

Texas Water Development Board



City of McAllen

CWSRF GREEN PROJECT RESERVE BUSINESS CASE EVALUATION

STATE FISCAL YEAR 2012 INTENDED USE PLAN

PROJECT NUMBER 73640

COMMITMENT DATE: September 20, 2012

DATE OF LOAN CLOSING: September 26, 2013

Green Estimate at closing is \$ 7,687,630

Subsidy awarded for Green components, (if any) \$1,153,551

Texas Water Development Board

P.O. Box 13231, 1700 N. Congress Ave.
Austin, TX 78711-3231, www.twdb.state.tx.us
Phone (512) 463-7847, Fax (512) 475-2053

November 9, 2011

Mr. Timothy E. Skoglund, P.E.
McAllen Public Utility
P.O. Box 220
McAllen, TX 78505-0220

**Re: State Fiscal Year 2012 Clean Water State Revolving Fund
Green Project Eligibility**

Dear Mr. Skoglund:

The Texas Water Development Board (TWDB) received Green Project Information Worksheets from the McAllen Public Utility (Utility) for project #9437 in response to a request letter dated August 24, 2011. The letter states that the Utility is eligible for loan forgiveness in an amount up to 15% of the green component cost if it can demonstrate that the project has green costs that are greater than or equal to 30% of the total project cost. After reviewing the worksheets, TWDB staff determined the Utility meets the 30% green cost threshold based on the following:

- The Utility's Green Project Information Worksheets dated November 1, 2011 requested that \$7,810,666 of the Utility's total unrounded IUP project cost of \$7,951,660 be considered eligible for the CWSRF Green Project Reserve (GPR). The green elements described include construction of a 2 MGD reuse water pump station, a UV disinfection system at the Utility's South WWTP and 34,100 feet of reuse pipeline.
- The Environmental Protection Agency's (EPA's) *Green Project Reserve Guidance for Determining Project Eligibility* (TWDB-0161) lists recycling and water reuse projects such as reuse distribution systems that replace potable sources with non-potable sources as categorically eligible for the GPR (Part A, 2.2-6).
- The Environmental Protection Agency's (EPA's) *Green Project Reserve Guidance for Determining Project Eligibility* (TWDB-0161) also lists environmentally innovative projects such as innovative treatment technologies that significantly reduce or eliminate the use of chemicals in wastewater treatment as business case eligible for the GPR (Part A, 4.5-5a).
- Information presented on the Green Project Information Worksheets and its attachments provided sufficient information to confirm the eligibility of the proposed Effluent Reuse Distribution System for the GPR in accordance with TWDB-0161, Part A, 2.2-6 and the UV Disinfection System for the GPR in accordance with TWDB-0161, Part A, 4.5-5a.

Our Mission : Board Members

To provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas

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Timothy E. Skoglund

November 9, 2011

Page 2

- Therefore, at this time, the TWDB considers project costs in the amount of \$7,810,666 (98%) to be eligible for the CWSRF GPR. This includes estimated construction costs in the amount of \$5,998,353 and a proportionate share of project engineering and financing costs.
- Please note that the Utility's application for financial assistance must be consistent with the project scope presented on the Green Project Information Worksheets. Inclusion of the green elements within the project will be verified prior to TWDB commitment.

For SFY 2012, the TWDB is required by federal law to allocate no less than 20% of the capitalization grant toward green component costs (herein referred to as the Green Project Reserve). Therefore, the TWDB gives first preference for invitations to entities that have a documented percentage of green component cost of at least 30% of the total project cost. The Utility has demonstrated that it meets/exceeds the 30% green cost threshold. A letter inviting the Utility to apply for Mainstream-Tier II funding with loan forgiveness will be sent separately.

If you have any questions regarding green project eligibility, please feel free to contact John Muras, Project Engineer, by phone at 512-463-1706 or by email at john.muras@twdb.state.tx.us.

The TWDB appreciates the McAllen Public Utility's interest in the CWSRF program.

Sincerely,



Stacy L. Barna
Director of Program Development
Program & Policy Development

SB:rf

- Attachments:
1. Green Project Information Worksheets, Approved
 2. Green Project Cost Summary

TEXAS WATER DEVELOPMENT BOARD

Green Project Reserve

Green Project Information Worksheets

**Clean Water State Revolving Plan
Intended Use Plan**

The Federal Appropriation Law for the current fiscal year Clean Water and Drinking Water State Revolving Fund programs contains the Green Project Reserve (GPR) requirement. The following Green Project Information Worksheets have been developed to assist TWDB Staff in verifying eligibility of potential GPR projects.

TWDB-0162
Revised 12/2/2010

TEXAS WATER DEVELOPMENT BOARD
CLEAN WATER STATE REVOLVING FUND (CWSRF)
GREEN PROJECT INFORMATION WORKSHEETS

PART I – GREEN PROJECT INFORMATION SUMMARY

Check all that apply and complete applicable worksheets:

Categorically Eligible

- Green Infrastructure \$ _____
- Water Efficiency \$4,220,351 _____
- Energy Efficiency \$ _____
- Environmentally Innovative \$ _____

Business Case Eligible

- Green Infrastructure \$ _____
- Water Efficiency \$ _____
- Energy Efficiency \$ _____
- Environmentally Innovative \$3,590,315 _____

Total Requested Green Amount \$7,810,666 _____

Total Requested Funding Amount \$7,810,666 _____

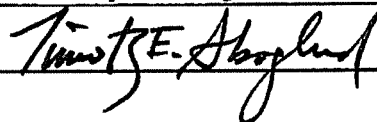
Type of Funding Requested:

- PAD (Planning, Acquisition, Design)
- C (Construction) Water Efficiency 2.2.6 (a) (b)

Completed by:

Name: Timothy E. Skoglund, P. E.

Title: Project Engineer

Signature: 

Date: November 1, 2011

**TEXAS WATER DEVELOPMENT BOARD
CLEAN WATER STATE REVOLVING FUND (CWSRF)
GREEN PROJECT INFORMATION WORKSHEETS**

PART II - CATEGORICALLY ELIGIBLE

Complete this worksheet for projects being considered for the Green Project Reserve (GPR) as categorically eligible. Categorically eligible projects or project components are described in the following sections of the EPA GPR guidance (TWDB-0161):

Green Infrastructure	Part A, Section 1.2
Water Efficiency	Part A, Section 2.2
Energy Efficiency	Part A, Section 3.2
Environmentally Innovative	Part A, Section 4.2

Information provided on this worksheet should be of sufficient detail and should clearly demonstrate that the proposed improvements are consistent with EPA and TWDB GPR guidance for categorically eligible projects. Refer to **Information on Completing Worksheets** for additional information.

Section 1 - General Project Information

Applicant: McAllen Public Utility PIF #: 9437

Project Name: Effluent Reuse System and UV Disinfection

Contact Name: Timothy E. Skoglund, P. E.

Contact Phone and e-mail: 956-681-1770 , tskoglund@mcallen.net

Total Project Cost: \$7,810,666 Green Amount: \$4,220,351
(Categorically Eligible)

Section 2 - Green Infrastructure

Brief Overall Project Description:

Effluent Reuse System and UV Disinfection. The project involves construction of a 2 MGD Reuse Water pump station and UV disinfection system at McAllen's South Wastewater Treatment Plant and 34,000 feet of a purple pipe distribution system to serve irrigation customers currently using potable water. This project has been adopted in the McAllen Public Utility Reuse Master Plan and improvements are consistent with an approved water plan. UV Disinfection is proposed to eliminate reliance on hazardous chlorine gas, but will also allow the existing chlorine contact tank to be converted to storage capacity for reuse pumping. An onsite bleach generator will provide residual disinfection to prevent biological fouling of the reuse pipeline. Project planning is underway for Reuse Pumping and UV Disinfection and the design is partially complete for the pipeline. Funding is requested for design of the reuse pumping and UV disinfection system and construction of all improvements.

Certain green infrastructure improvements are considered categorically eligible for the GPR according to EPA GPR guidance (TWDB-0161) Part A, Section 1.2. List categorically eligible green infrastructure contained within the project in the table below. Also provide a detailed description of the categorically eligible green infrastructure improvements. The detailed description should provide sufficient detail that clearly demonstrates that the proposed improvements are consistent with EPA GPR guidance (TWDB-0161).

