
Canal Total Depth: 3.25 - 5.73 feet	**Finish Time:** 3:53 pm
Location: East of river pumping plant and Milpa Verde Rd.	

Staff Gage Readings

Date	**A**		**B**		**C**		**D**	
	Time	**Feet**	**Time**	**Feet**	**Time**	**Feet**	**Time**	**Feet**
17 Jun	**13:03**	1.82	12:58	5.02	12:57	6.12	12:52	6.3
	14:23	1.78	14:25	4.98	14:26	6.08	14:29	6.25
	15:21	1.76	15:23	4.96	15:26	6.05	15:27	6.24
	16:17	1.74	16:19	4.93	16:21	6.04	16:23	6.21
	17:15	1.7	17:14	4.9	17:12	6.01	17:10	6:18
18 Jun	**10:46**	1.34	10:48	4.54	10:49	5.64	10:52	5.82
	12:06	1.3	12:08	4.52	12:09	5.61	12:11	5.79
	10:55	0.93	10:57	4.12	10:59	5.22	11:01	5.4
	12:11	0.9	12:16	4.1	12:17	5.2	12:19	5.38
	14:05	0.86	14:07	4.08	14:08	5.17	14:10	5.36
	15:53	0.84	15:52	4.04	15:51	5.14	15:50	5.31
True depth adjustment factor (ft)		+1.43		+1.61		+0.05		+0.57

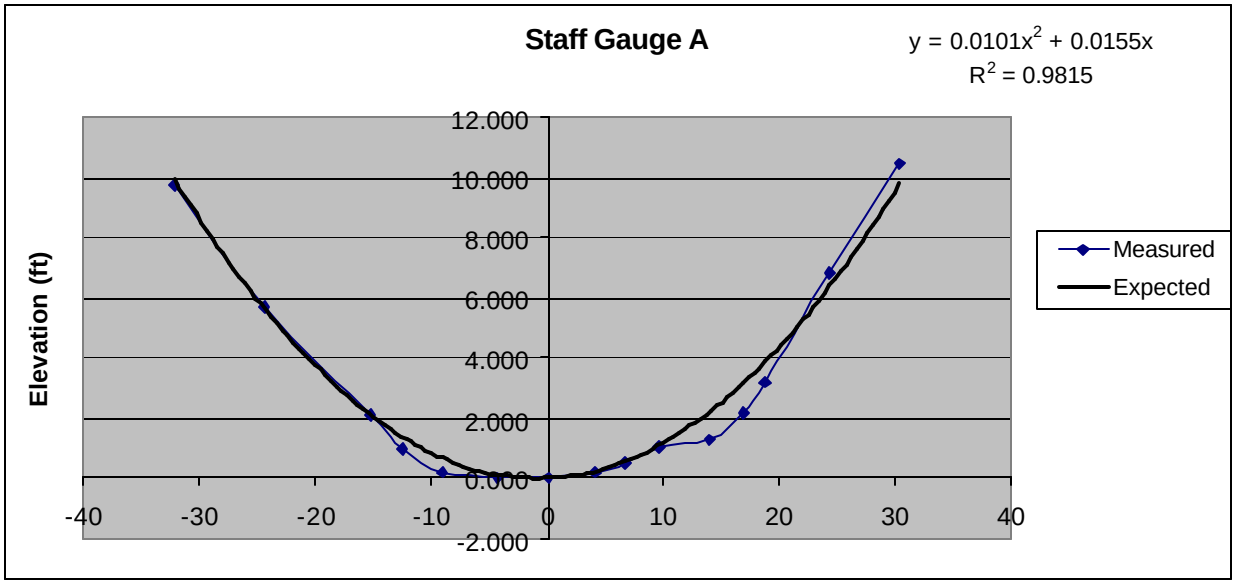

Figure 3. Cross-section at Staff Gauge A.

