

# **Final Report for Cameron County Irrigation District No. 6 Saldaña Canal Improvements**

by  
Frank A. Ferris, PE  
Ferris, Flinn & Medina, LLC  
1405 North Stuart Place Road  
Palm Valley, Texas 78552  
Ph. (956) 364-2236  
Fax. (956) 364-1023  
Texas Board of Professional Engineers  
Firm Registration No. F-897

TWDB Contract No. 1513581821  
Final Report  
Received: August 30, 2021



Funded in part through an Agricultural Water Conservation Fund Grant (No. 1513581821), provided by the Texas Water Development Board.

*This page is intentionally blank.*

# **Final Report for Cameron County Irrigation District No. 6 Saldaña Canal Improvements**

by

Frank A. Ferris, PE, PSAP

**FERRIS, FLINN & MEDINA, LLC**

1405 North Stuart Place Road

Palm Valley, Texas 78552

Ph. (956) 364-2236

Fax. (956) 364-1023

Texas Board of Professional Engineers

Firm Registration No. F-897

August 2021

**This project was funded in part by the U.S. Bureau of Reclamation WaterSMART; Water and Energy Efficiency Grants for FY 2015 – Funding Group I and by the Texas Water Development Board**

**Draft Final Report comments received from Texas Water Development Board, Executive Administrator, regarding the report, included as Appendix D, were noted and addressed in this report.**

# Texas Water Development Board

## Table of Contents

1 Executive Summary .....	1
2 Introduction.....	2
3 Application Phase Seepage Testing.....	7
4 Bureau of Reclamation WaterSMART Funding .....	8
5 Design Phase.....	10
6 Construction Phase .....	11
7 Conservation Results .....	20
8 Project Cost.....	22
9 Economic Analysis of Conservation.....	23
10 Education Seminar .....	26
11 Conclusion .....	30
12 Acknowledgements.....	31
13 References.....	31
14 Appendix.....	31

## List of Figures

Figure 1 Inset vicinity map for irrigation District boundary, centered in Cameron County.....	2
Figure 2 Map of project location.....	3
Figure 3 Saldaña Canal Service Area .....	5
Figure 4 Saldaña Canal, Test Day. ....	8
Figure 5 Saldaña Pump to be replaced in Phase II. ....	8
Figure 6 Placement of Saldaña Canal into Pipeline - Cross Sections .....	10
Figure 7 Typical Well Detail .....	12
Figure 8 Saddle Outlet Detail.....	13
Figure 9 Aerial Overlay of Proposed Pipeline .....	14
Figure 10 Photo, 7.25.16, clearing for the new pipeline. Pipe materials on site. Note the large open canal that is being replaced. ....	15
Figure 11 Photo, 11.2.16, laying new PVC pipeline. New PVC pipeline to replace the open canal. ....	15
Figure 12 Photo, 12.15.16, District crews laying pipeline. Westward view. ....	16
Figure 13 Photo, 12.15.16, District crews laying pipeline.....	16
Figure 14 Photo, 2.17.17, rebar partially installed for saddle outlet. ....	17
Figure 15 Photo, 4.20.17, pipes being connected to east end well.....	17
Figure 16 Photo, 8.29.17, foundation for well at station 0+73, prepared for well construction. 24 inch fused PVC directionally drilled under Resaca in background.....	18
Figure 17 Photo, 10.27.17, District working on connection of new Resaca crossing to upstream Saldaña Canal. ....	19
Figure 18 Photo, 11.17.17, District working on connection of existing lateral to new Saldaña Canal. ....	19
Figure 19 Saldaña Pump Discharge Bypassing Meter.....	21



Figure 20 Education Seminar Flyer.....27  
 Figure 21 Presentation on Metering Alternatives by Mr. Tom McLemore, in the Rio Grande Center for Ag Water Efficiency, funded by the TWDB.....28  
 Figure 22 Tour of the Rio Grande Center for Ag Water Efficiency.....28  
 Figure 23 SCADA System and volumetric billing for irrigation water, presentation by Mr. Andy Slovak, Brownville Irrigation District, Field Supervisor. ....29  
 Figure 24 Unit 8 Pump Station, site visit with Mr. Andy Slovak. Attendees were able to observe the devices, including the meter and SCADA system, in use. ....29  
 Figure 25 Unit 8 SCADA System panel and flow meter. ....30

## List of Tables

Table 1 Water Use and Loss 2014-2020 ..... 6  
 Table 2 Seepage and Evaporation Estimate ..... 7  
 Table 3 Project Budget and Funding Sources..... 9  
 Table 4 Conservation Results.....20  
 Table 5 Hydraulic Modeling to High Blocks .....22  
 Table 6 Project Final Cost .....23  
 Table 7 Economic Analysis of Conservation.....25

## Appendices

Appendix A – Seepage Test Results and Water Loss Data.....32  
 Appendix B – Conservation Estimates.....34  
 Appendix C – Education Seminar Sign In Sheets.....46  
 Appendix D – Executive Administrator’s Draft Final Report Comments.....48



The final report bears the seal and signature of Frank A. Ferris, PE,  
 as required by the Texas Engineering Practice Act.

# 1 Executive Summary

Cameron County Irrigation District No. 6 (the District), is an irrigation district located in Cameron County, Texas, with 17,000 acres of irrigable land within its boundaries. The District delivers water to Olmito Water Supply Corporation and the City of Los Fresnos, potable water suppliers, for treatment and distribution to their customers. The District also delivers water to Cameron County Water Improvement District No. 10, Bayview Irrigation District No. 11 and Cameron County Irrigation District No. 20. Excess flow in the Rio Grande is pumped for the Brownsville Public Utilities Board under the 1838 Excess Use Permit. The District typically diverts between 10,000 and 30,000 acre feet annually, approximately 2,000 to 6,000 acre feet is utilized by farmers in the District. The remainder is diverted to the other water entities; the District is a regional supplier of water.

Current efficiency is about 75%, an improvement over its 65% efficiency about 10 years ago. The TWDB, Agricultural Water Conservation Fund Grant amounting to \$150,000 definitely helped the District with conservation. The funds were utilized to place 3,800 linear feet of the Saldana Canal into a 24 inch diameter PVC pipeline. The former canal was very large, as it was a main canal that was eventually rerouted to another location; however, the Saldana Canal was still utilized to distribute irrigation water to a few hundred acres. The large canal volume of six acre feet had to be filled each time water was delivered to a customer, sometimes the water delivered was only two acre feet. The seepage rate out of the canal was 1.53 acre feet per day, confirmed by testing. Over the past four years, the District saved an average of 234 acre feet annually, about 1.5% of the total diversion, by eliminating the canal that was only approximately 45% efficient. The final cost of the Phase I project was \$339,723, 44% funded by the TWDB, 46% funded by the US Bureau of Reclamation under their WaterSMART Water and Energy Efficiency Grant (WEEG), with the remaining 10% funded by the District. Considering the capitalized value of not pumping the conserved water at the District's First Lift Pumping Plant, located at the Rio Grande. The net capital cost per acre foot conserved is \$1,393. This is significantly less than the current market rate of about \$1,500 per acre foot for a Class A irrigation water right in the Lower Rio Grande. Considering the District's share of the capital cost annualized at 2% over a 50 year period, less the annual energy cost savings, results in a net cost of \$2.55 per acre foot conserved, much less than the spot market rate of \$30.00 per acre foot.

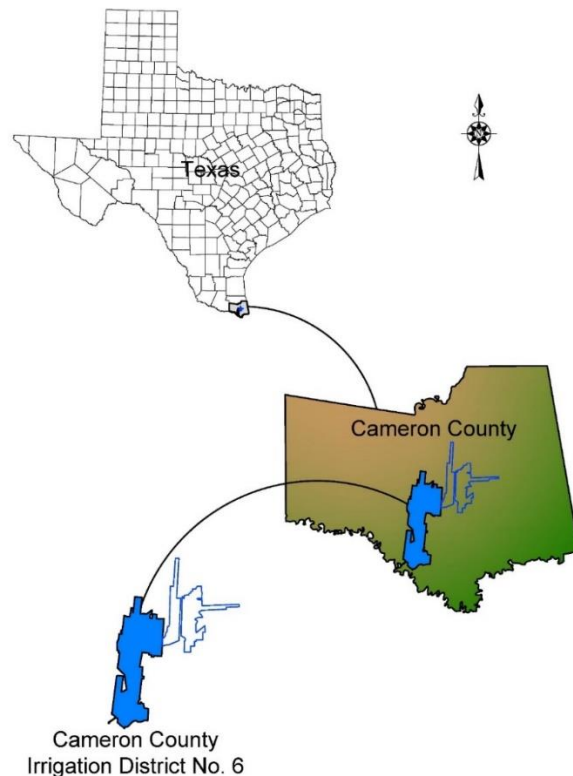
The WEEG funded the Phase I Saldana Canal Piping Project, as well as Phase II; a new 24 inch fused PVC crossing of the upstream resaca that resulted in significantly less energy usage at the, very inefficient, Saldana Pump, a solar powered pump at the Second Lift Pump Station, both energy conservation components of the grant. The District reduced its operation and maintenance costs because it no longer has to mow and maintain the Saldana Canal, and had less operation of the Saldana Pumps. Cost savings in addition to the energy savings are not included in the financial analysis. A final component of the WEEG was an outlet to the US Fish & Wildlife Service Lower Rio Grande Valley National Wildlife Refuge to help them manage their water resources to improve habitat on the refuge, benefiting endangered species. In turn, the District acquired a new customer. The WEEG is mentioned, because the funds contributed to the Phase I conservation project and the TWDB funds helped leverage those funds. The total project cost of Phases I and II was \$643,054.

Considering the District's 30% share of the capital cost, for Phases I & II, annualized over 50 years at 2%, less the annual energy savings of \$4,000, yielded a cost per acre foot conserved of \$8.86, much less than the spot market rate of \$30.00 per acre foot.