Green Infrastructure Description	Project / Component Cost
Reuse Pump Station	\$906,757
On-Site Hypochlorite generator	\$485,422
Yard Piping	\$507,455
Reuse Pipeline	\$2,320,716
Total (including loan origination fee):	\$4,220,351

Detailed Description (attach additional pages if necessary):

Reuse water produced by the treatment process will be substituted for 2 MGD of potable water currently being used for irrigation, thereby conserving raw and potable water supplies and deferring the purchase additional water rights needed to meet growth. Expansion of Water Treatment Plant capacity is also deferred. Please refer to the attached excerpts from the Reuse Implementation Plan including a table of intended reuse customers. A map showing the recommended alignment for the reuse pipeline is also provided from a preliminary engineering report previously prepared for the reuse pipeline.

(See continuation of detailed description on next page under Section 3.1 of TWDB-0162)

Green amount associated with green infrastructure (categorically eligible): \$4,220,351

Section 3 - Water Efficiency

Certain water efficiency improvements may be considered categorically eligible for the GPR. Refer to EPA and TWDB GPR guidance for a complete list and description of categorically eligible GPR Projects. One such common type of water efficiency project is effluent reuse to replace potable water use. For this type of project, complete section 3.1 below. For any other water efficiency projects being considered for categorical eligibility, complete Section 3.2.

Section 3.1 - Wastewater Effluent Reuse

Briefly describe existing wastewater treatment and disposal system:

McAllen's South WWTP uses an extended aeration treatment process to provide secondary treatment for municipal wastewater flows. Disinfection is currently achieved using chlorine gas, and effluent is either discharged to the Arroyo Colorado or conveyed to a municipal golf course.

Green amount associated with effluent reuse (categorically eligible): \$4,220,351

Section 3.2 - Other Water Efficiency Improvements

Provide a detailed description of proposed effluent reuse facilities including all additional treatment and distribution improvements. Individually list, describe and provide costs for components such as treatment units, pumping facilities and distribution lines. Description should identify reuse users and quantify potable water saved (attach additional pages if necessary):

The Reuse Pump Station includes pumps, piping, structures, electrical and controls and civil work associated with pumping reuse water at transmission line pressures.

The On-site Hypochlorite Generator is needed to provide sodium hypochlorite disinfectant to prevent biological growth in the purple pipe system. It is a new component required because all use of gaseous chlorine is being eliminated in the conversion to UV disinfection. Sodium hypochlorite is not needed for any use other than disinfection residual for the reuse system.

Yard Piping is needed to divert effluent from the existing flow path to the new disinfection facilities. Because the reuse pumping will be incorporated within the UV disinfection structure, all yard piping costs have been assigned to the reuse system.

The Reuse Pipeline consists of 18" through 8" diameter purple pipe that will convey pressurized effluent from the reuse pump station to reuse customers. Since design costs for this portion of the project have already been incurred by MPU, they are not included in the amount requested for CWSRF funding.

The total project cost inclusive of loan origination fee is \$7,810,666 of which \$4,220,351 is associated with reuse system costs and therefore categorically green.

Complete this section for water efficiency improvements other than those listed above. Provide reference to the applicable sections of the EPA GPR guidance (TWDB-0161) that demonstrate GPR eligibility. Provide a detailed description of the proposed water efficiency improvements of sufficient detail that clearly demonstrates that the proposed improvements are consistent with EPA GPR guidance (TWDB-0161).

Guidance Reference:

EXECUTIVE SUMMARY

1.0 INTRODUCTION

McAllen Public Utility (MPU) initiated a planning effort to expand its existing water reuse program to meet future water resource needs. The Reuse Feasibility Study, Phase I, identified four feasible direct reuse alternatives based on an economic comparison to the future costs of new water and six other non-economic criteria. Recommendations from the Feasibility Study provided a path focused on tapping into the available reuse supply to meet McAllen's irrigation demands, see Figure E-1.

Reuse Demand and Supply		
Potable Water	21	MGD
Consumption	3.7	MGD
Irrigation	5.3	MGD
Return Flow	12	MGD
Existing Reuse	4	MGD
Reuse Supply	8	MGD

Figure E-1

The Reuse Implementation Plan optimizes reuse pipeline alignments from the South Wastewater Treatment Plant (SWWTP) to both efficiently serve public reuse demands as well as attract new commercial and industrial reuse customers within this area. The Implementation Plan provides the basic information needed to launch the design and construction of reuse projects.

The specific goals and objectives of the Reuse Implementation Plan are:

1. **Expand MPU's reuse customer** base by identifying and soliciting potential commercial and industrial water users within the SWWTP reuse service area.
2. **Minimize reuse costs** by optimizing pipe sizing and alignment based on the actual committed reuse water demand.
3. Develop **cost effective reuse treatment** at the SWWTP for the specific reuse flows.
4. Determine an **affordable reuse rate** that encourages expanded reuse while providing sufficient cost recovery.
5. Provide design details to identify costs in addition to adopting a **fast track approach to the final design** projects through local consultants.

6. Advance future reuse expansion through public involvement and development of scalping plants, residential reuse, and indirect reuse concepts.

To identify customers in the vicinity of the South WWTP, a bubble plot of large water users was developed based on the most recent three years of consumption data from MPU. A reuse service area for the South WWTP was developed to include large potential reuse customers. Potential reuse customers were then prioritized based on water demand. MPU's extensive irrigation (sprinkler) meter program was very beneficial in identifying the irrigation demand in the area. A series of interviews and surveys were used to further characterize the potential reuse demand.

Based on the enthusiastic support of the large public entities, particularly the City's Parks and Recreation Department, a plan was developed to use the public demand to set the basic alignment for the system and then to identify those private customers in the vicinity of this alignment. A reconnaissance level field inspection of the planned pipe routings confirmed the alignment and the address of potential reuse customers.

2.0 REUSE SYSTEM DEVELOPMENT

2.1 Pipelines

To serve public and private demand in the vicinity of the SWWTP, a series of pipelines, pump stations and storage facilities are required to meet the potential reuse demand. With the McAllen Parks and Recreation Department as a priority reuse customer, an initial pipeline alignment was developed based on a detailed analysis of the department's irrigation demand. In addition to the demand at several neighborhood parks and the new convention center, Bicentennial and 2nd Street linear parks were also identified as potential corridors for reuse pipelines.

The alignment shown in Figure E-2 puts a majority of the significant sprinkler meter demands directly on the pipe route. The pipeline route targeted a number of key demand points.

- McAllen's new Convention Center and associated development
- The Bicentennial St. and 2nd St. linear parks
- The airport and Military Highway business Parks

The pipeline sizes (as shown in Figure E-2) were developed based on providing the maximum nightly flow rate to each customer, while maintaining velocities in the 2.5 to 3 feet per second range. This pipeline velocity range was targeted to avoid excessive head losses, while minimizing deposits of wastewater treatment plant effluent solids and biological growth in the pipes.

MPU's retired Water Plant No. 1 is also a feature in the reuse pipeline alignment. The Parks and Recreation Department has plans to convert the City's first water treatment facility into a municipal park and education center along with some private development. The new park will have a water theme and the existing underground storage tanks are targeted for storage of reuse and storm water runoff to be used as a non-potable irrigation supply. A new reuse pump station will be added to the existing storage at the WTP No.1 site.