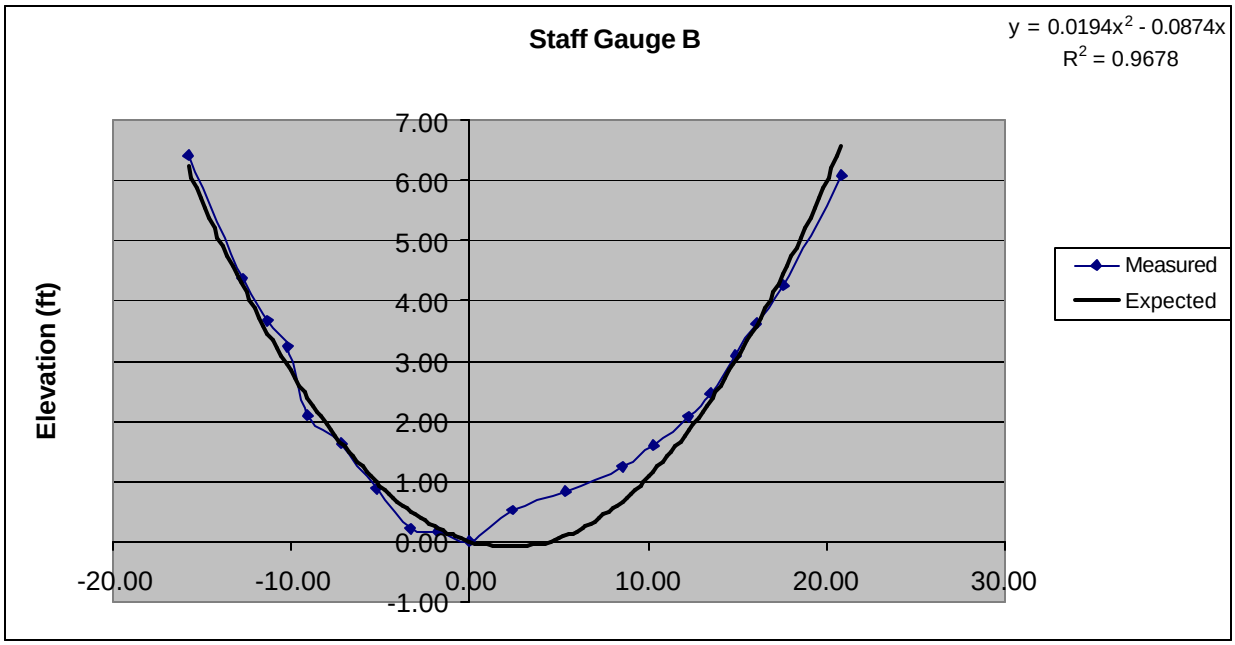

Figure 4. Cross-section at Staff Gauge B.