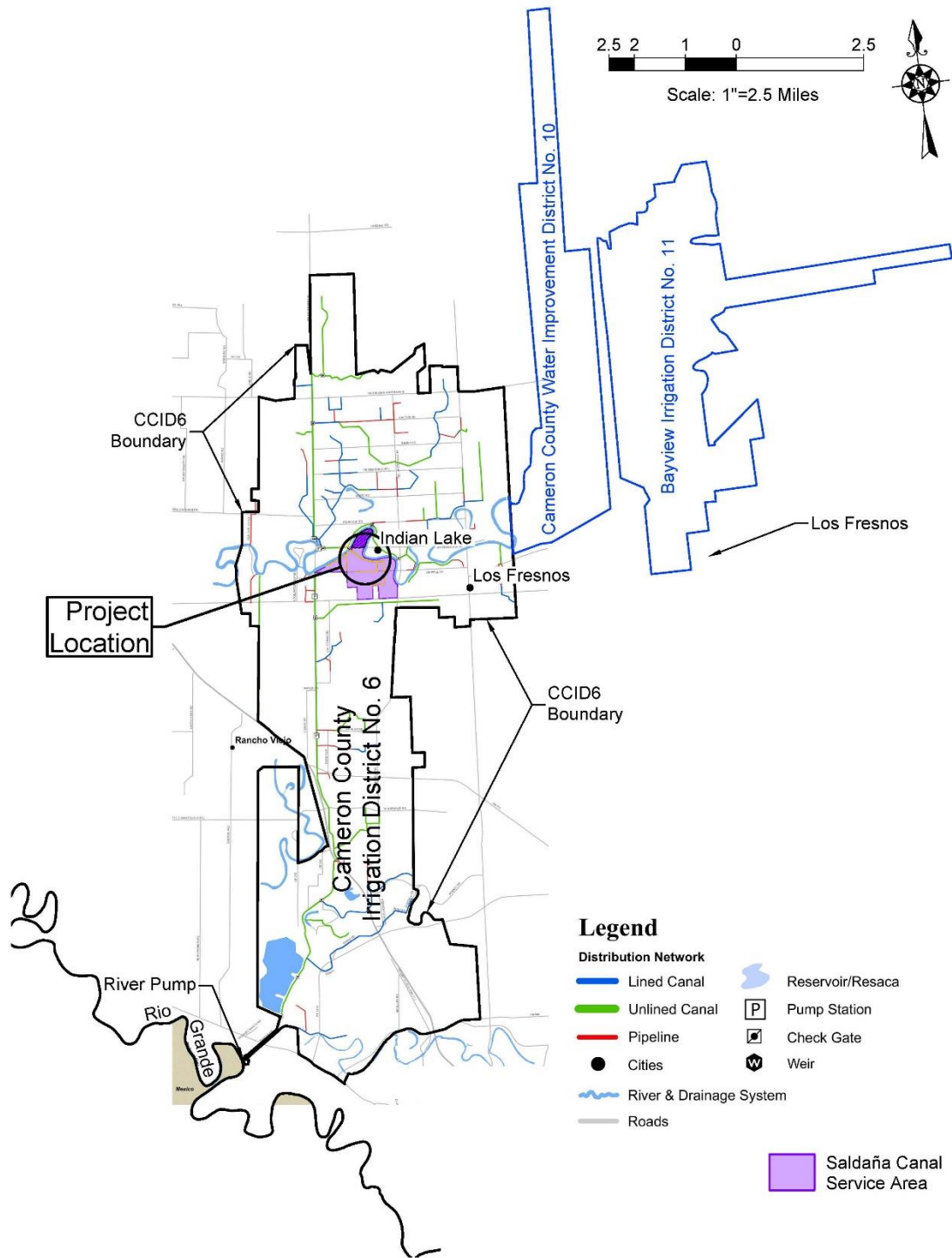
The grant from the TWDB was instrumental in leveraging federal funds to accomplish this successful project. The District often sells surplus water to other entities, which is especially important at the time this report is written, as the area supplied in the Lower Rio Grande System is in a severe to exceptional drought. An Education Seminar was conducted at the Harlingen Irrigation District, Rio Grande Center for Ag Water Efficiency, a facility funded by the TWDB. The Education Seminar included presentations from several water districts regarding metering and volumetric water rates for irrigation, SCADA systems for improved efficiency, as well as, the successes of the Saldaña Project. The seminar was attended by Board Members and managers from several districts.

## 2 Introduction

Cameron County Irrigation District No. 6 (the District) is located in the Lower Rio Grande Valley Region with its main office located in Los Fresnos, Texas. Figure 1 provides a general location map of the District. The District boundary, shown in Figure 2, encompasses 33,400 acres. The District currently serves 17,800 acres of irrigated farmland where farmers grow citrus, vegetables, sugarcane, sorghum, corn and hay.



**Figure 1 Inset vicinity map for irrigation District boundary, centered in Cameron County.**



F:\0408 Cameron County Irrig. Dist. #6\408-001 CCID 6 General Services\DWG\408-001 for TWDB Cover.dwg, 4/16/2021 9:14:31 AM, DWG To PDF.pc3

**Figure 2 Map of project location.**

The District provides raw water to the potable water suppliers of the City of Los Fresnos and Olmito Water Supply Corporation. The District diverts and delivers irrigation water for Cameron County Water Improvement District No. 10 (District 10), Bayview Irrigation District No. 11 (District 11) and Cameron County Irrigation District No. 20.

The District entered into a contract with the Texas Water Development Board (TWDB) in May of 2015 to place 3,800 linear feet of the Saldaña Canal into 24 inch PVC pipeline. The project was delayed because the District had applied for a US Bureau of Reclamation (USBR) WaterSMART Grant to fund a portion of the Saldaña Canal project. The District was successful with the federal grant that augmented the TWDB award of \$150,000, 44% of the pipeline cost, with a USBR award of 46% of the pipeline cost. The USBR also funded what was identified in the TWDB Application as Phase II, to fund other objectives of the USBR, resulting in total grant funds of \$448,000 to accomplish projects to conserve 275 acre feet of water, 53,000 kilowatt hours per year of energy, provide an outlet to the Lower Rio Grande Valley Natural Wildlife Refuge to benefit endangered species and conduct an education seminar for the project. The final project cost amounted to approximately \$643,054.

The TWDB Grant helped the District leverage federal funds; however, the federal funds delayed the project. The District could not proceed with the project until the federal grant was executed, which was around October 1, 2016. The federal agency, did however, assist with environmental requirements that were useful to comply with the TWDB environmental requirements. The District did execute a one year extension with the TWDB through Amendment No. 1 in August of 2016.

Figure 3 shows the service area for the Saldaña Canal, the proposed 3,800 linear feet of PVC pipe (Phase I), as well as the Resaca crossing for Phase II.

Table 1 provides a history of water diverted by the District from 2014 through 2020. The District diverted an average of 26,000 acre feet, of that 12,000 was diverted for downstream customers. District 10 is an irrigation customer and maintains about 8,000 acre feet of water rights. District 11 is an agricultural customer of District 6 and maintains approximately 17,000 acre feet. Olmito Water Supply Corporation and the City of Los Fresnos maintain approximately 1,546 acre feet and 1,051 acre feet of municipal water rights, respectively. The District occasionally diverts water for the Brownsville Public Utilities Board, under their Excess Use 1838 Permit, as well as other downstream customers.

The District, being one of the last diverters on the Rio Grande prior to the Gulf of Mexico, often takes advantage of the “No Charge” Diversions where excess flow in the river may be diverted without being charged against the District’s storage allotment in the Rio Grande Watermaster System. Over the past seven (7) years, the District has averaged 1,519 acre feet of “No Charge” Diversions. The District actively markets surplus water to other irrigators and Districts in need.

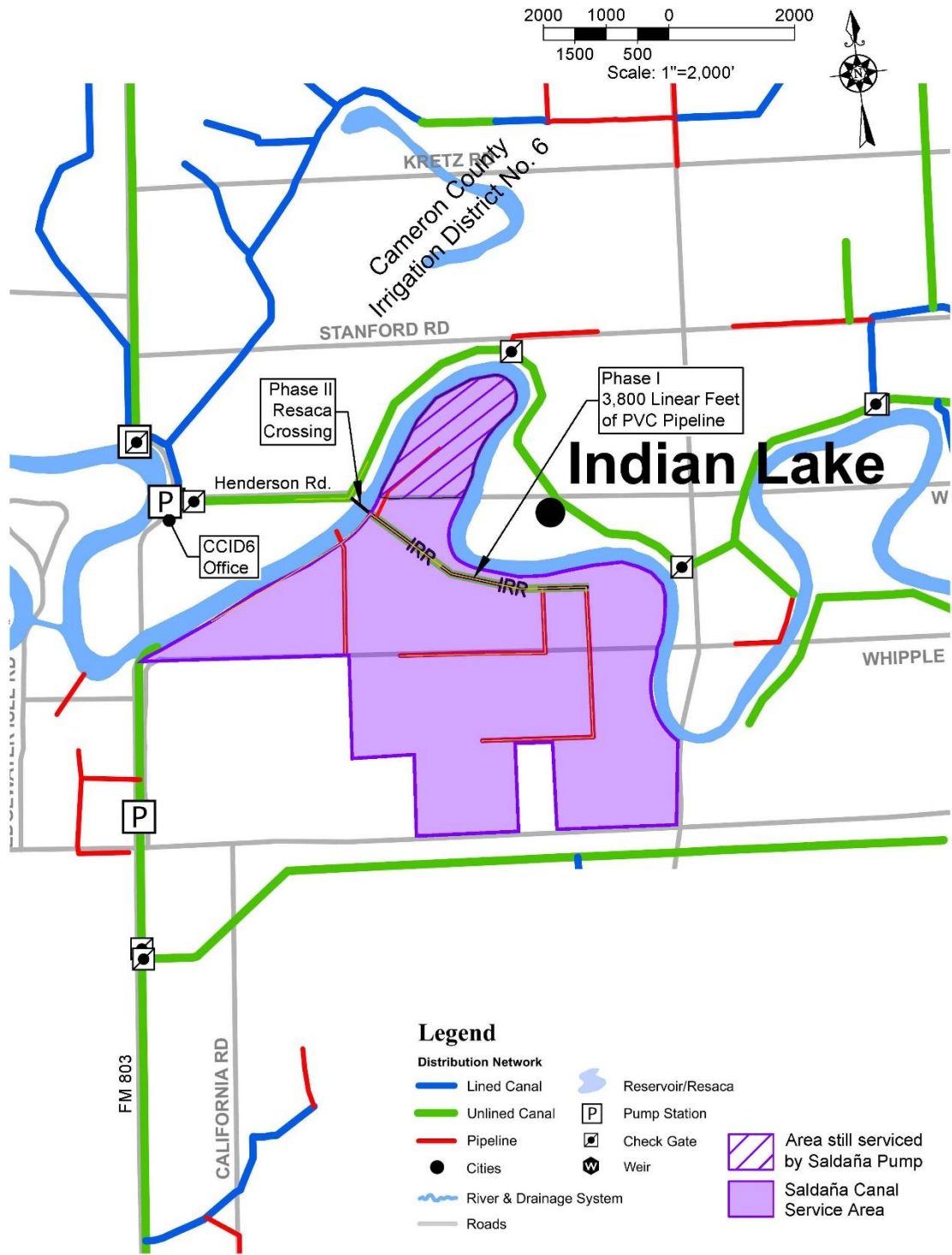


Figure 3 Saldaña Canal Service Area

**Table 1 Water Use and Loss 2014-2020**

All units in Acre Feet except for percent loss as shown.

