Texas Water Development Board

City of Stamford

DWSRF GREEN PROJECT RESERVE BUSINESS CASE EVALUATION

STATE FISCAL YEAR 2016 INTENDED USE PLAN

PROJECT NUMBER 62685

COMMITMENT DATE: March 3, 2016

DATE OF LOAN CLOSING: June 14, 2016

Green Estimate at closing is $ 16,296,000

Subsidy awarded for Green components $952,980

TEXAS WATER DEVELOPMENT BOARD

Green Project Reserve

Green Project Information Worksheets

Drinking Water State Revolving Fund

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-0163
Revised 7/29/2014

TEXAS WATER DEVELOPMENT BOARD
DRINKING WATER STATE REVOLVING FUND (DWSRF)
GREEN PROJECT INFORMATION WORKSHEETS

PART I – GREEN PROJECT INFORMATION SUMMARY

General Project Information

Applicant: City of Stamford Project #: 62685

Project Name: Water System Improvements

Contact Name: Scott D. Hay, P.E.

Contact Phone and e-mail: 325-698-5560

Brief Overall Project Description:

The proposed project will consist of five main project components, including improvements at the City's Raw Water PS, replacement of the City's raw water transmission main, upgrade of the City's Water Treatment Plant, replacement of the City's elevated storage tank, and replacement of a portion of the City's water distribution pipelines.

The Raw Water PS improvements will include complete replacement of the mechanical and electrical equipment at the Raw Water PS, as well as structural and instrumentation improvements at the Raw Water PS.

The Raw Water Transmission Main improvements will include complete replacement of the raw water transmission pipeline.

The WTP improvements will include construction of a new pretreatment system, membrane filtration system, chemical storage and feed system, upgrade of the existing storage tanks, new high service pump station, new instrumentation system, and ancillary support systems for a new advance treatment WTP.

The elevated storage improvements will include replacement of the City's existing elevated storage tanks as well as instrumentation and chemical injection system improvements.

The distribution improvements will replacement of key distribution lines throughout the City that have been identified as the highest risk for water loss.

TEXAS WATER DEVELOPMENT BOARD
DRINKING WATER STATE REVOLVING FUND (DWSRF)
GREEN PROJECT INFORMATION WORKSHEETS

Check all that apply and complete applicable worksheets:

Categorically Eligible

- ☐ Green Infrastructure $ _____
- ■ Water Efficiency $ 4,812,000
- ☐ Energy Efficiency $ _____
- ☐ Environmentally Innovative $ _____

Business Case Eligible

- ☐ Green Infrastructure $ _____
- ■ Water Efficiency $ 9,352,000
- ■ Energy Efficiency $ 2,132,000
- ☐ Environmentally Innovative $ _____

Total Requested Green Amount $ 16,296,000

Total Requested Funding Amount $ 20,000,000

Type of Funding Requested:

- ■ PAD (Planning, Acquisition, Design)
- ■ C (Construction)

Completed by:

Name: Scott D. Hay, P.E. Title: Vice President

Signature: Scott D. Hay Date: 12/16/2015

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 B, Section 1.2
Water Efficiency	Part B, Section 2.2
Energy Efficiency	Part B, Section 3.2
Environmentally Innovative	Part B, 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: City of Stamford PIF #: 62685

Project Name: Water System Improvements

Contact Name: Scott D. Hay, P.E.

Contact Phone and e-mail: (325) 698-5560 scott.hay@e-ht.com

Brief Overall Project Description: The proposed project will consist of five main project components, including improvements at the City's Raw Water PS, replacement of the City's raw water transmission main, upgrade of the City's Water Treatment Plant, replacement of the City's elevated storage tank, and replacement of a portion of the City's water distribution pipelines.

The Raw Water PS improvements will include complete replacement of the mechanical and electrical equipment at the Raw Water PS, as well as structural and instrumentation improvements at the Raw Water PS.

The Raw Water Transmission Main improvements will include complete replacement of the raw water transmission pipeline.

The WTP improvements will include construction of a new pretreatment system, membrane filtration system, chemical storage and feed system, upgrade of the existing storage tanks, new high service pump station, new instrumentation system, and ancillary support systems for a new advance treatment WTP.