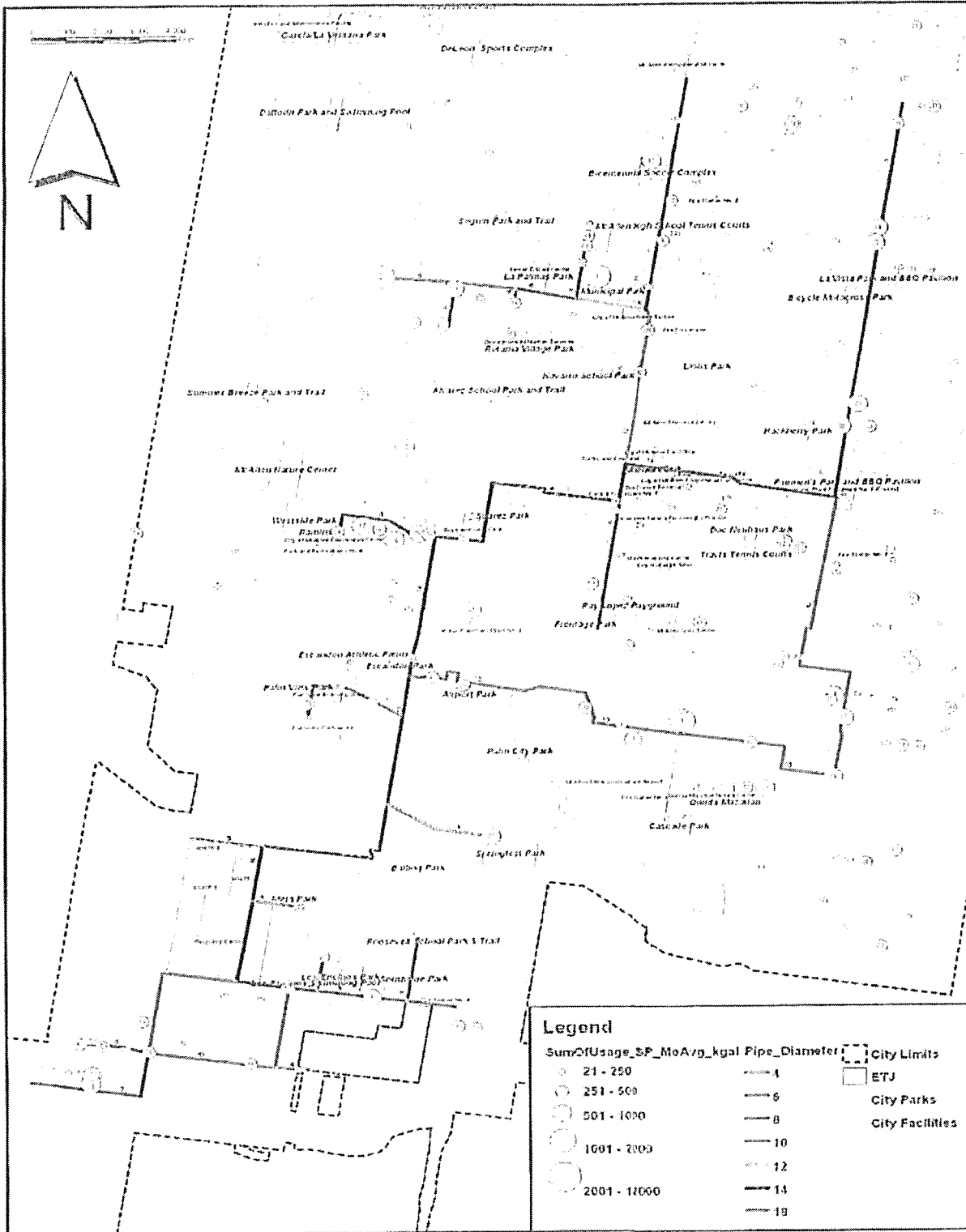


Figure E-2

2.2 Pump Stations

In addition to the pipeline distribution system, other improvements are needed to serve all potential reuse customers identified along the pipe alignment. MPU plans to replace its existing circular chlorine contact basin with a new disinfection system. The existing basin will then be used as a reuse storage and pumping facility. The reuse pumping facilities will include a steel framework built over the existing chlorine contact basin to support five vertical turbine pumps and the associated discharge piping (See Figure E-3). These pumps along with a hydro pneumatic tank system will assist in maintaining pressure in the reuse distribution piping.

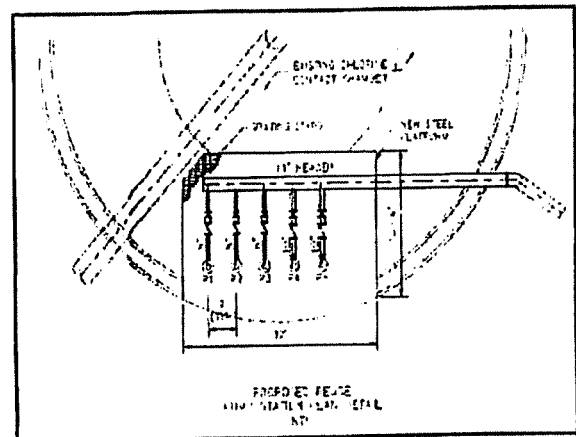


Figure E-3
Preliminary Pump Station Layout

Options for the addition of a cloth media filtration system were also developed for the South WWTP. Effluent quality at the South Plant consistently meets Type I reuse quality criteria, including the 3.0 NTU turbidity standards. However, provisions are being made for the future addition of cloth media filters if future regulations or plant effluent conditions warrant. With the addition of a second pump station to move the flow from the chlorine contact basin to the filters, adding filtration would significantly increase capital costs. An alternative potable water supply will be available to supplement the reuse system in the event that a temporary upset condition prevents the plant from meeting the Type I criteria.

2.3 Storage

A majority of the reuse demand will initially be used for irrigation. The McAllen Parks and Recreation Department typically irrigate their facilities over an 8 hour period from around 10:00 PM to 6:00 AM in the morning. Therefore, the entire reuse demand must be met within an 8 hour period. These peak demands were factored into both the pump station and pipe line sizing. Like most wastewater treatment facilities, the South WWTP

flows typically drop off significantly during the proposed over-night reuse irrigation period. Storage will be a key to maximizing the available reuse water from the South WWTP. The existing chlorine contact basin will provide between 150,000 and 200,000 gallons of storage. The ground storage tank at the old Water Treatment Plant No. 1 site will provide an additional 200,000 gallons of storage. Ultimately, an additional 1.5 million gallons of storage will be required to meet the future 8 hour peak irrigation demand when the reuse system is fully implemented. The final location and size of the third storage and re-pump facility will be determined later in the Phased Implementation Program based on experience with actual demand, pressure and storage requirements.

3.0 PHASED IMPLEMENTATION PROGRAM

Planning level cost estimates were developed for each reuse pipeline segment and for the various pump stations and storage facilities required to meet the ultimate reuse demand. As a supplemental water supply and conservation measure, water reuse facilities tend to have a longer economic recovery period than other water capital programs. Consequently, a Phased Implementation

Program was developed based on programming criteria provided by MPU. The program would extend over 10 years with an average of \$1 million per year in capital expenditure, as shown in Table E-1.

This phased approach allows MPU to fund some projects with cash reserves while including some of the larger projects in the Utility's bond financing program. Several of the larger projects are

planned for a two year implementation cycle so as to maintain an average capital investment of approximately \$1 million.

Table E-1		
Phase Implementation Program		
Phase I 2009-2011	Onsite Facilities	\$632,500
	WWTP Pipeline	\$170,365
	Convention Center Pipeline	\$1,712,428
Phase II 2012-2013	WWTP PS additions	\$169,445
	Beaumont Pipeline	\$558,560
	Municipal Park Pipeline	\$728,730
Phase III 2014	Beech Street Pipeline	\$464,431
	Pumping Facility at WTP No. 1	\$519,495
Phase IV 2015-2017	Storage & Pumping facility	\$2,558,211
	South	\$1,677,033
Phase V 2018	WTP 1 PS Addition	\$194,242
	Airport Pipeline	\$943,537
	WTP No 1 - Pipeline	\$327,184
Phase VI 2019	N. 2nd	\$545,709
	N. Bicentennial	\$222,008
Total Capital Program		\$11,423,877

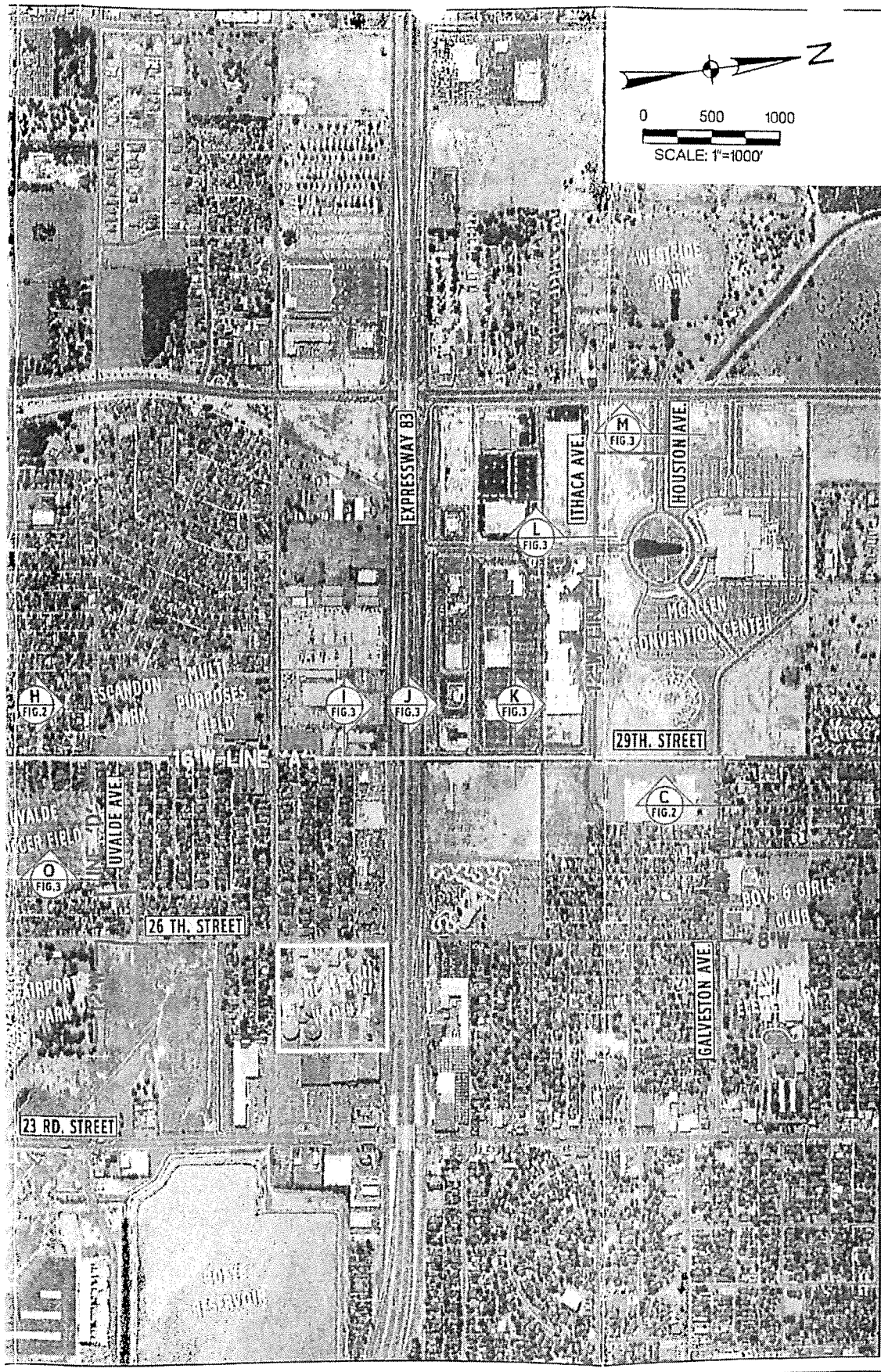
right-of-way to Westside Park. A bore would be required to cross Ware Road and would terminate at the Westside Park. The preliminary probable construction cost for Line "E" is \$261,950.