<b>Year</b>	<b>Total Pumped</b>	<b>Diversions Charged</b>	<b>No Charge Diversions</b>	<b>Un-pumped Losses</b>	<b>Net Gain from (Lost to) River</b>	<b>In District Irrigation</b>	<b>Out of District Irrigation</b>	<b>Bayview Irrigation Delivered</b>
<b>2014</b>	27,628	24,691	2,569	(368)	2,937	4,848	681	5,426
<b>2015</b>	9,103	8,380	1,676	953	723	1,849	310	2,335
<b>2016</b>	21,840	21,174	806	140	666	3,686	111	4,905
<b>2017</b>	35,162	33,343	2,342	523	1,819	7,575	296	6,382
<b>2018</b>	28,432	27,848	995	411	584	6,287	606	6,985
<b>2019</b>	26,190	23,243	886	(2,061)	2,947	5,642	380	6,551
<b>2020</b>	31,508	30,259	1,358	109	1,249	6,835	542	9,739
<b>Average</b>	<b>25,695</b>	<b>24,134</b>	<b>1,519</b>	<b>(42)</b>	<b>1,561</b>	<b>5,246</b>	<b>418</b>	<b>6,046</b>

**In District Losses**

<b>Year</b>	<b>District 10 Delivered</b>	<b>Los Fresnos Delivered</b>	<b>Olmito WSC Delivered</b>	<b>1838 Delivered</b>	<b>Other Customers Delivered</b>	<b>Lawn Water Delivered</b>	<b>Total Delivered</b>	<b>Acre-Feet</b>	<b>%</b>
<b>2014</b>	2,329	430	925		1,190	30	15,859	11,769	42.60%
<b>2015</b>	1,451	466	902		1,118	21	8,452	651	7.15%
<b>2016</b>	1,037	646	1,067		395	52	11,899	9,941	45.52%
<b>2017</b>	4,067	515	1,206	332	997	65	21,435	13,727	39.04%
<b>2018</b>	4,441	591	1,484	543	1,753	34	22,724	5,708	20.08%
<b>2019</b>	2,401	607	1,394	434	2,173	47	19,629	6,561	25.05%
<b>2020</b>	2,921	704	1,555	257	920	36	23,509	7,999	25.39%
<b>Average</b>	<b>2,664</b>	<b>565</b>	<b>1,219</b>	<b>392</b>	<b>1,221</b>	<b>41</b>	<b>17,812</b>	<b>8,051</b>	<b>29.26%</b>

### 3 Application Phase Seepage Testing

Seepage tests were performed on the canal to establish the losses due to seepage. Evaporation was estimated utilizing the “Monthly Reservoir Evaporation Rates for Texas, 1940 through 1965,” by the Texas Water Development Board, 1967. The Canal operates about 60 days out of the year. Each time the canal is filled to serve a customer, the volume of the canal is lost to seepage and evaporation.

The seepage estimate is presented in Table 2. The detailed test results are provided in Appendix “A”. The existing Saldaña Canal, when full, has a surface area of 2.5 acre feet and a volume of 6.1 acre feet. The measured seepage loss was 1.5 acre feet per day. In contrast, the proposed 24 inch pipeline has a volume of 0.27 acre feet and negligible losses. Figure 4 is a view of the Saldaña Canal on the day of the test. Figure 5 is a picture of the Saldaña Pump, which was eliminated from most of the service area.

**Table 2 Seepage and Evaporation Estimate**

Saldaña Canal Surface Area	2.49 Acres
Saldaña Canal Volume	6.06 Acre Feet
Average Depth	2.43 Feet
Measured Seepage	1.53 Acre Feet per Day
Estimated Evaporation during Irrigation Periods when Canal is full	4 Feet per year 0.011 Feet per Day
	0.03 Acre Feet per Day
Total Canal Losses when operating	1.56 Acre Feet per Day





**Figure 4 Saldaña Canal, Test Day.**



**Figure 5 Saldaña Pump to be replaced in Phase II.**

## 4 Bureau of Reclamation WaterSMART Funding

When the District filed the TWDB Application in September of 2014, it had planned on requesting USBR funding, under the WaterSMART WEEG, in the amount of \$300,000, to fund Phases I & II of the project, a resaca crossing for the Saldaña Canal to eliminate the Saldaña Pump Station. With the amount of \$300,000 requested from USBR the total project cost would be \$614,051.49.

When the District submitted the actual WaterSMART Grant application, it included additional project components in an effort to accomplish more USBR program objectives thus giving them a better chance to be awarded a grant. The additional components were a solar powered pump at the District's Second Lift Pump Station that feeds the Saldaña Canal and an outlet off the Main Canal to feed the US Fish and Wildlife Service as well as the Lower Rio Grande Valle National Wildlife Refuge, to benefit endangered species. Both of these components were added to develop a more competitive application, while also benefiting the District. The solar powered pump offered some power savings, while the Refuge outlet would increase the District's customer base. The total project budget and funding sources are provided in Table 3. The planned budget was for the TWDB to fund 48% of Phase I and the USBR to fund 49% (\$300,000) of the total project cost. The District was successful at acquiring the USBR grant, which ultimately delayed the project approximately one year.

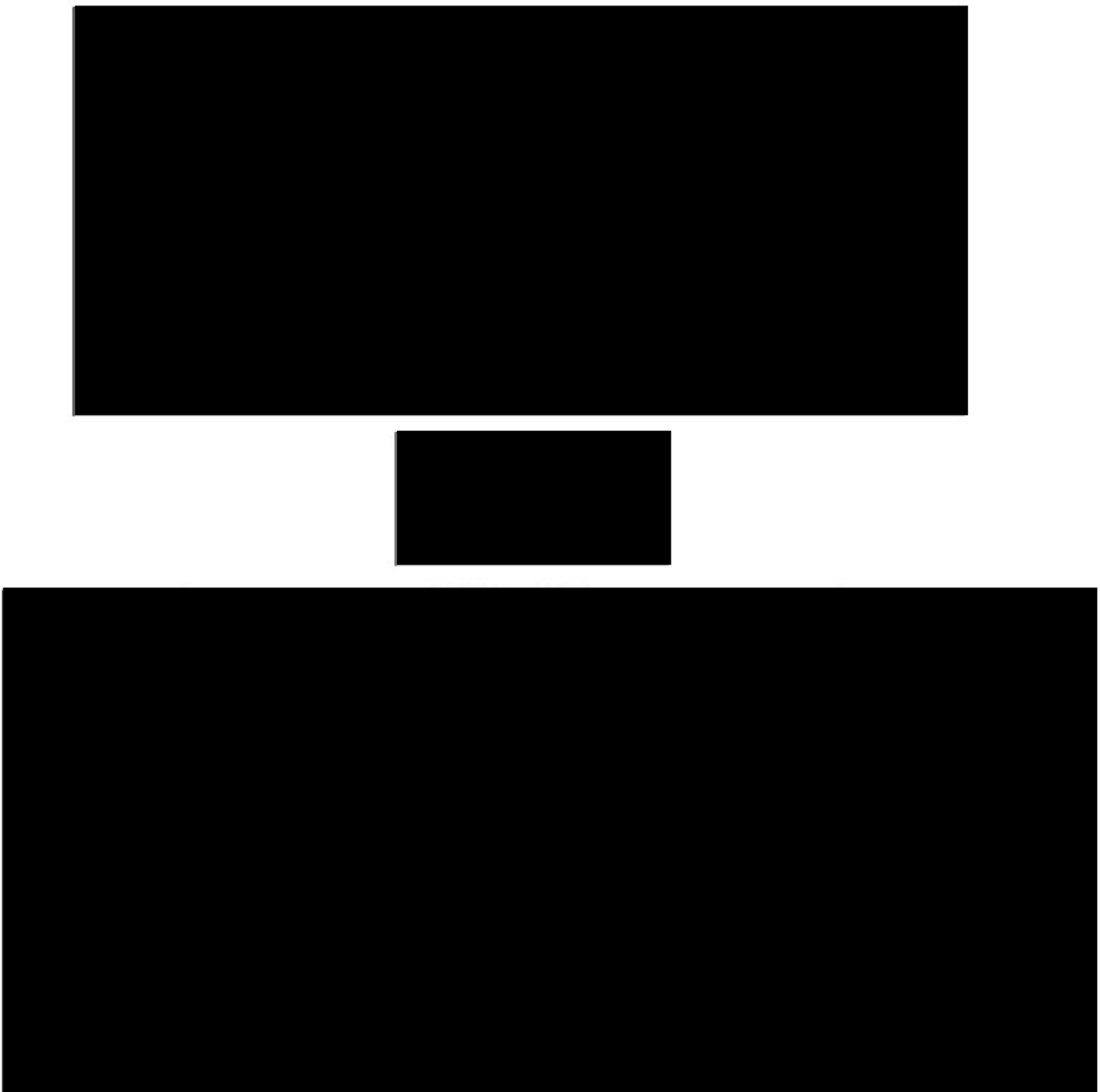
**Table 3 Project Budget and Funding Sources**

<b>Funding Source</b>	<b>Phase I Saldaña Canal</b>	<b>Phase II Saldaña Resaca Crossing and Solar Pump</b>	<b>Total Project</b>
<b>TWDB Funding Amount</b>	\$150,000	0	\$150,000
<b>Percentage</b>	48%	0	24%
<b>Cameron County Irrigation District No. 6 Funding Amount</b>	\$14,051	\$153,000	\$164,051
<b>Percentage</b>	3%	51%	27%
<b>US Bureau of Reclamation Funding Amount</b>	\$153,000	\$147,000	\$300,000
<b>Percentage</b>	49%	49%	49%
<b>Total Project</b>	<b>\$317,051</b>	<b>\$300,000</b>	<b>\$614,051</b>

## 5 Design Phase

The design of the Saldaña 24 inch pipeline was quite simple, replace the larger earthen canal with a 24 inch diameter polyvinyl chloride (PVC) pipe, rated for 80 pounds per square inch (psi) of internal pressure. A 24 inch line is rated for about 10 cubic feet per second, or about three farm outlets (commonly known as heads), operating at one time. The Saldaña Canal was formerly a main canal that was rerouted after an upstream aerial resaca crossing had failed.

Much of the conservation is derived from no longer having to fill such a large canal for such a small amount of flow. Figure 6 shows the cross section of the pre-existing canal and the 24 inch PVC pipeline used to replace the oversized canal.



**Figure 6 Placement of Saldaña Canal into Pipeline - Cross Sections**

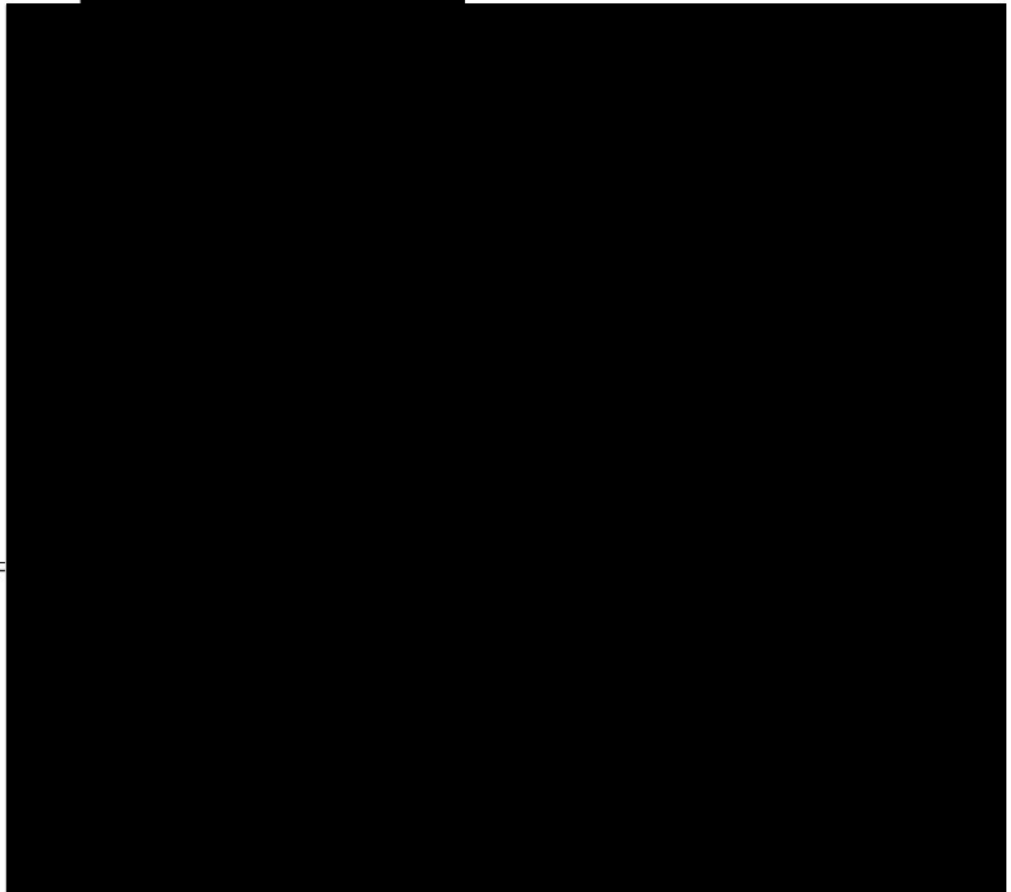
Existing farm outlets, out of the canal, were located by survey and an outlet at each location was incorporated into the construction plans for the new line. Generally outlets are constructed at irrigation wells or saddle outlets. The wells serve as surge relief, air release, pipeline access and canal gate location. Saddle outlets, typically fitted with an alfalfa overflow valve, serve as a location to regulate flow out of the pipeline to an outlet. Figure 7 is a typical well detail from the Saldaña construction plans while Figure 8 provides the saddle outlet detail. Figure 9 is an aerial overlay of the proposed pipeline and the upstream Resaca crossing.