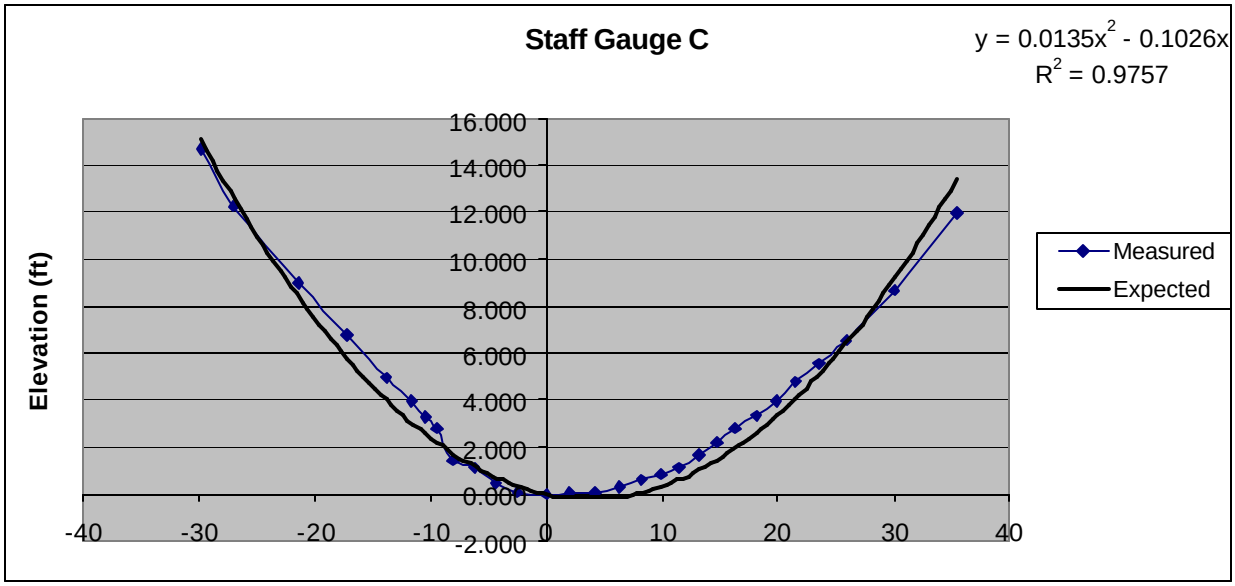

Figure 5. Cross-section at Staff Gauge C.

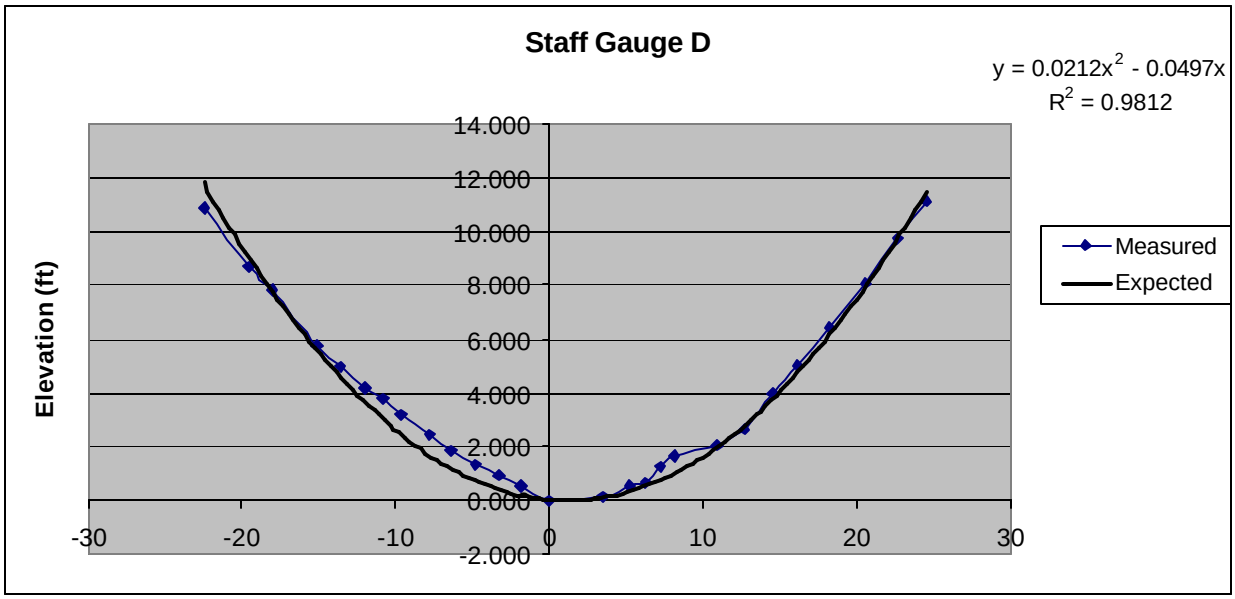

Figure 6. Cross-section at Staff Gauge D.

Figure 7. View of the Main Canal Test Segment.

Figure 8. Staff gauge A and water level near the end of the test.

SOIL DESCRIPTIONS

General Soil Series

5 – Rio Grande-Matamoros association: Nearly level to gently sloping, well drained and moderately well drained silt loams and silty clays (source: Soil Survey of Cameron County, Texas USDA, 1977).

Detailed Soil Units

Table 4. Soil Series Key Codes and Permeability Ranges.

Soil Unit	**Permeability (in/hr)**
RR- Rio Grande silt loam	0.63-2.0

TR-372
2011
TWRI

This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under Agreement No.2010-45049-20713 and Agreement No. 2010-34461-20677. For program information, see http://riogrande.tamu.edu.