XIII. Potential Reuse customers and Pipe Sizing

For the proposed alignments, pipe sizing was verified and modified as needed using the potential reuse customers provided in the initial McAllen Public Utility Reuse Implementation Plan Report (Table 3). Piping for Phase I was obtained using the the provided flow plus and additional 50% demand for future growth in most cases. Appendix 4 shows a comparison of the different velocities using different pipe sizes. Maintaining velocities above 2 feet per second was a targeted criteria used in selecting pipe sizes. Avoiding the use of non-standard pipe size (i.e. 10 inch pipe) will help keep cost down and was a methodology also used in sizing the Phase I pipe. Collaboration with the City will help identify potential future users and may require for an increase or decrease in the proposed pipe sizes. This identification can be during the design phase of the project.

**Table 4
Phase I Potential Reuse Customers**

Pin Rank or Map ID	Customer	Address Line	Use	Ave Mo SP Meter Usage Kgal	Ave Mo Est. Irrig Kgal	Ave Mo Water Meter Kga	Ave Mo Total SP and Irrig. Kgal	Max Mo Total Kgal	Flow for 8-Hr Nightly Irrig Gpm	
27	CITY OF McALLEN - Springst Park	3501 S 23RD ST	Park	554	0	0	554	1,108	76	Pub
84	CITY OF McALLEN - W/SIDE COMPK	1000 S WARE RD	Park	263	0	3,241	289	577	39	Pub
29	CITY OF McALLEN-CONVENTION CTR	3051 GALVESTON AVE	Public space	795	0	0	795	1,590	109	Pub
12	CITY OF McALLEN-CONVENTION CTR	3551 GALVESTON AVE	Public space	824	0	0	824	1,648	113	Pub
16	CITY OF McALLEN-CONVENTION CTR	1299 HOUSTON AVE	Public space	715	0	0	715	1,429	98	Pub
124	CITY OF McALLEN - BOYS CLUB	2620 GALVESTON AVE	Camp	212	0	0	212	424	29	Pub
48	McALLEN ISD - BROWN CH	2790 S WARE RD	School	332	0	178	332	679	67	Pub
66	CITY OF McALLEN-CONVENTION CTR	1297 CONV. CTR BLVD	Public space	532	0	0	532	1,033	91	Pub
76	CITY OF McALLEN - PARKS	2351 GALVESTON AVE	Park	338	0	0	338	696	54	Pub
101	CITY OF McALLEN-PALM VIEW COMM	3161 JORDAN RD	Park	241	0	0	241	483	33	Pub
132	CITY OF McALLEN - SUAREZ PARK	409 S 27th St	Park	203	0	0	203	407	28	Pub
276	SIMON PROPERTY GRP Palms Crossing	3300 Expressway 83	Commercial	1,500	0	0	1,500	3,000	205	
186	P.F. Chang's China Bistro Inc.	3100 Expressway	Commercial	149	0	0	149	299	20	
105	WARE INDUSTRIAL PARTNERS LP	5501 S WARE RD	Commercial	231	0	0	231	462	32	
145	McALLEN HOUSING FACILITY CORP	3101 JORDAN	Commercial	185	0	0	185	372	25	
158	ARTS TRUCKS & EQUIPMENT	3001 W EXPRESSWAY 83	Commercial	169	0	0	169	339	23	
29	CITY OF McALLEN - AIRPORT Park	2201 S 26th ST	park	417			417	834	57	Pub
47	CGM Mobile Practice Parks and Rec	2701 Ueade Ave	park	399			399	798	55	Pub
165	CITY OF McALLEN - ESCANOCAN PK	2012 S 20TH ST	Park	163	0	0	163	326	22	Pub
193	CITY OF McALLEN - ESCANOCAN	2002 S 20TH ST	Park	144	0	0	144	289	20	Pub
207	SALTILLO GROUP, LLC	4599 TYLER	Commercial	131	0	0	131	262	18	
221	CITY OF McALLEN PALM VIEW PARK	3371 JORDAN	Park	119	0	0	119	238	16	Pub
Flow Totals				8,763	0	4,019	8,763	17,625	1,229	
Average Daily Demand				288,114 gpd				Public Demands		61%



5000 WEST MILITARY, SUITE 100
 McALLEN, TEXAS 78503
 TEL (956) 664-0265
 FAX (956) 664-0282

TBPE FIRM #F-312

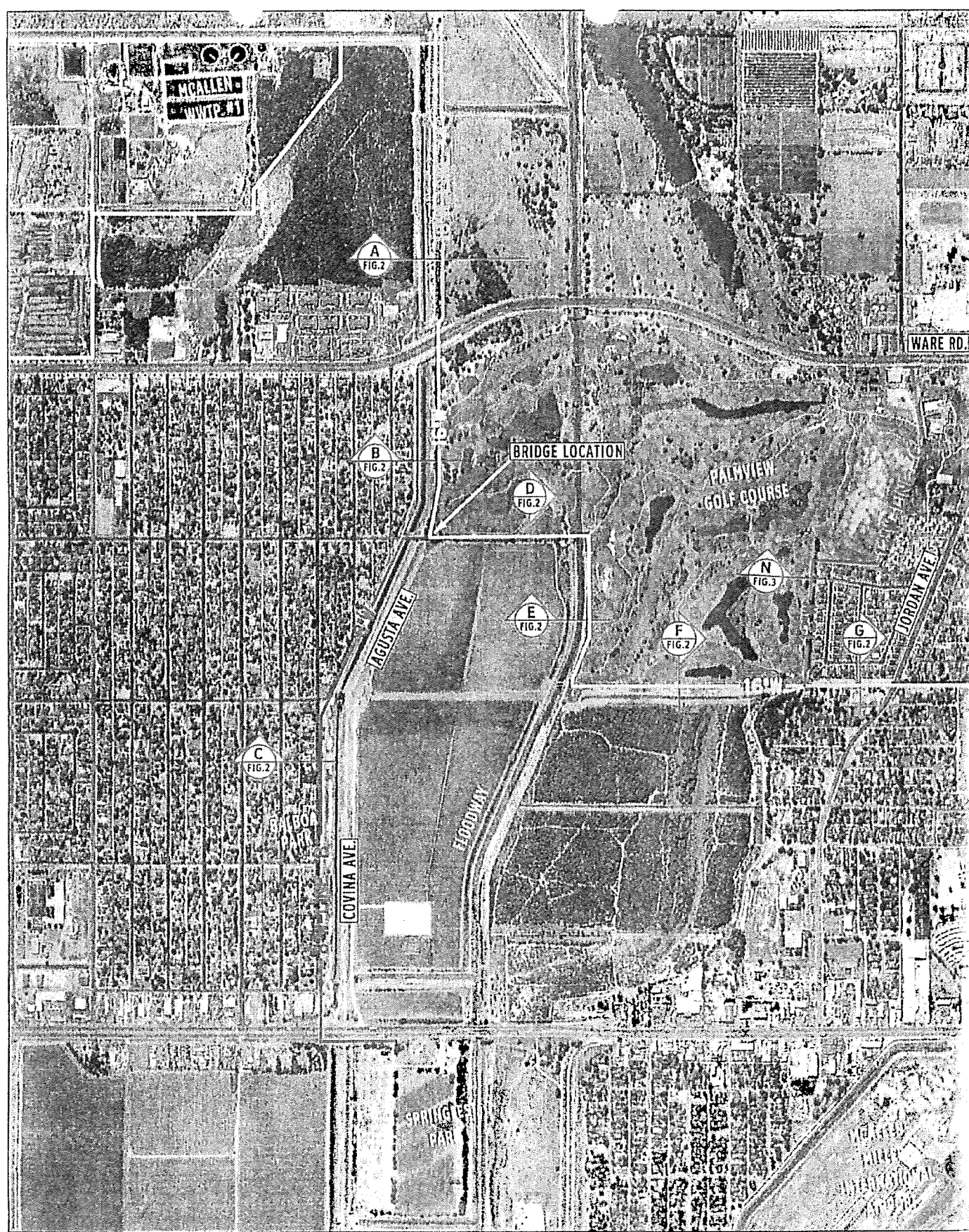
McAllen Public Utility Board
 Reuse Improvement Project
 Phase I