The plans were designed for the District to construct the Saldaña Pipeline (Phase I) with District forces. The District had the capability in personnel and equipment, and Mr. Nieto has extensive experience constructing irrigation facilities. The plans were approved by the Texas Water Development Board, on July 25, 2016.

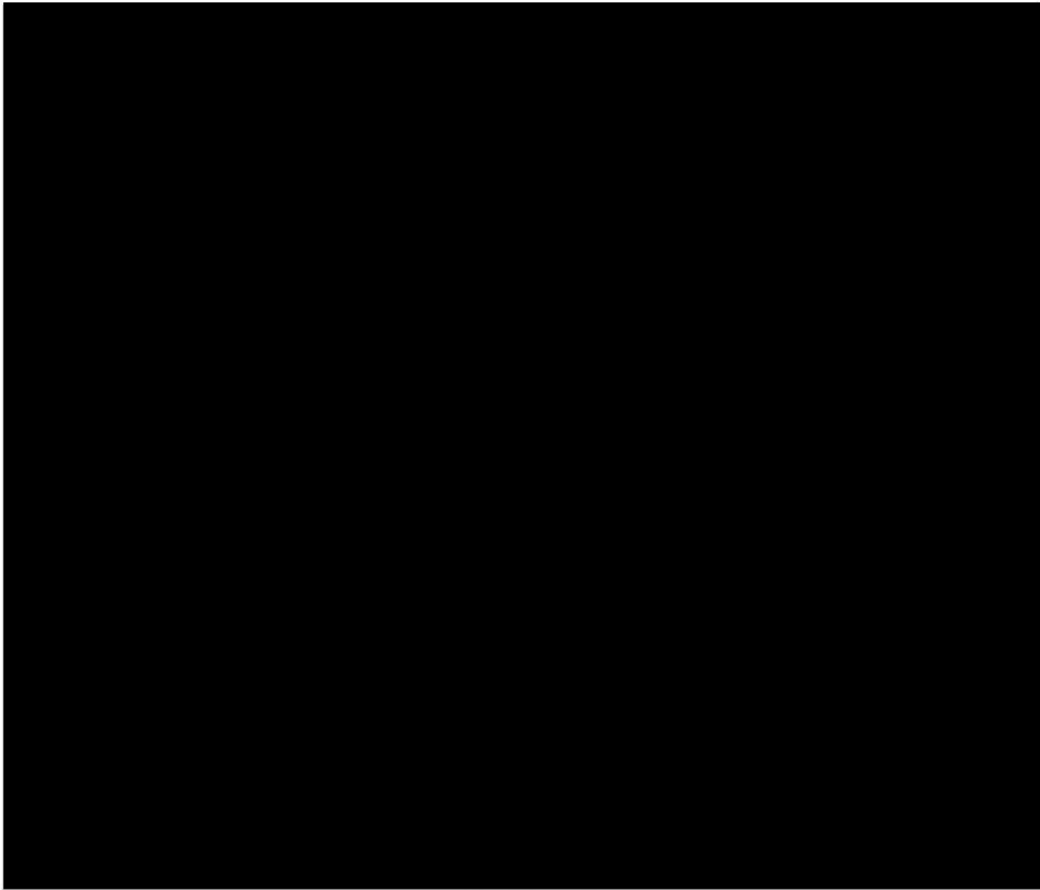
## **6 Construction Phase**

The District completed the project construction by the end of 2017. All of the pipeline was completed first, followed by construction of the wells, then the saddle outlets and alfalfa valves. Watering occurred during construction as demands required. The District utilized portions of the pipeline that were completed during the year 2017, in conjunction with the portions of the canal as required, depending on where the irrigation water was delivered.

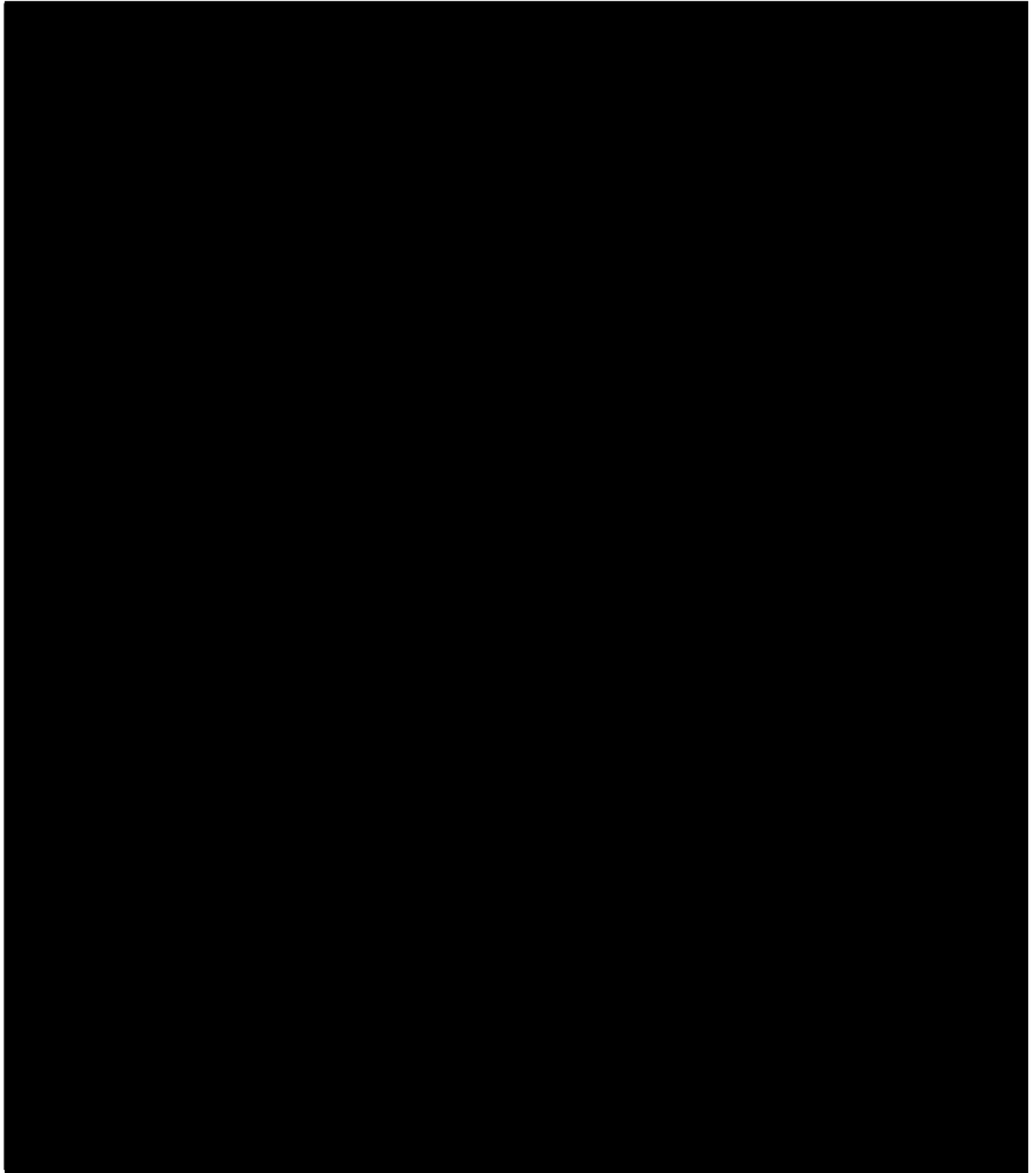
Figures 10 - 18 are progress photos through the construction of the pipeline. The pipeline was complete by the end of 2017 and connected to the Phase II Resaca Crossing. Portions of the new pipeline were in use during 2017, as available. The meter was installed by the end of June 2017.



**Figure 7 Typical Well Detail**



**Figure 8 Saddle Outlet Detail**



**Figure 9 Aerial Overlay of Proposed Pipeline**





**Figure 10 Photo, 7.25.16, clearing for the new pipeline. Pipe materials on site. Note the large open canal that is being replaced.**



**Figure 11 Photo, 11.2.16, laying new PVC pipeline. New PVC pipeline to replace the open canal.**





**Figure 12 Photo, 12.15.16, District crews laying pipeline. Westward view.**



**Figure 13 Photo, 12.15.16, District crews laying pipeline.**





**Figure 14 Photo, 2.17.17, rebar partially installed for saddle outlet.**



**Figure 15 Photo, 4.20.17, pipes being connected to east end well.**





**Figure 16 Photo, 8.29.17, foundation for well at station 0+73, prepared for well construction. 24 inch fused PVC directionally drilled under Resaca in background.**





**Figure 17 Photo, 10.27.17, District working on connection of new Resaca crossing to upstream Saldaña Canal.**



**Figure 18 Photo, 11.17.17, District working on connection of existing lateral to new Saldaña Canal.**

## 7 Conservation Results

The former Saldaña Canal was originally a main canal, which explains why it was so large, 6.06 acre feet. Each time the District needed to provide water to an irrigator in the area, they had to fill the canal and since the seepage was 1.5 acre feet per day, it would take about 4 days for the volume of water in the canal to seep out when irrigation was completed. The calculated conservation for each year, 2017 through 2020 are included in Appendix “B”. For each year, water ticket data, for lands irrigated with the new pipeline, that replaced the Saldaña Canal, are listed. The second portion of the table, for each year, provides an analysis of the duration the former canal would have contained water. The canal was filled a day before the time the field irrigation began and the canal had water for four days after the irrigation ceased. In addition, it would take about 50% longer to irrigate before the pipeline was installed, so an additional 50% duration is added to the water ticket data. When the ticket durations result in a time overlap, the end of irrigation is defaulted to the next ticket end date.