The elevated storage improvements will include replacement of the City's existing elevated-storage tanks as well as instrumentation and chemical injection system improvements.

The distribution improvements will replacement of key distribution lines throughout the City that have been identified as the highest risk for water loss.

Section 3.3– Other Water Efficiency Improvements

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:

2.2-9 - Water loss audit from WTP completed in Preliminary Engineering Feasibility Report - current 10% water loss through WTP.

Detailed description of proposed water efficiency improvements (attach additional pages if necessary):

The proposed WTP improvements include addition of a new membrane filtration system, upgrades to the pretreatment clarification system required to enhance MF treatment, upgrades to the chemical feed system to support MF, and upgrades to the SCADA system to allow for automated operation of the MF system.

The existing conventional filtration system at the City's WTP results in an internal plant water loss due to backwashing, ranging from 10%. The proposed MF system is anticipated to be a pressure MF system, which has a typical internal water loss of 3-5% (generally 3% or less when new, reducing to about 5% as the membranes age). For this reason, there will be an inherent water efficiency by utilizing MF as opposed to a conventional filtration system.

In addition to the design of the MF system, upgrades to the clarification pretreatment system will further reduce plant water loss, by reducing the amount of sludge waste each day (and subsequently plant water with the sludge). The advanced pretreatment system will reduce water loss through sludge blowdown from 3-5% for conventional clarifiers to less than 1% for advanced pretreatment like plate settler systems. Also, the membranes and plates themselves do not work only on their own, and require operation of support systems as well. With a combination of the MF system improvements and pretreatment improvements, the internal plant water loss through the WTP should be reduced from the current 10% loss to approximately 1%. For this reason, the anticipated green percentage of WTP improvements will be based on the percentage of overall WTP cost associated with the membrane filtration and pretreatment improvements.

The following provides the projected annual water savings for the WTP by utilizing the improvements discussed above:

Estimated annual water lost based on current average 10% internal loss = 20 MG
Estimated annual water lost based on improvements reducing loss to 1% = 2 MG
Annual volume of raw water saved with proposed WTP improvements = 18 MG

Anticipated % of MF and pretreatment improvements at WTP: 71%
Anticipated WTP cost: $6,778,000
Anticipated green component for the MF and pretreatment improvements: $4,812,000

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 B, Section 1.4
Water Efficiency	Part B, Section 2.4 and 2.5
Energy Efficiency	Part B, Section 3.4 and 3.5
Environmentally Innovative	Part B, 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: City of Stamford PIF #: 62685

Project Name: Water System Improvements

Contact Name: Scott D. Hay

Contact Phone and e-mail: (325) 698-5560 scott.hay@e-ht.com

Brief Overall Project Description:

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The Raw Water PS improvements will include complete replacement of the mechanical and electrical equipment at the Raw Water PS, as well as structural and instrumentation improvements at the Raw Water PS. The Raw Water Transmission Main improvements will include complete replacement of the raw water transmission pipeline. The WTP improvements will include construction of a new pretreatment system, membrane filtration system, chemical storage and feed system, upgrade of the existing storage tanks, new high service pump station, new instrumentation system, and ancillary support systems for a new advance treatment WTP. The elevated storage improvements will include replacement of the City's existing elevated storage tanks as well as instrumentation and chemical injection system improvements. The distribution improvements will replacement of key distribution lines throughout the City that have been identified as the highest risk for water loss.

Section 2 – Green Infrastructure

Certain green infrastructure 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 green infrastructure improvements of sufficient detail that clearly demonstrates that the proposed improvements are consistent with EPA GPR guidance (TWDB-0161).

Guidance Reference:

2.4-1: Improve water efficiency that will reduce the amount of water taken of rivers, lakes, streams, groundwater, or from other sources.
2.4-3: Reducing water loss in the system will reduce the amount of energy required since less water would need to be treated and transported.
2.4-4: Addressing where water losses are occurring in the system by replacement aging infrastructure.
2.5-2: Distribution pipe replacement or rehabilitation to reduce water loss and prevent main breaks
2.5-3: Elevated storage tank replacement to reduce water loss.