McAllen, Texas

Project No.:	27521
Issued:	AUGUST 2010
Drawn By:	J.A.
Checked By:	R.L.S.
Scale:	AS NOTED
Sheet Title	OVERALL SCHEMATIC

Figure 1

Sheet Number



**TEXAS WATER DEVELOPMENT BOARD
CLEAN WATER STATE REVOLVING FUND (CWSRF)
GREEN PROJECT INFORMATION WORKSHEETS**

PART III - BUSINESS CASE ELIGIBLE

Complete this worksheet for projects being considered for the Green Project Reserve (GPR) as business case eligible. Business case eligible projects or project components are described in the following sections of the EPA GPR guidance (TWDB-0161):

Green Infrastructure	Part A, Section 1.4 and 1.5
Water Efficiency	Part A, Section 2.4 and 2.5
Energy Efficiency	Part A, Section 3.4 and 3.5
Environmentally Innovative	Part A, Section 4.4 and 4.5

Information provided on this worksheet should be of sufficient detail and should clearly demonstrate that the proposed improvements are consistent with EPA and TWDB GPR guidance for business case eligible projects. Refer to **Information on Completing Worksheets** for additional information.

Section 1 - General Project Information

Applicant: McAllen Public Utility PIF #: 9437

Project Name: Effluent Reuse System and UV Disinfection

Contact Name: Timothy E. Skoglund, P. E.

Contact Phone and e-mail: 956-681-1770 , tskoglund@mcallen.net

Total Project Cost: \$7,810,666 Green Amount: \$3,590,315
(Business Case Eligible)

Brief Overall Project Description:

Effluent Reuse System and UV Disinfection. The project involves construction of a 2 MGD Reuse Water pump station and UV disinfection system at McAllen's South Wastewater Treatment Plant and 34,000 feet of a purple pipe distribution system to serve irrigation customers currently using potable water. This project has been adopted in the McAllen Public Utility Reuse Master Plan and improvements are consistent with an approved water plan. UV Disinfection is proposed to eliminate reliance on hazardous chlorine gas, but will also allow the existing chlorine contact tank to be converted to storage capacity for reuse pumping. An onsite bleach generator will provide residual disinfection to prevent biological fouling of the reuse pipeline. Project planning is underway for Reuse Pumping and UV Disinfection and the design is partially complete for the pipeline. Funding is requested for design of the reuse pumping and UV disinfection system and construction of all improvements.

Section 5 – Environmentally Innovative

Certain environmentally innovative improvements may be considered business case eligible for the GPR. Refer to EPA and TWDB GPR guidance for a complete list and description of business case eligible GPR Projects. Provide reference to the applicable sections of the EPA GPR guidance (TWDB-0161) that demonstrate GPR eligibility. Provide a detailed description of the proposed environmentally innovative improvements of sufficient detail that clearly demonstrates that the proposed improvements are consistent with EPA GPR guidance (TWDB-0161).

Guidance Reference:

Section 4.5-5a – Projects that significantly reduce or eliminate the use of chemicals in wastewater treatment

Detailed Description (attach additional pages if necessary):

The conversion of chlorine disinfection with sulfur dioxide disinfection to UV disinfection at McAllen Public Utility's (MPU) South Wastewater Treatment Plant (SWWTP) is an integral part of the overall Effluent Reuse Project. MPU has been evaluating improvements to the disinfection system at its South Wastewater treatment Plant (SWWTP) for several years. Conversion from gaseous elemental chlorine disinfection and gaseous sulfur dioxide dechlorination to UV disinfection will not only eliminate reliance on hazardous chlorine and sulfur dioxide gases, but will also allow the existing chlorine contact tank to be converted to a reuse water storage tank. The UV Disinfection portion of the Project would be Business Case Eligible under the Environmentally Innovative category based on eliminating over 140 tons per year of chlorine and sodium dioxide chemicals at MPU's South Wastewater Treatment Plant. The significant environmental risk, vulnerability, and community risk issues associated with the transport and storage of liquefied chlorine and sulfur dioxide chemicals and the application of gaseous chemicals are additional factors that recommend conversion to UV disinfection.

The UV Disinfection System Alternative is compared to the Chlorination Base Case Option in the attached Green Project Reserve Business Case. The Chlorination Base Case Option includes modifications to the existing system required to meet capacity and reliability requirements at the SWWTP. The Chlorination Base Case Option has a lower capital cost and a slight overall economic advantage when compared to the UV Disinfection System Alternative. Because non-economic factors are very important in this evaluation, a triple bottom line approach was used in developing the Business Case.

Green amount associated with environmentally innovative (business case eligible): \$ 3,590,315
(Attach a detailed cost estimate if necessary)

McAllen Public Utility

Effluent Reuse System and UV Disinfection System

Clean Water State Revolving Fund (CWSRF)

Green Project Reserve Business Case

PIF # 9437

Introduction

The McAllen Public Utility (MPU) Effluent Reuse System Project (Project) involves the construction of a 2 MGD Reuse Water pump station and UV disinfection system at McAllen's South Wastewater Treatment Plant (SWWTP) and 34,000 feet of a purple pipe distribution system to serve irrigation customers currently using MPU potable water. In its SFY 2012 Clean Water State Revolving Fund (CWSRF) Intended Use Plan (IUP) Packet and subsequent Green Project Information Worksheet (GPIW), MPU characterized the reuse elements of the overall Project as Categorically Eligible for Green Project Reserve funding water efficiency category. The reuse Project elements represented 57% of the overall \$7,810,666 project.

The following Business Case provides the basis for funding the innovative Ultra Violet Light (UV) Disinfection portion of the Project with Green Project Reserve funds. MPU has been evaluating improvements to the disinfection system at its SWWTP for several years. Conversion from gaseous elemental chlorine disinfection and gaseous sulfur dioxide dechlorination to UV disinfection will not only eliminate reliance on hazardous chlorine and sulfur dioxide gases, but will also allow the existing chlorine contact tank to be converted to a reuse water storage tank. The UV Disinfection portion of the Project would be Business Case Eligible under the Environmentally Innovative category based on eliminating the use of chlorine and sodium dioxide chemicals at MPU's South Wastewater Treatment Plant. Considering the significant environmental risk, vulnerability, and community risk issues associated with the transport and storage of liquefied chlorine and sulfur dioxide chemicals and the application of gaseous chemicals, a triple bottom line approach was used in developing this Business Case.

Disinfection System Alternative Descriptions

Improvements to the disinfection system at the SWWTP were evaluated in 2003 facility planning study and in a 2009 Alternative Disinfection Evaluation which recommended the conversion from gaseous chlorine to a UV system at the SWWTP. A Reuse/Disinfection Facility Plan, completed in 2011, integrated the proposed UV conversion project with the development of a reuse pumping and storage facility at the SWWTP. The integrated Reuse/Disinfection system improvements are part of MPU's overall Effluent Reuse Project. The UV disinfection conversion will free up the existing chlorine contact basin for a reclaimed water storage tank. Storage of reclaimed water is required to meet the nighttime irrigation demands during periods of low diurnal wastewater flows.