For the year 2017, the new pipeline was only half completed, so only half of the estimated conservation is utilized. Table 4 provides the conservation for each of the four analyzed years. The result is that the old canal was only about 46% efficient, in other words, 54% of the water was lost to seepage and evaporation in the canal. The overall improvement to District efficiency is about 1.5% from this project, which is significant. Over the past four years, the District conserved an average of 234 acre feet per year.

**Table 4 Conservation Results**

All units in acre feet.						
Year	Estimated losses in former Saldana Canal	Net irrigation water applied to crops	Former Canal efficiency %	Conservation in the Saldana System	Diversions for in District irrigation	Conservation as a percentage of total diversion for District
2017	153.8	205.8	40%	60%	18,739	0.8%
2018	268.6	179.5	40%	60%	13,804	1.9%
2019	187.6	95.5	34%	66%	13,586	1.4%
2020	171.3	314	65%	35%	15,694	1.1%
*Average	233.7	198.7	45%	55%	15,456	1.5%

\* Note: Average estimated losses includes 2 x 2017 since canal was only half replaced in that year.



The District was not able to utilize the meter for conservation estimates. This is due to the fact that there were several high blocks where leaving the Saldaña Pump Station in service would help increase the pressure to the high blocks, increasing the irrigation rate and efficiency. The high blocks are shown in Figure 3 (the hatched area). This method of utilizing the Saldaña pumps bypassed the meter resulting in the inability to use the meter to estimate conservation. Figure 19 is a photograph of the Saldaña Pump discharge line bypassing the meter.



**Figure 19 Saldaña Pump Discharge Bypassing Meter**

Table 5 compares the flow condition at the high block using various sizes of outlets and lay flat for irrigation. Current conditions is the elevation of the water surface at the Saldaña Pipeline before the upstream canal bank was restored. Resurfacing the canal bank (which has been completed) increased the energy by another foot. Utilizing the old Saldaña Pump as a booster increased the energy by another foot and provides an additional 45% flow. This is the reason the District utilized the Saldaña Booster, preventing the use of the meter for some irrigation from the new pipeline. The meter is, however, useful when the Saldaña Booster is not utilized and the District can measure flow rates and total flow per irrigation.

**Table 5 Hydraulic Modeling to High Blocks**

Flow in gpm (% of total energy loss in 18 inch conc. pipeline).

<b>Description of Field Piping</b>	<b>Current Conditions Available Energy = 0.4 ft.</b>	<b>Cuates Main Canal Bank Restored Available Energy = 1.0 ft.</b>	<b>Saldana Booster Available Energy = 2.0 ft.</b>	
12 inch Poly Outlet	420	685	988	
15 in Layflat		55%	63%	63%
15 in Poly Outlet	460	750	1,080	
18 inch Layflat		75%	74%	73%
18 inch Ply Outlet	475	775	1,115	
21 in Layflat		80%	79%	79%

The new pipeline results in the irrigation occurring much faster and the conservation methodology assumes that the irrigation used to take 50% longer through the old canal compared to the pipeline. This is because some of the flow was lost to seepage and the pressure from the canal was lower than the pipeline.

## 8 Project Cost

The final project cost for the portion funded by the TWDB, placement of the Saldaña Canal into pipeline, amounted to \$339,723. The TWDB share, a grant amount of \$150,000, amounted to 44%. The grant agreement was based on the TWDB paying for materials only. The reimbursements were based on 93.51% materials cost prorated per the Application budget total of \$164,051.49 for materials.

The final material cost was about \$20,000, under budget, at \$143,689.26. An amendment to the TWDB Grant Agreement, to reimburse the total grant amount of \$150,000, was executed to allow expenditures of the remaining TWDB funds on the Education Seminar and reporting.

The USBR funded 46% of the total project cost. Table 6 provides total funding for Phases I and II to provide context for how the USBR share applies to the Phase I project. The USBR Final Report is complete and available upon request.

**Table 6 Project Final Cost**

Source	Phase I	Phase II	Total
TWDB	\$150,000 44%		\$150,000 23%
USBOR	\$157,432 46%	\$140,568 46%	\$298,000 46%
CCID #6	\$32,291 10%	\$162,763 54%	\$195,054 30%
Total	\$339,723	\$303,331	\$643,054

## 9 Economic Analysis of Conservation

Table 7 presents an economic analysis of the project cost. The project resulted in the conservation of approximately 234 acre feet per year, over four years, from 2017 to 2020. The analysis is simple as it compares the cost of the project per acre foot conserved. The first column is that portion funded by the TWDB, Phase I, at a cost of \$339,723.00. The capital cost per acre foot conserved is \$1,452 per acre foot. The market rate per acre foot is approximately \$1,500 per acre foot of Rio Grande, Class A, irrigation rights; thus, the project was feasible. If one considers the energy conserved by not pumping the conserved water at the First Lift Pump Station, from the “New River Pump Station Engineering Report,” the energy conserved has a value of \$440 per year, based on \$0.13 per kilowatt hour at the First Lift. Capitalizing the energy savings, assuming an interest rate of 2%, the average rate the District may earn on its investments, over a period of 50 years; the life of the pipelines, adds a present value of the energy savings of \$13,822. The net project cost per acre foot, deducting capitalized energy savings, is \$1,393 per acre foot. This project is cost effective considering all funds, due to the expenditures being less than the value of the water conserved.

For Phase I, the District’s share of expenditures for the project was 10% of the total capital cost. The District, however, enjoys 100% of the power cost savings. Deducting the capitalized power cost savings from the District’s share of the capital cost and dividing it by the 234 acre feet conserved, yields a net capital cost, to the District, of \$80 per acre foot conserved. The annualized cost per acre foot conserved is only \$2.55 per acre foot, significantly less than the spot market rate of \$30 per acre foot. The District often sells surplus water at spot market rates, thus, this project will help them generate cash to accomplish further conservation projects and sell surplus water rights to municipal utilities.

Phase II, not funded by the TWDB, is more complicated. It is presented here because the TWDB was instrumental in leveraging USBR funds that funded part of Phase I. The District’s share of Phase I would have been 56% if not for the USBR grant. The grant included funding the resaca crossing, to eliminate the Saldaña Pump Station. The Saldaña Station is extremely inefficient, consuming approximately 70 kilowatt hours per acre foot pumped. The District did not completely eliminate the station because it is still utilized to more efficiently irrigate the high blocks.



The energy conservation estimate is based on 75% of the sum of the average conservation from the project, 234 acre feet, plus the irrigation water delivered, 199 acre feet (Table 4), about 325 acre feet. This saved the District about \$3,994, annually, by not running the Saldaña pumps for 75% of the water delivered through the former canal. The total capital cost per acre foot, including Phase II, was \$2,212 per acre foot. Considering the District's share of Phases I and II, less the capitalizing energy cost savings, yields a net capital cost per acre foot of \$279 per acre foot, while the annualized cost is \$8.86 per acre foot compared to the market capital rate of \$1,500 per acre foot, and the spot market rate of \$30 per acre foot. The project was well worth the expenditures to the District.

There are some additional benefits to the District not included in the financial analysis that are listed below:

- The District no longer has to mow or maintain the Saldaña Canal.
- The District and the irrigators save money on labor, as the tracts fed by the new pipeline water more efficiently.
- The District does not need to expend as much labor and fuel necessary to prime the Saldaña Pumps.
- The District has acquired a new customer in the USF&WS Lower Rio Grande Valley National Wildlife Refuge and assists them in their mission to benefit endangered species and restore wetland habitat.

**Table 7 Economic Analysis of Conservation**

	Phase I Saldana Canal	Phases I & II Saldana Canal, Solar Pump, and Refuge Outlet
Project Cost	\$339,723	\$643,054
Annual Conservation (Acre Feet)	234	234
Cost per Acre Foot Conserved	\$1,452	\$2,748
From the District's "New River Pump Station Engineering Report" the energy consumed at First Lift Pump Station in (kilowatt hours per acre foot conserved)	14.46	14.46
Annual Energy Conservation not pumping conserved water at First Lift Pump Station (Kilowatt Hours per year)	3,384	3,384
From the District's WaterSMART Application, Net annual energy conserved by elimination of Saldana Pump (kilowatt hours per ac foot pumped)		70.00
Annual water not pumped through Saldana Pump (acre feet)		325
Annual energy conservation not pumping through Saldana Pumps (kilowatt hours per year)		22,750
From the District's WaterSMART Application, annual energy conservation provide by solar pump (kilowatt hours per year)		4,593
Total annual energy conservation from energy improvements (Kilowatt hours per year)	3,384	30,727
Annual Energy Cost Savings at a long term Energy Cost of \$0.13 per kilowatt hour.	\$440	\$3,994
Capitalized Value of Energy Savings assuming 2% interest rate for a term of 50 Years	(\$13,822)	(\$125,520)
Net Project Capital Cost considering Capitalized Energy Savings	\$325,901	\$517,534
Net Capital Cost per Acre Foot Conserved	\$1,393	\$2,212
Estimated Market Value of irrigation water rights per acre foot.	\$1,500	\$1,500
District's Share of Expenditures	10%	30%
District's Share of Capital Cost less Capitalized Energy Savings	\$20,149.90	\$67,395.76
District's Share Net Capital Cost per Acre Foot Conserved	\$80	\$279
Annualized District's Share of Net Capital Cost per Acre Foot Conserved assuming 2% interest for a 50 year Life	\$2.55	\$8.86
Estimated Market Value of irrigation water (spot market) per acre foot.	\$30	\$30

## 10 Education Seminar

The District conducted the seminar on November 1 and 2 of 2018. A flier with the schedule and outline of the seminar, is included as Figure 20. The District invited its Board Members and farmers known to irrigate in the District. A few other District Managers that might have an interest were also invited to attend. An attendance list is included in Appendix “C”.

The first day of the seminar was held at the Harlingen Irrigation District, Rio Grande Center for Ag Water Efficiency, a facility funded by the Texas Water Development Board. The facility includes a classroom, where the seminar was held. The morning was dedicated to the Saldaña Canal Improvement Project, its water conservation goals and results. Due to the TWDB Grant, the District was able to leverage federal funds that expanded the project scope. A US Bureau of Reclamation WaterSMART Grant was obtained that funded a portion of the pipeline as well as a Resaca crossing to eliminate a pump station, a solar pump and an outlet for the US Fish & Wildlife Service Lower Rio Grande Valley Wildlife Refuge. The other components of the project were also discussed. The challenges presented by high blocks downstream of the pipeline were discussed, as well as the inability to meter flows to the high blocks. A power point of the morning’s presentation was submitted to the TWDB in January of 2019.

The afternoon presentation was conducted by Tom McLemore, General Manager for the Harlingen Irrigation District. Mr. McLemore was a key person at the Harlingen Irrigation District during development of the Rio Grande Center for Ag Water Efficiency; he did a great job on his presentation. Mr. McLemore’s presentation conveyed various types of meters in use at the District, their advantages and normal application. He then gave a tour of the testing facility and the Supervisor Control and Data Acquisition (SCADA) System that controls the facility. A few pictures of the facility and the seminar are included in Figures 21-25.