Chlorination Base Case Option - The existing chlorination/dechlorination system at the SWWTP consists of a single 70 ft. diameter circular chlorine contact tank with a 10 ft side water depth. The contact tank is equipped with a mechanical sludge scrapper to remove any settled solids. Eight one ton chlorine cylinders are stored on site. Gaseous chlorine is metered through

two 500 lb/day chlorinators. The chlorine is injected in a chemical injection control box just upstream of the chlorine contact basin. Sulfur dioxide is injected immediately upstream of the existing effluent parshall flume flow meter just downstream of the chlorine contact basin. The SWWTP currently uses approximately 500 lbs/day of chlorine and 280 lbs/day of sulfur dioxide in the chlorination/dechlorination process.

The existing chlorine contact tank limits the SWWTP's peak flow capacity to 21 MGD at a 20 minute minimum chlorine contact time. The lack of a redundancy with the single chlorine contact basin also presents a maintenance challenge. This basin cannot be taken out of service for maintenance without blocking off the entire flow of the plant. The 2009 Alternative Disinfection Evaluation proposed an alternative to add a second chlorine contact basin that would increase the SWWTP peak flow capacity to 30 MGD and provide a redundant basin for maintainability. This alternative also included improvements to the chlorine and sulfur dioxide feed systems and a new parshall flume to handle the new peak flow. These proposed modifications form the **Chlorination Base Case Option** and are detailed in the attached Proposed Chlorine Contact Basin Improvements Opinion of Probable Construction Cost from the 2009 Alternative Disinfection Evaluation.

UV Disinfection System Alternative - The use of ultraviolet light to disinfect wastewater is an innovative technology that eliminates the need for adding chlorine and dechlorination chemicals. UV disinfection has been used in wastewater treatment in Texas for just over 20 years. During that period, the UV industry has developed steady improvements in the efficiency and effectiveness of its equipment to make available more cost effective products. While UV disinfection is not widely used in wastewater treatment across the state, it performs better than conventional chlorine disinfection and offers a number of advantages as indicated in the following Table.

Advantages of UV Disinfection
Operator and community safety is enhanced by reducing or eliminating chemicals on site.
A Risk Management Plan is not required with a UV disinfection system.
A shorter contact time is required for UV than is required for chlorine gas or ozone, resulting in smaller a footprint.
UV systems have no significant chemical use and dechlorination chemicals are not required.
UV disinfection facilities are easy to operate and can easily be brought in service and taken off line.
Both medium and low-pressure systems can come with automated cleaning devices.

Since the terrorist attacks on September 11, 2001, there has been an increased interest in the use of UV disinfection to eliminate the inherent vulnerability of storing 1 ton liquefied chlorine cylinders on wastewater treatment plant sites. Transport, storage, and application of these

hazardous chemicals also increase the risk of exposure to individuals in the communities surrounding the treatment facility. Eliminating the use of chlorine and sulfur dioxide was a key factor in developing the UV disinfection alternative for the SWWTP.

The application UV disinfection technology to produce reuse water quality that meets the State's Type I Reuse Requirements also involves innovative technology not widely used across the State. The design of the UV disinfection system to consistently meet the <20 CFU/100 ml average fecal coliform requirements required close coordination with the various UV equipment manufactures to insure adequate UV light intensity.

The 2009 Alternative Disinfection Evaluation recommended conversion to UV disinfection for the SWWTP based on the reduced risk of injecting gaseous chlorine and sulfur dioxide and its advantages over other disinfection chemical storage and feed systems. These recommendations were incorporated into the 2011 Reuse/Disinfection Facility Plan which further developed the UV disinfection system concepts and added reuse pumping and storage to the integrated reuse/disinfection improvements package. These improvements are part of MPU's overall Effluent Reuse Project.

The **UV Disinfection System Alternative** includes the elements listed below as illustrated in the Figure 1 that follows.

1. Addition of a new two-channel, covered UV disinfection system with two low pressure, high output vertical UV bulb banks positioned in series to provide sufficient disinfection to meet TCEQ Type I reuse criteria. The UV system would be designed with a peak capacity of 25 MGD for Type I reuse and provide disinfection for Type II reuse with in channel backup UV modules. A backup UV module would be stored onsite to quickly restore Type I reuse quality in the unlikely event of a catastrophic module failure. Pumping to Type I reuse sites would be halted during any such UV system problem.
2. Continued flow through the existing chlorine contact basin to allow its use as a reuse water storage tank. The tank could be drawn down if reuse flows exceed the wastewater flow volume.
3. Removal of the existing elemental chlorine and sulfur dioxide chemical storage and feed systems.
4. Addition of a new electrical feed system and dedicated transformer to handle the new UV disinfection facility and reuse pump station. This system would include a new emergency backup generator required by TCEQ for UV disinfection systems.

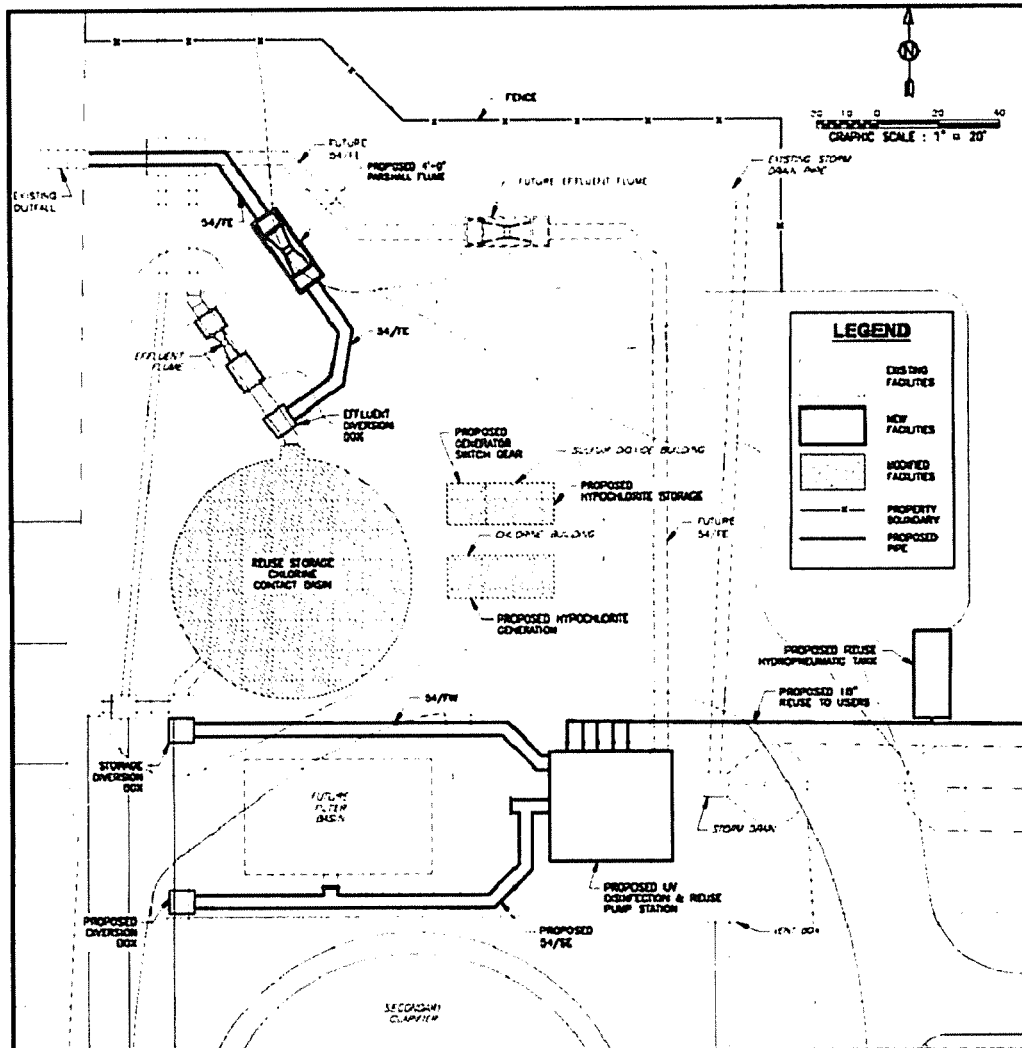


Figure 1 – SWWTP UV/Reuse Pump Station Layout

Project Environment Aspects

The innovative UV Disinfection System Alternative offers a number of environmental benefits over the conventional disinfection system used in the Chlorination Base Case Option.