The morning of day two was conducted at the Brownsville Irrigation District Office. Mr. Arturo Cabello, Brownsville Irrigation District, Manager, and Mr. Andy Slovak, Field Operation Supervisor, conducted this session of the seminar. Mr. Cabello discussed water rate structure, SCADA System and metering practices. The District has successfully, and cost effectively, implemented a volumetric rate structure using strategically located meters, monitored by the SCADA System. A copy of the District’s volumetric rate structure was presented. The afternoon session, of day two, consisted of visiting the Brownsville pump station known as Unit 8 to review the field devices, as well as, the SCADA remote terminal unit and communication system.

**Cameron County Irrigation District No. 6  
Education Component for the Saldana Canal Improvements Project funded by a  
Texas Water Development Board Agricultural Water Conservation Grant**

You are invited to attend the District's Education Seminar as scheduled below.

Thursday, November 1, 2018  
Harlingen Irrigation District Rio Grande Center for Ag Water Efficiency  
South end of Trevino Rd, Los Indios, TX

10:00 AM Presentation on Water Conservation Project  
Frank A. Ferris, PE, President, Ferris, Flinn and Medina, LLC  
-Scope and Conservation Goals  
-Project Cost and Funding Sources  
-Project Implementation  
-Conservation Results  
-Reduction in Operating Cost

11:30 AM Lunch Catered on Site

12:30 PM Presentation on Metering Alternatives  
Tom McLemore, General Manager, Harlingen Irrigation District  
-Discussion on Metering Alternatives  
-Demonstration of Meters

Friday, November 2, 2018  
Brownsville Irrigation District  
6925 Coffee Port Road, Brownsville, TX

10:30 AM Presentation on Metering and Volumetric Billing for Irrigation Water  
Arturo Cabello, Jr., General Manager  
-Water Rate Structure  
-SCADA System and Metering Process

12:00 PM Lunch

1:30 PM Site Visit to Metering Site  
Andy Slovak, Field Supervisor  
-Metering Equipment  
-SCADA Communication  
-Operation and Maintenance  
-Contingency during Communication or Meter Failure

Please RSVP by Tuesday, October 30, 2018 by email to Patricia Munoz,  
pmunoz.ccid6@yahoo.com, or by telephone, 956 399-7186

**Figure 20 Education Seminar Flyer**





**Figure 21 Presentation on Metering Alternatives by Mr. Tom McLemore, in the Rio Grande Center for Ag Water Efficiency, funded by the TWDB.**



**Figure 22 Tour of the Rio Grande Center for Ag Water Efficiency.**





**Figure 23 SCADA System and volumetric billing for irrigation water, presentation by Mr. Andy Slovak, Brownville Irrigation District, Field Supervisor.**



**Figure 24 Unit 8 Pump Station, site visit with Mr. Andy Slovak. Attendees were able to observe the devices, including the meter and SCADA system, in use.**



**Figure 25 Unit 8 SCADA System panel and flow meter.**

In summary, the Education Seminar was very successful and met the requirements of the Texas Water Development Board, Contract No. 1513581821.

## **11 Conclusion**

The Cameron County Irrigation District No. 6 conserved an annual average of 234 acre feet per year by piping 3,800 linear feet of the Saldaña Canal, funded by a \$150,000 grant from the Texas Water Development Board. After considering energy cost savings, the District's net capital cost per acre foot of this portion of the project was \$80 per acre foot, much less than the current market rate of \$1,500 per acre foot of Rio Grande irrigation water rights.

The District was able to expand the project through a \$300,000 grant provided by the Bureau of Reclamation under their WaterSMART program, which resulted in significant energy savings, implemented solar power and provided water to the Lower Rio Grande Valley National Wildlife Refuge. The Bureau of Reclamation project included the energy conservation improvements that resulted in a net capital cost, to the District, per acre foot of \$279 per acre foot, also very economical when compared to the capital value of an irrigation water right. There were additional benefits to the project such as, lower operation and maintenance costs and conserved water available to other customers in the Lower Rio Grande Valley.

## **12 Acknowledgements**

The District personnel were quite instrumental in acquiring the information to compile the water use information. In addition, they performed all of the construction on the pipeline funded by the TWDB. The District farmers supplied by the Saldaña Canal were helpful in scheduling the shutdowns necessary to complete the work. The District Board of Directors and General Manager had the foresight to support this project, which placed a temporary strain on cash flow, but ultimately proved to be a very worthwhile endeavor.

## **13 References**

Texas Water Development Board, 1967, Monthly Reservoir Evaporation Rates for Texas 1940 through 1965

Ferris, F.A., 2013, New River Pump Station Engineering Report

Ferris, F.A., 2014, Application to the Texas Water Development Board for an Agricultural Irrigation System Improvement Grant

Ferris, F.A., 2016, WaterSMART Grant, Final Report

Ferris, F.A., 2019, Letter on Education Seminar

Ferris, F.A., 2019, Construction Completion and Annual Conservation Report 2017 and 2018

## **14 Appendix**



**Test Results for Saldana Canal West End on 9/5/2014**

Date & Time	ΔT	Water Surface Level Mark in Inches (Based on Yard Stick Stuck in Canal)	Seepage Loss in Inches	Approximate Water Surface Elevation in Feet	Canal Water Surface Width in Feet	Δvolume in cubic feet	Bucket Water Evaporation Losses Mark in Inches (Based on Yard Stick Stuck in Canal)	Bucket Water Evaporation Loss in Inches	Δvolume due to Evaporation in cubic feet	Approximate Bucket Water Surface Elevation in Feet	Canal Surface Area at Water Elevation 35.5 in Acres	Linear Feet of Canal	Approx. Water Loss (gallons per minute)
9/5/14 9:49		18.000		35.62	29.50		18.000			35.62	2.49	3,730	
	0.053		0.375			3,432.22		0.125	1,144.07				338
9/5/14 11:05		17.625		35.59	29.39		17.875			35.61	2.49	3,730	
	0.024		0.125			1,141.24		0.125	1,141.24				251
9/5/14 11:39		17.500		35.58	29.35		17.750			35.60	2.49	3,730	
	0.059		0.500			4,550.79		0.000	-				400
9/5/14 13:04		17.000		35.54	29.21		17.750			35.60	2.49	3,730	
	0.018		0.125			1,134.16		0.063	567.08				326
9/5/14 13:30		16.875		35.53	29.17		17.688			35.59	2.49	3,730	
	0.021		0.125			1,132.74		0.000	-				282
9/5/14 14:00		16.750		35.52	29.14		17.688			35.59	2.49	3,730	
	0.021		0.125			1,131.32		0.000	-				282
9/5/14 14:30		16.625		35.51	29.10		17.688			35.59	2.49	3,730	
	0.021		0.188			1,694.33		0.000	-				422
9/5/14 15:00		16.438		35.49	29.04		17.688			35.59	2.49	3,730	
	0.021		0.188			1,691.14		0.000	-				422
9/5/14 15:30		16.250		35.47	28.99		17.688			35.59	2.49	3,730	
	0.021		0.125			1,125.66		0.000	-				281
9/5/14 16:00		16.125		35.46	28.95		17.688			35.59	2.49	3,730	
<b>Total Time Change in Days</b>	<b>0.26</b>												
<b>Net Seepage Loss in Inches</b>	<b>1.88</b>												
<b>Net Seepage Loss in Feet per Day</b>	<b>0.61</b>												
<b>Net Seepage Loss in Acre Feet per Day</b>	<b>1.51</b>												
<b>Average Net Seepage Loss in Acre Feet Per Day</b>	<b>1.53</b>												
<b>Average Water Loss in gallons per minute</b>	<b>343.43</b>												
<b>Average Water Evaporation Loss in gallons per minute</b>	<b>57.51</b>												

**Test Results for Saldana Canal East End on 9/5/2014**

Date & Time	ΔT	Water Surface Level Mark in Inches (Based on Yard Stick Stuck in Canal)	Seepage Loss in Inches	Approximate Water Surface Elevation in Feet	Canal Water Surface Width in Feet	Δvolume due to Seepage in cubic feet	Bucket Water Evaporation Losses Mark in Inches (Based on Yard Stick Stuck in Canal)	Bucket Water Evaporation Loss in Inches	Δvolume due to Evaporation in cubic feet	Approximate Bucket Water Surface Elevation in Feet	Canal Surface Area at Water Elevation 35.5	Linear Feet of Canal	Approx. Canal Water Loss (gallons per minute)
9/5/14 10:38		20.000		35.62	29.50		20.000			35.12	2.49	3,730	
	0.029		0.250			2,289.56		0.000	-				408
9/5/14 11:20		19.750		35.60	29.43		20.000			35.12	2.49	3,730	
	0.021		0.125			1,142.66		0.000	-				285
9/5/14 11:50		19.625		35.59	29.39		20.000			35.12	2.49	3,730	
	0.061		0.500			4,556.46		0.000	-				387
9/5/14 13:18		19.125		35.55	29.24		20.000			35.12	2.49	3,730	
	0.017		0.125			1,135.57		0.000	-				354
9/5/14 13:42		19.000		35.54	29.21		20.000			35.12	2.49	3,730	
	0.024		0.063			567.26		0.000	-				125
9/5/14 14:16		18.938		35.53	29.19		20.000			35.12	2.49	3,730	
	0.020		0.188			1,699.64		0.000	-				438
9/5/14 14:45		18.750		35.52	29.14		20.000			35.12	2.49	3,730	
	0.021		0.250			2,261.23		0.000	-				564
9/5/14 15:15		18.500		35.50	29.06		20.000			35.12	2.49	3,730	
	0.021		0.063			564.42		0.000	-				141
9/5/14 15:45		18.438		35.49	29.04		20.000			35.12	2.49	3,730	
	0.021		0.188			1,691.14		0.000	-				422
9/5/14 16:15		18.250		35.47	28.99		20.000			35.12	2.49	3,730	
<b>Total Time Change in Days</b>	<b>0.23</b>												
<b>Net Seepage Loss in Inches</b>	<b>1.75</b>												
<b>Net Seepage Loss in Feet per Day</b>	<b>0.62</b>												
<b>Net Seepage Loss in Acre Feet per Day</b>	<b>1.55</b>												
<b>Average Net Seepage Loss in Acre Feet Per Day</b>	<b>1.53</b>												
<b>Average Water Loss in gallons per minute</b>	<b>353.09</b>												
<b>Average Water Evaporation Loss in gallons per minute</b>	<b>0.00</b>												

## 2017 Conservation

### Water Tickets

<u>Start</u>	<u>End</u>	<u>Days</u>	<u>Acres</u>	<u>Share/ Subdivision</u>	<u>Block</u>	<u>Crop</u>
2/15/2017	2/21/2017	6	12	Saldana	M	Orchard
2/28/2017	3/6/2017	6	32	Ramsey	12	Vegetables
3/31/2017	4/25/2017	25	55.3	Fresno	140	Cotton
3/31/2017	4/21/2017	21	61	12	V	Cotton
6/11/2017	6/23/2017	12	55.3	Fresno	140	Cotton
6/17/2017	6/23/2017	6	61	12	V	Cotton
6/27/2017	7/4/2017	7	12	Saldana	M	Orchard
7/21/2017	7/24/2017	3	61	12	V	Cotton
7/25/2017	8/3/2017	9	50	Fresno	140	Cotton
8/25/2017	9/6/2017	<u>12</u>	<u>12</u>	Saldana	M	Orchard
		107	411.6			

Based on Table 3 from the TWDB Application, the Old Canal lost 1.53 acre feet per day to seepage and has a volume of 6.06 acre feet, so 1 day is needed to fill the canal, irrigation duration increased by 50% to account for seepage during irrigation and 4 days is added to each run to account for water held in canal to seep out. In Addition, annual net evaporation of 4.0 feet, amounting to .027 acre feet per day, is added to the seepage to arrive at total losses.