Water Quality Impacts – The UV Disinfection System Alternative will improve the quality of the SWWTP effluent and overall receiving stream water quality in a number of different ways:

- **Bacteria Levels** – the UV Disinfection System Alternative is designed to treat the entire SWWTP flow to meet the TCEQ Type I Reuse requirements for bacteria. Because of the potential for public contact, Type I reuse standards call for fecal coliform or E. Coli levels of < 20 CFU/100 ml average and < 75CFU/100 ml on a single grab sample. This is considerably more stringent than the 126 CFU/100ml average and 394 CFU/100ml E. Coli limit in the SWWTP current TPDES discharge permit. The UV Disinfection System Alternative has been designed with the

additional UV lamps required to meet the Type I bacteria standards. Therefore the UV Disinfection System Alternative should result in lower bacteria levels in the SWWTP effluent and in the downstream waters.

- **Disinfection By Products** - One disadvantage of disinfection with chlorine is that free and combined chlorine residues are toxic to aquatic organisms. This concern is generally mitigated through the dechlorination process. There is also potential for the formation of organo-chlorinated derivatives or disinfection by products from the action of chlorine on organic compounds. These derivatives are of particular concern as they tend to be relatively toxic, persistent, and accumulate in the environment. While disinfection by-products are more of a concern in drinking water, they are more likely to form in chlorinated wastewater effluents where more organics are present. Dechlorination has no effect on the quantities of toxic chlorinated organic compounds present in the final effluent discharge. No by-products are formed with UV disinfection, thereby eliminating this potential water quality concern.
- **Chemical Elimination** - The UV Disinfection system will eliminate over 90 tons of chlorine and 50 tons of sulfur dioxide and their chemical derivatives from the SWWTP effluent and downstream waters.
- **Process Reliability and Operability** – While the Chlorination Base Case Option provides a redundant chlorination basin and improved chemical feed systems, the UV Disinfection System Alternative will provide automated lamp control to optimize energy efficiency and improve system reliability. The UV control system will be equipped with auto-dialers to notify plant staff of any operating issues with the UV system.
- **Emergency Power** – the Chlorination Base Case Option relies on the existing redundancy in the electrical power feed to the plant to avoid interruption of disinfection operations during power outages. The UV Disinfection Alternative includes a new standby power generator to provide the electricity needed to operate the UV lamps in the event of a power outage.

Air Quality Impacts – A catastrophic release of gaseous chlorine or sulfur dioxide, while unlikely, would cause severe short term air quality impacts in the vicinity of the chemical storage area. The chemicals are heavier than air and therefore move along the ground surface and would damage or kill any plants that are exposed. The day to day operations with these gases will release small quantities into the atmosphere. While not an immediate air quality issue, atmospheric releases of chlorine and sulfur dioxide will be eliminated by the UV Disinfection System Alternative.

Overall Environmental Sustainability – while the UV Disinfection System Alternative will increase energy consumption at the SWWTP to power the UV lamps, it will eliminate the use of 90 tons of Chlorine gas and 50 tons of sulfur dioxide per year. Production of chlorine is extremely energy intensive, consumes raw materials, and requires transportation to the plant site.

Project Social Aspects

There are a number of social benefits of using the innovative UV Disinfection Alternative over the Chlorination Base Case Option. While the City of McAllen faces some of the same socio-economic challenges as other cities in the Lower Rio Grande Valley, it remains a leader in education, international trade, and commercial and retail economic development. The City's Green Initiative supports conservation and the development of more sustainable infrastructure for the future. As illustrated in Figure 2, the SWWTP is located near the southern City limits and is surrounded by residential development to the east and west. Commercial / industrial development and the McAllen Foreign Trade Zone are located to the south of the SWWTP. Plans are underway to develop the vacant land south and west of the plant for the NAMRI Research & Development Park. Additional residential development is also planned northwest of the plant. Minimizing the plant's impact on current and future economic development was a key factor recommending the UV Disinfection System Alternative.



Figure 2- area surrounding the SWWTP

Specific social benefits associated with the UV Disinfection System Alternative versus the Chlorination Base Case Option include:

Worker Safety Impacts - Severe acute effects of chlorine exposure in humans have been well documented since World War I when chlorine gas was used as a chemical warfare agent. Other severe exposures have resulted from the accidental rupture of chlorine tanks. These exposures have caused death, lung congestion, pulmonary edema, pneumonia, pleurisy, and bronchitis.

The lowest lethal concentration reported is 430 ppm for 30 minutes. Exposure to 15 ppm causes throat irritation, exposures to 50 ppm are dangerous, and exposures to 1000 ppm can be fatal, even if exposure is brief. The OSHA standard for sulfur dioxide (SO₂) is 5 ppm. In severe cases where very high concentrations of SO₂ have been produced in closed spaces, SO₂ has caused severe airway obstruction, hypoxemia (insufficient oxygenation of the blood), pulmonary edema (a life threatening accumulation of fluid in the lungs), and death in minutes.

The plant operations and maintenance staff work in around both of these hazardous chemicals on a daily basis. Safety training, hazard chemical awareness, and safe operating procedures have prevented serious accidents. However, workers are routinely exposed to concentrations within the OSHA limits and are at risk for higher exposure levels associated with equipment or system failures. The UV Disinfection System Alternative will permanently remove gaseous chlorine and sulfur dioxide chemicals from the site.

Community Impacts – Like other wastewater treatment plants, the SWWTP was initially constructed in a relatively undeveloped area in south McAllen. As the City grew, residential and commercial developments were constructed near the plant's buffer zone. Treatment plant operations can impact the neighboring community. A significant benefit of the UV Disinfection Alternative is the elimination of the risk to the neighboring community associated with the transport, storage, and handling of one ton cylinders of chlorine and sulfur dioxide. These highly toxic chemicals are stored in a pressurized liquid form that will turn into a concentrated cloud of poisonous gas if released to the atmosphere in a catastrophic failure. A single one ton cylinder of chlorine could have devastating impacts within a mile or more from the treatment facility. Because of the significant risk to the surrounding community, the storage of chlorine and sulfur dioxide at wastewater treatment facilities is regulated under the EPA Risk Management Program. Elimination of the chemicals from the plant site will remove these regulatory requirements.

In addition to the risk of a potential catastrophic event associated with the storage and handling of chlorine and sulfur dioxide, there are potential impacts on the community from the transport of these chemicals from the supplier to the plant site. Trucks carrying the one ton cylinders of chlorine and sulfur dioxide make routine deliveries to the plant site. Transportation presents an additional risk to the surrounding community and to the City at large. Other risks include minor releases of either chemical during routine operations that may result in nuisance exposure levels.

Vulnerability to Terrorist Threats – Since the events of September 11, 2001, the nation's water treatment facilities have been the focus of attention relative to potential damage from terrorist attacks. Federal law does not require wastewater treatment plants to implement security measures. While the EPA's Risk Management Program is designed to mitigate accidental releases of chlorine and sulfur dioxide, the SWWTP remains venerable to potential terrorist threats that may target the transportation and storage of these hazardous chemicals. Elimination of chlorine and sulfur dioxide transport and onsite storage through implementation of the UV Disinfection Alternative would eliminate this threat.

Economic Development Impacts - The undeveloped area surrounding the SWWTP is currently being evaluated for several development projects that could have a positive economic impact in McAllen. These projects may be negatively impacted by the presence of hazardous chemicals on the wastewater treatment plant site.

McAllen Green Initiative – As a progressive Valley City, McAllen has launched a conservation, recycling, and sustainability initiative across all City Departments. The Effluent Reuse Project is

a natural component of the City's "McAllen Go Green" program. The UV disinfection System Alternative provides an innovative step in a reliable wastewater treatment process. While the UV system does increase energy consumption at the treatment plant site, eliminating the need for 90 tons of chlorine and 50 tons of sulfur dioxide annually should be considered an integral part of the City's green initiative.

Project Economic Aspects

The following four economic aspects are considered in developing the economic portion of this triple bottom line business case comparing the Chlorination Base Case Option and the UV Disinfection System Alternative.

- **Capital Construction Cost** – Feasibility study level estimates for construction of the comparable elements are used. Base construction costs are taken from each Study. A common contractor mobilization, overhead, and profit multiplier of 25% was applied to each base construction cost to determine a total raw construction cost. A contingency of 15% was applied to the raw construction estimate to get a total construction cost. The base years for the two estimates were close enough that no escalation was applied.
- **Engineering and Other Soft Costs** – This includes the cost of engineering, surveying and other professional services required to complete the design and construction of the facilities including construction administration services and testing. These costs were computed as 15% of the base construction cost plus contingency.
- **Annual Base Operation and Maintenance costs** – This item includes the annual cost for personnel to perform routine operation and maintenance. These figures were based on 4 personnel hours per week at a cost of \$30 per hour for both cases.
- **Annual Chemical, Energy and Equipment Replacement Costs** – The chemical costs associated with Chlorination/dechlorination were developed and compared with the energy and UV lamp replacement costs of the UV system as follows:
 - **Annual Chemical Costs** - The cost for chlorine and sulfur dioxide is based on the existing average flow through the SWWTP of 6.5 MGD. The chemical consumption rates and chemical unit costs were based on actual SWWTP data for the chlorination case. Minimal liquid chemicals are required for cleaning the UV bulb modules.
 - **Annual Energy Costs** – The cost of electrical power is based on estimated demands and equipment supplier demand information and an energy cost of \$0.10 per KW-hr.
 - **Annual Equipment Replacement Costs** – The annual average cost is based on the initial 20 years of operation, assuming industry standards for equipment life expectancy.