Start to fill canal	End of Irrigation	Duration +50% Plus 4 Days	Canal Seepage (Days)	Seepage @ 1.53 AF/day
2/14/2017	4/25/2017	6/3/2017	109	166.77
6/10/2017	7/4/2017	7/20/2017	40	61.2
7/20/2017	8/3/2017	8/14/2017	25	38.3
8/24/2017	9/6/2017	9/16/2017	<u>23.5</u>	<u>36.0</u>
			<b>197.5</b>	<b>302.2</b>

Estimated Seepage that would have occurred in former Saldana Canal	302.2 Acre Feet
Evaporation at .027 acre feet per day	5.3 Acre Feet
Total Canal Losses to Seepage and Evaporation	307.5 Acre Feet
Net Crop Applied @ 6"/Ac.	205.8 Acre Feet
Total Annual Water Use before Improvements	513.3 Acre Feet
Saldana Canal Efficiency	40%

Since the project was about half completed in Year 2017 and the canal was about half removed as the project was ongoing, conservation is estimated to be about half of the total preconstruction seepage.

**Estimated Conservation in 2017** **154 Acre Feet**

**Conservation in the Saldana System =** **30%**

Total Diversions for CCID #6 in 2017 18,739 Acre Feet

**2017 Conservation as a percentage of  
District Total Diversion** **0.8%**

01/12/2018

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
 RIO GRANDE WATER DIVISION - LOWER  
 MONTHLY REPORT STATEMENT  
 FOR THE PERIOD OF 11/26/2017 - 12/30/2017

**COPY**

10:00 AM

**Adjudication Certificate:** 0829-000

**Authorized Water Right:** 49,564.6750

**Owner name:** CC I.D. #6

**Storage Limit:** 69,886.1918

**Diverter name:** CC I.D. #6

**Use Type:** MUL

CC I.D. #6  
 PO BOX 295  
 LOS FRESNOS TX 78566-0295

Previous Month Summary	
UB: 31,475.3194	YTD: 16,397.3556
CB: 0.0000	YTD: 0.0000
SB: 69,886.1918	NC YTD: 2,341.9015
SOLD: 1,692.0000	

2017 YEAR END

**New Balances**

TOTAL DIVERSIONS = ↓ + ↓ = 18,739 AF

	Useable	Storage	Contract	AWR Ytd	NC Ytd	Sold Ytd	Cntrct Ytd
	31,475.3194	69,886.1918	0.0000	16,397.3556	2,341.9015	1,692.0000	0.0000

**Transactions**

Code	Useable	Storage	Contract	AWR Wtr	NC Wtr	Sold Wtr	Cntrct Wtr
ADJUST	409.0019	409.0019	0.0000	-409.0019	0.0000	0.0000	0.0000
DIVERT	-409.0019	-409.0019	0.0000	409.0019	0.0000	0.0000	0.0000
<b>Totals:</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>

**Falcon and Amistad Reservoir Information**

In Falcon and Amistad Reservoirs (66.18%)	2,244,856.0000 AF
Dead Storage	4,600.0000 AF
Reserved for Municipal / Domestic / industrial	225,000.0000 AF
Reserved for Lower Rio Grande	1,585,597.9072 AF
Allocation for Lower Rio Grande	78,156.2673 AF
Reserved for Middle Rio Grande	249,763.8237 AF
Allocation for Middle Rio Grande	1,252.9910 AF
Reserved for Operational Uses	75,000.0000 AF
Unallocated Water	25,485.0107 AF

**Comments**

ALLOCATION RATES: Class A = 0.066048222 \* \* \* Class B = 0.038851895

Rio Grande WAC Meeting on Tuesday, February 6, 2018 @ 1:30 PM at the TCEQ Harlingen Regional Office. Conference call is available - Toll Free Access Number: 1-844-368-7161 then Enter Participant Pass Code: 176075 #  
 January 15th is a State Holiday. The office will be closed.  
 The next monthly report period ends on January 27, 2018.

Jose G. Luna  
 Rio Grande Watermaster

**2018 Conservation**

## Water Tickets

<u>Start</u>	<u>End</u>	<u>Days</u>	<u>Acres</u>	<u>Share/ Subdivision</u>	<u>Block</u>	<u>Crop</u>
3/16/2018	3/20/2018	4	12	Saldana	M	Orchard
3/21/2018	3/30/2018	9	22	12	V	Grain
4/3/2018	4/23/2018	20	61	12	V	Grain
4/3/2018	4/23/2018	20	55	Fresno	140	Grain
4/18/2018	4/27/2018	9	22	12	V	Grain
5/4/2018	5/6/2018	2	3	Ramsey	V	Pasture
5/15/2018	5/20/2018	5	55	Fresno	140	Grain
5/18/2018	5/24/2018	6	32	Ramsey	V	Cotton
5/18/2018	5/25/2018	7	59	12	V	Grain
5/29/2018	6/1/2018	3	12	Saldana	M	Orchard
6/4/2018	6/6/2018	2	4	Saldana	M	Pasture
6/14/2018	6/15/2018	1	2	12	X	Ground
8/7/2018	8/9/2018	2	4	Saldana	M	Pasture
8/13/2018	8/17/2018	4	12	Saldana	M	Orchard
8/30/2018	9/2/2018	3	4	Saldana	M	Pasture
		<b>97</b>	<b>359</b>			

Based on Table 3 from the TWDB Application, the Old Canal lost 1.53 acre feet per day to seepage and has a volume of 6.06 acre feet, so 1 day is needed to fill the canal, irrigation duration increased by 50% to account for seepage during irrigation and 4 days is added to each run to account for water held in canal to seep out. In Addition, annual net evaporation of 4.0 feet, amounting to .027 acre feet per day, is added to the seepage to arrive at total losses.

Start to fill canal	End of Irrigation	Duration +50% Plus 4 Days	Canal Seepage @ Seepage (Days)	1.53 AF/day
3/15/2018	6/15/2018	8/4/2018	142	217.26
8/6/2018	8/17/2018	8/26/2018	20.5	31.365
8/29/2018	9/2/2018	9/8/2018	10	15.3
			<b>172.5</b>	<b>263.925</b>

Estimated Seepage that would have occurred in former Saldana Canal	263.9 Acre Feet
Evaporation at .027 acre feet per day	4.7 Acre Feet
Total Canal Losses to Seepage and Evaporation	268.6 Acre Feet
Net Crop Applied @ 6"/Ac.	179.5 Acre Feet
Total Annual Water Use before Improvements	448.1 Acre Feet
Saldana Canal Efficiency had it existed in 2018	40%
<b>Estimated Conservation in 2018</b>	<b>269 Acre Feet</b>
<b>Conservation in the Saldana System =</b>	<b>60%</b>
Total Diversions for CCID #6 in 2018	13,804 Acre Feet
<b>2018 Conservation as a percentage of District Total Diversion</b>	<b>1.9%</b>



01/16/2019

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
 RIO GRANDE WATER DIVISION - LOWER  
 MONTHLY REPORT STATEMENT  
 FOR THE PERIOD OF 11/25/2018 - 12/29/2018

**COPY** 10:00 AM

**Adjudication Certificate:** 0829-000

**Authorized Water Right:** 49,564.6750

**Owner name:** CC I.D. #6

**Storage Limit:** 69,886.1918

**Diverter name:** CC I.D. #6

**Use Type:** MUL

CC I.D. #6  
 PO BOX 295  
 LOS FRESNOS TX 78566-0295

**Previous Month Summary**  
 UB: 36,120.5599 YTD: 12,355.1151  
 CB: 0.0000 YTD: 0.0000  
 SB: 69,886.1918 NC YTD: 994.7480  
 SOLD: 1,189.0000

2018 YEAR END

**New Balances**

TOTAL DIVERSIONS = ↓ + ↓ = 13,804

	Useable	Storage	Contract	AWR Ytd	NC Ytd	Sold Ytd	Contract Ytd
	35,566.7186	69,886.1918	0.0000	12,808.9564	994.7480	1,189.0000	0.0000

**Transactions**

Code	Useable	Storage	Contract	AWR Wtr	NC Wtr	Sold Wtr	Contract Wtr
ADJUST	185.6525	185.6525	0.0000	-185.6525	0.0000	0.0000	0.0000
ALLOC	0.0000	553.8413	0.0000	0.0000	0.0000	0.0000	0.0000
DIVERT	-639.4938	-639.4938	0.0000	639.4938	0.0000	0.0000	0.0000
SELL	-100.0000	-100.0000	0.0000	0.0000	0.0000	100.0000	0.0000
<b>Totals:</b>	<b>-553.8413</b>	<b>0.0000</b>	<b>0.0000</b>	<b>453.8413</b>	<b>0.0000</b>	<b>100.0000</b>	<b>0.0000</b>

**Falcon and Amistad Reservoir Information**

In Falcon and Amistad Reservoirs (63.67%)	2,159,731.0000 AF
Dead Storage	4,600.0000 AF
Reserved for Municipal / Domestic /Industrial	225,000.0000 AF
Reserved for Lower Rio Grande	1,487,322.8622 AF
Allocation for Lower Rio Grande	95,719.9258 AF
Reserved for Middle Rio Grande	229,256.3056 AF
Allocation for Middle Rio Grande	12,773.0672 AF
Reserved for Operational Uses	75,000.0000 AF
Unallocated Water	30,058.8392 AF

**Comments**

ALLOCATION RATES: Class A = 0.085660019 \* \* \* Class B = 0.050388246

\*\*\*\*\* PRACTICE WATER CONSERVATION \*\*\*\*\*

Pay assessments fees promptly. Delinquent accounts are not authorized to divert water.

Pump Operation Reports are due within 5 days after the end of the certification period. Please submit reports promptly.

January 21st is a State Holiday. The office will be closed.  
 The next monthly report period ends on January 26, 2019.

Jose G. Luna - Rio Grande Watermaster



**CCID #6 Saldana Canal Improvement Project  
2019 Conservation**

Water Tickets

<u>Start</u>	<u>End</u>	<u>Days</u>	<u>Acres</u>	<u>Share/ Subdivision</u>	<u>Block</u>	<u>Crop</u>
3/15/2019	3/22/2019	7	32	Ramsey	V	Cotton
4/30/2019	5/4/2019	4	12	Saldana	M	Orchard
5/1/2019	5/8/2019	7	4	Saldana	M	Pasture
5/27/2019	6/19/2019	23	22	Fresno	140	Cotton
5/29/2019	6/19/2019	21	53	12	V	Cotton
5/26/2019	5/29/2019	3	4	Saldana	M	Pasture
7/15/2019	7/27/2019	12	48	Fresno	140	Cotton
8/12/2019	8/15/2019	3	12	Saldana	M	Orchard
8/21/2019	8/23/2019	2	4	Saldana	M	Pasture
		<b>82</b>	<b>191</b>			

Based on Table 3 from the TWDB Application, the Old Canal lost 1.53 acre feet per day to seepage and has a volume of 6.06 acre feet, so 1 day is needed to fill the canal, irrigation duration increased by 50% to account for seepage during irrigation and 4 days is added to each run to account for water held in canal to seep out. In Addition, annual net evaporation of 4.0 feet, amounting to .027 acre feet per day, is added to the seepage to arrive at total losses.

Start to fill canal	End of Irrigation	Duration +50% Plus 4 Days	Canal Seepage @ Seepage (Days)	1.53 AF/day
3/14/2019	3/22/2019	3/30/2019	16	24.48
4/29/2019	5/8/2019	5/16/2019	17.5	26.775
5/25/2019	6/19/2019	7/5/2019	41.5	63.495
7/14/2019	7/27/2019	8/6/2019	23.5	35.955
8/11/2019	8/23/2019	9/2/2019	22	33.66
			<b>120.5</b>	<b>184.365</b>

Estimated Seepage that would have occurred in former Saldana Canal	184 Acre Feet
Evaporation at .027 acre feet per day	3.3 Acre Feet
Total Canal Losses to Seepage and Evaporation	187.6 Acre Feet
Net Crop Applied @ 6"/Ac.	95.5 Acre Feet
Total Annual Water Use before Improvements	283.1 Acre Feet
Saldana Canal Efficiency had it existed in 2019	34%

**Estimated Conservation in 2019** **188 Acre Feet**

**Conservation in the Saldana System = 66%**

Total Diversions for CCID #6 in 2019 13,586 Acre Feet

**2019 Conservation as a percentage of District Total Diversion 1.4%**

01/10/2020

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
 RIO GRANDE WATER DIVISION - LOWER  
 MONTHLY REPORT STATEMENT  
 FOR THE PERIOD OF 12/01/2019 - 12/28/2019

10:00 AM

Adjudication Certificate: 0829-000

Class: A

Authorized Water Right: 49,564.6750

Owner name: CC I.D. #6

Storage Limit: 69,886.1918

Diverter name: CC I.D. #6

Use Type: MUL

CC I.D. #6  
 PO BOX 295  
 LOS FRESNOS TX 78566-0295

Previous Month Summary	
UB: 34,630.1087	YTD: 12,532.5663
CB: 0.0000	YTD: 302.0000
SB: 65,573.4266	NC YTD: 848.8186
SOLD: 2,432.0000	

2019 YEAR END

**New Balances**

TOTAL DIVERSIONS = ↓ + ↓ = 13,586

Useable	Storage	Contract	AWR Ytd	NC Ytd	Sold Ytd	Cntrct Ytd
34,395.3342	66,896.5418	0.0000	12,737.3408	848.8186	2,432.0000	302.0000

**Transactions**

Code	Useable	Storage	Contract	AWR Wtr	NC Wtr	Sold Wtr	Cntrct Wtr
ADJUST	215.1056	215.1056	0.0000	-215.1056	0.0000	0.0000	0.0000
ALLOC	0.0000	1,557.8897	0.0000	0.0000	0.0000	0.0000	0.0000
DIVERT	-419.8801	-419.8801	0.0000	419.8801	0.0000	0.0000	0.0000
SELL	-30.0000	-30.0000	0.0000	0.0000	0.0000	30.0000	0.0000
<b>Totals:</b>	<b>-234.7745</b>	<b>1,323.1152</b>	<b>0.0000</b>	<b>204.7745</b>	<b>0.0000</b>	<b>30.0000</b>	<b>0.0000</b>

**Falcon and Amistad Reservoir Information**

In Falcon and Amistad Reservoirs (55.38%)	1,878,415.0000 AF
Dead Storage	4,600.0000 AF
Reserved for Municipal / Domestic /Industrial	225,000.0000 AF
Reserved for Lower Rio Grande	1,303,972.7044 AF
Allocation for Lower Rio Grande	44,544.3553 AF
Reserved for Middle Rio Grande	218,872.9535 AF
Allocation for Middle Rio Grande	5,379.2596 AF
Reserved for Operational Uses	75,000.0000 AF
Unallocated Water	1,045.7272 AF

**Comments**

ALLOCATION RATES: Class A = 0.031431452 \* \* \* Class B = 0.018489089

Pay assessment fees promptly. Delinquent accounts are not authorized to divert water.

Pump Operation Reports are due within 5 days after the end of the certification period. Please submit reports promptly.

January 20th is a State Holiday – The office will be closed.

The next monthly report period ends on January 25, 2020.

Jose G. Luna  
 Rio Grande Watermaster

**CCID #6 Saldana Canal Improvement Project  
2020 Conservation**

Water Tickets

<u>Start</u>	<u>End</u>	<u>Days</u>	<u>Acres</u>	<u>Share/ Subdivision</u>	<u>Block</u>	<u>Crop</u>
2/12/2020	2/27/2020	15	172	Fresnos	187	Grain
2/12/2020	2/28/2020	16	60	12	V	Grain
2/12/2020	2/28/2020	16	48	Fresnos	140	Grain
3/12/2020	3/18/2020	6	4	Saldana	M	Vegetables
3/27/2020	3/31/2020	4	12	Saldana	M	Orchard
4/15/2020	4/19/2020	4	34	Fresnos	62	Grain
4/18/2020	5/1/2020	13	172	Fresnos	187	Grain
4/19/2020	4/30/2020	11	58	Fresno	138	Grain
4/24/2020	5/2/2020	8	48	Fresnos	140	Grain
4/21/2020	4/23/2020	2	4	Saldana	M	Hay
5/7/2020	5/12/2020	5	12	Saldana	M	Orchard
8/28/2020	8/30/2020	2	4	Saldana	M	Hay
		<b>102</b>	<b>628</b>			

2020 Conservation (continued)

Based on Table 3 from the TWDB Application, the Old Canal lost 1.53 acre feet per day to seepage and has a volume of 6.06 acre feet, so 1 day is needed to fill the canal, irrigation duration increased by 50% to account for seepage during irrigation and 4 days is added to each run to account for water held in canal to seep out. In Addition, annual net evaporation of 4.0 feet, amounting to .027 acre feet per day, is added to the seepage to arrive at total losses.

Start to fill canal	End of Irrigation	Duration +50% Plus 4 Days	Canal Seepage @ Seepage (Days)	1.53 AF/day
2/11/2020	2/28/2020	3/11/2020	29.5	45.135
3/11/2020	3/18/2020	3/25/2020	14.5	22.185
3/26/2020	3/31/2020	4/6/2020	11.5	17.595
4/14/2020	5/12/2020	5/30/2020	46	70.38
8/27/2020	8/30/2020	9/4/2020	8.5	13.005
			<b>110</b>	<b>168.3</b>

Estimated Seepage that would have occurred	168 Acre Feet
Evaporation at .027 acre feet per day	3.0 Acre Feet
Total Canal Losses to Seepage and Evaporation	171.3 Acre Feet
Net Crop Applied @ 6"/Ac.	314.0 Acre Feet
Total Annual Water Use before Improvements	485.3 Acre Feet
Saldana Canal Efficiency had it existed in 2020	65%

**Estimated Conservation in 2020** **171 Acre Feet**

**Conservation in the Saldana System = 35%**

Total Diversions for CCID #6 in 2020	15,694 Acre Feet
<b>2020 Conservation as a percentage of</b>	<b>1.1%</b>

01/15/2021

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
RIO GRANDE WATER DIVISION - LOWER  
MONTHLY REPORT STATEMENT  
FOR THE PERIOD OF 11/29/2020 - 12/26/2020

10:00 AM

**Adjudication Certificate:** 0829-000**Class:** A**Authorized Water Right:** 49,148.6745**Owner name:** CC I.D. #6**Storage Limit:** 69,299.6310**Diverter name:** CC I.D. #6**Use Type:** MUL

CC I.D. #6  
PO BOX 295  
LOS FRESNOS TX 78566-0295

**Previous Month Summary**

UB: 29,541.6545 YTD: 13,955.0282  
CB: 0.0000 YTD: 640.0000  
SB: 66,564.0047 NC YTD: 1,358.4005  
SOLD: 9,251.9918

**New Balances**

$$2020 = AWR YTD + NC YTD = 15,694$$

	Useable	Storage	Contract	AWR Ytd	NC Ytd	Sold Ytd	Contract Ytd
	25,560.7265	64,165.7361	0.0000	14,335.9562	1,358.4005	9,251.9918	640.0000

**Transactions**

Code	Useable	Storage	Contract	AWR Wtr	NC Wtr	Sold Wtr	Contract Wtr
ADJUST	162.3220	162.3220	0.0000	-162.3220	0.0000	0.0000	0.0000
ALLOC	0.0000	1,582.6594	0.0000	0.0000	0.0000	0.0000	0.0000
DIVERT	-543.2500	-543.2500	0.0000	543.2500	0.0000	0.0000	0.0000
SELL	-3,600.0000	-3,600.0000	0.0000	0.0000	0.0000	3,600.0000	0.0000
<b>Totals:</b>	<b>-3,980.9280</b>	<b>-2,398.2686</b>	<b>0.0000</b>	<b>380.9280</b>	<b>0.0000</b>	<b>3,600.0000</b>	<b>0.0000</b>

**Falcon and Amistad Reservoir Information**

In Falcon and Amistad Reservoirs (48.45%)	1,643,309.0000 AF
Dead Storage	4,600.0000 AF
Reserved for Municipal / Domestic / industrial	225,000.0000 AF
Reserved for Lower Rio Grande	1,120,720.2209 AF
Allocation for Lower Rio Grande	45,511.7682 AF
Reserved for Middle Rio Grande	166,802.5149 AF
Allocation for Middle Rio Grande	5,421.8325 AF
Reserved for Operational Uses	75,000.0000 AF
Unallocated Water	252.6635 AF

**Comments**

ALLOCATION RATES: Class A = 0.032201467\* \* \* Class B = 0.018942039

Pay assessment fees promptly. Delinquent accounts are not authorized to divert water.

Pump Operation Reports are due within 5 days after the end of the certification period. Please submit reports promptly.

The office will be closed on Monday, January 18, 2021, in observance of Dr. Martin Luther King, Jr. Day.

The next monthly report period ends on January 30, 2021.

Jose G. Luna  
Rio Grande Watermaster



## Cameron County Irrigation District No. 6

Education Component for the Saldana Canal Improvements Project funded by a  
Texas Water Development Board Agricultural Water Conservation Grant

Thursday, November 1, 2018

10:00 AM Presentation on Water Conservation Project

Name	Organization	Email
Frank Ferris	Ferris Flinn + Medina	
Antonio Caballo	Brownsville I.D	
Ray L. Lopez	CCWD #4	
Jerry Bruce	CCWD #6	
Carlos Luna	Ferris, Flinn + Medina	
Tito Nieta	CCID #4	
Andrew P Shouk	BID	
Tom McLemore	HID	
David Saucedo	HIDCC1	
Alexander Campos	Kellis Flinn & Medina	
David Flinn	FFM	
Samuel Flores	FFM LLC	
Patricia D. Murray	CCID #6	



Draft Final Report Comments Cameron County ID No. 6 Contract #1513581821

- Please remove check-in sheet with personal email information or redact emails (Appendix C)