Chlorination Base Case Option - The base construction cost estimate for the Chlorination Base Case Option was taken from the 2009 Alternative Disinfection Evaluation which included the attached Opinion of Probable construction costs. To develop an equitable comparison with the UV Disinfection System Alternative, yard piping and cost items associated with the parshall

flume were deducted from the base construction cost number. The Chlorination Base Case Option would require that the SWWTP existing chlorine contact basin remain in service and make it unavailable for reuse storage. Therefore, the cost of a reuse storage tank, was added to the base construction costs. The costs for the Chlorination Base Case Option are presented in the following Table.

Chlorine Base Case Option Costs

Chlorination Base Case Option Cost Factors	Total Costs
Capital Construction Cost	\$2,276,734
Engineering and Other Soft	\$ 341,510
Annual Base Operation and Maintenance Costs	\$ 6,240
Annual Chemical Costs	\$ 90,000
Annual Energy Costs	\$ 5,000
Annual Equipment Replacement	\$ 2,250

UV Disinfection Alternative – The UV Disinfection System Alternative was based on the 2011 Reuse Master Plan South WWTP Reuse/Disinfection Facility Plan and Preliminary Engineering Report. The construction costs includes the UV system, detailed in the attached UV Disinfection Opinion of Probable Cost (Table 6.3 attached) plus the costs for the primary UV electrical service and stand-by generator.

UV Disinfection Alternative Costs

UV Disinfection Alternative Cost Factors	Total Costs
Construction Cost	\$3,075,162
Engineering and Other Soft	\$ 449,938
Annual Base Operation and Maintenance Costs	\$ 6,240
Annual Chemical Costs	\$ 1,000
Annual Energy Costs	\$ 32,400
Annual Equipment Replacement	\$ 45,648

Triple Bottom Line Analysis

The sections above have highlighted the environmental, social and economic aspects of the UV disinfection System Alternative relative to the Chlorination Base Case Option. The following triple bottom line (TBL) analysis is based a weighted numerical scoring matrix that relates the objective economic analysis to the more subjective environmental and social evaluation. The analysis assigns relative weights and scores for the various categories described above to compute a total triple bottom line score for the two options. The TBL Analysis Matrix which follows was based on the following scoring criteria:

- **Weights** - Relative weights were assigned to each of the categories in the three TBL Areas. The total of the numerical weights assigned was set at 100. The four categories in the economic area were apportioned 50 points or half of the total scoring weight. The environmental and social areas were then each assigned 25 points. The weights were divided among the various categories based on their relative importance in making a final recommendation on the two options. For example, the capital construction cost was given the highest weight in the economic area. Weights in the environmental and social areas were apportioned subjectively based on their relative importance.
- **Raw Score** – A relative raw score was assigned to each option. Scoring was based on a numerical score from 1 to 10 with the higher scores representing the more favorable option. The raw scores for the economic categories were also objective and based on the actual costs presented in the cost tables above. The costs were converted to a relative single digit integer and then subtracted from 10 to get a relative score favoring the lower cost. For example:

Chlorination - Capital Construction Cost of \$2,276,734 would be $10-2=8$
UV Disinfect – Capital Construction Cost of \$3,075,162 would be $10-3=7$

The scores for the environmental and social categories are inherently more subjective and were developed on the relative impact of the two options. In general a score of 5 was considered as neutral relative to the impact in that category.

- **Weighted Score** - Each weighted score is simply calculated as the weight times the raw score. The overall TBL scores are calculated by adding up all the weighted scores. This would produce a maximum possible TBL score of 1000.

Triple Bottom Line Analysis Matrix						
TBL Area	TBL Element	Weight	Chlorination Base Case		UV Disinfection System	
			Raw Score	Weighted Score	Raw Score	Weighted Score
Economic	Capital Construction Cost	30	8	231	7	207
	Engineering and Other Soft	4	7	26	6	22
	Annual Base Operation and Maintenance costs	4	4	15	4	15
	Annual Chemical, energy and Equipment replacement costs	12	0	0	2	24
Environmental	Water Quality Impacts	15	3	45	6	90
	Air Quality Impacts	5	3	15	5	25
	Overall Environmental Sustainability	5	5	25	6	30
Social	Worker Safety Impacts	7	3	21	6	42
	Community Impacts	6	3	18	7	42
	Vulnerability to Terrorist Threat	5	2	10	8	40
	Economic development Impacts	4	3	12	6	24
	McAllen's Green Initiative	3	5	15	7	21
Total TBL Scores		100	45	434	69	582

Conclusions and Recommendations

As indicated in the cost tables above, the UV Disinfection System Alternative has a higher capital construction costs, but a slightly lower annual operating costs than the Chlorination Base Case Option. Other weighted scores comparing environmental and social impacts showed clear benefits offered by the UV alternative. Final results of the triple bottom line analysis indicate that while the Chlorination Base Case Option scores higher in the economic area, the higher scores for the UV Disinfection System Alternative in environmental and social categories results in a higher overall TBL score of 582 for UV versus 434 for Chlorination.

While the Chlorination Base Case Option may be the most economical option, the environmental and social benefits of the UV Disinfection Alternative outweigh the slight economic advantage. Therefore, the UV Disinfection Alternative is the recommended option for MPU's Effluent Reuse Project. Application of this innovative UV disinfection technology is consistent with the EPA decision criteria for environmentally innovative projects. This technology is not widely used in Texas but performs better than the conventional gaseous chlorination/dechlorination process as demonstrated in this Business Case. The implementation of the UV Disinfection System Alternative will eliminate the use of over 140 tons per year of chlorine and sulfur dioxide chemicals at MPU's SWWTP and, therefore, should qualify for TWDB Green Project Reserve funding.

Prepared for McAllen Public Utility By:

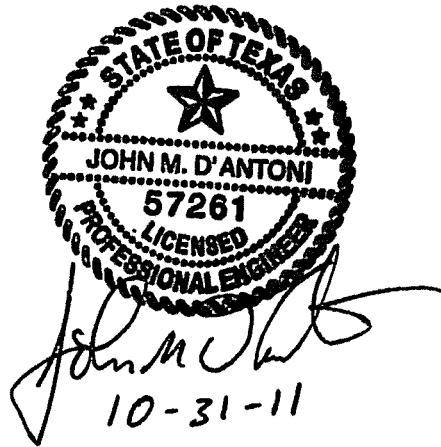
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**Summary of Cost Estimates for UV Disinfection and Reuse CWSRF Application
McAllen, TX**

Item	Raw Costs	Contingency	Engineering	Total	Total + Loan Origination	Responsible Engineer
*Reuse Storage Tank	\$200,000	\$40,000	\$20,000	\$260,000		Tim Skoglund, MPU
Re-use Pump Station	\$673,185	\$100,978	\$116,124	\$890,287		APAI
Hypochlorite System	\$360,382	\$54,057	\$62,166	\$476,605		APAI
Yard Piping	\$376,739	\$56,511	\$64,988	\$498,238		APAI
Reuse piping	\$1,913,993	\$364,570	N/A	\$2,278,563		Half Associates
Reuse-only Subtotal	\$3,524,299	\$616,116	\$263,278	\$4,403,693	\$4,485,161	
UV	\$2,170,208	\$325,531	\$374,361	\$2,870,100		APAI
Primary Electric & Genset	\$503,846	\$75,577	\$75,577	\$655,000		APAI
*Deduct for Reuse Tank	\$200,000	\$40,000	\$20,000	\$260,000		Tim Skoglund, MPU
UV-only Subtotal	\$2,474,054	\$361,108	\$429,938	\$3,265,100	\$3,325,504	
Grand Total	\$5,998,353	\$977,224	\$693,216	\$7,668,793	\$7,810,666	

*Costs Estimate for Reuse Storage Tank prepared by Tim Skoglund, P.E.



Timothy E. Skoglund 10/6/11

Timothy E. Skoglund, P.E.