Detailed Description (attach additional pages if necessary):

The proposed project will include installation of new raw water and finished water lines to eliminate leaks and reduce water loss. The green component includes saving water that is currently lost due to leaking system; saving electrical energy by elimination of pumping of water lost due to line leaks, replacement of piping to eliminate sources of contaminants migrating into water supply, and upgrading of multiple pump stations to reduce energy usage.

Green components in this project will include water efficiency, enhanced water conservation, and increased energy efficiency.

Section 3 – Water Efficiency

Certain water efficiency 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. For all water efficiency business case eligible projects Section 3.1 must be completed. A common water efficiency project that may be considered business case eligible is water line replacements to address water loss. For this type of project complete Section 3.2 of the worksheet. For any other water efficiency improvement being considered for business case eligibility, complete Section 3.3.

Section 3.1 - System and Water Loss Information

Section 3.1 is required for all water efficiency business case eligible projects. Attach a copy of most recent Water Audit, if available. Otherwise, complete and attach Water Audit Worksheet or provide water audit data in a similar format. Additional information on water loss and water audits as well as a copy of the Water Audit Worksheet is available at:
http://www.twdb.state.tx.us/assistance/conservation/Municipal/Water_Audit/wald.asp

Reference and attach water loss audit and/or any other completed planning or engineering studies:

- [X] TWDB Water Loss Audit 2014 (attached)
- [ ] _____
- [ ] _____

Section 3.2 - Water Line Replacement

Proposed pipe to be replaced:

Length (LF)	Existing Pipe			Proposed Pipe	
	Material	Age (yr)	Dia. (in)	Dia. (in)	Material
72,000	Concrete Cylinder	40	18	16	HDPE
11,000	Ductile Iron	60	6	6	C-900 PVC

Percent of distribution lines being replaced: 4.20%

Number of breaks/leaks/repairs recorded in past 24 months for areas being replaced: 100

Estimated water loss from pipe being replaced (provide calculations on following page): 25%

Estimated annual water savings (provide calculations on following page): 18,806 kgal / year

Estimated annual cost savings (provide calculations on following page): $122,427.06 / year

Provide detailed description of the propose improvements and provide supporting calculations. Description should include a description of the methodology used to select pipes for replacement (attach additional pages if necessary):

The proposed improvements will include replacement of dilapidated cast iron water lines. The lines have been repaired many time. Each time a line is repaired a larger section has to be installed because it becomes difficult to place a repair coupling on the old pipe because it is so brittle. The City has identified the water lines with the most need of replacement.

The City is proposing to install approximately 72,000 linear feet of 16" HDPE parallel to the existing 18" raw water transmission line. HDPE was evaluated against other material pipe which includes ductile iron pipe and PVC pipe. HDPE has the best Life Cycle Cost than both PVC and ductile iron pipe. HDPE is best used where there are long stretches of pipe to be laid normally in one direction with not many trees and connections. The transmission line will be located in a rural location that does not have many tress or connections. The City currently spends approximately $20,000 dollars per month repair the current transmission line. The current amount of water loss that the line experiences is unknown at this time.

The City is proposing to replace approximately 11,000 linear feet of cast iron pipe with C-900 PVC pipe. PVC pipe has been evaluated against other material pipe which includes ductile iron pipe and HDPE pipe. As explained above HDPE does have a better Life Cycle Cost than PVC but it does not fit the location

PVC pipe has a better Life Cycle Cost than ductile iron. HDPE has a better Life Cycle Cost than PVC but it is not commonly used in a urban area. As explained above HDPE is best used where there are long stretches of pipe to be laid normally in one direction with not many trees and connections. If installed and bedded correctly, PVC can outlast most piping system. Another reason to recommend PVC over most material pipe is that it is easy to handle and does not corrode over a long period of time.

Most all of the pipe that is being installed in the distribution system is being installed along City streets and the unit cost of laying it will be at a premium because of all the potential problems that may exist. Existing utility lines will have to be located as well. The streets and alleys trenched will also need to be repaired.

The City's existing elevated tank is located on the southwest end of the City whereas the existing WTP is located on the northwest end. In order to fill the existing elevated tank, the existing High Service PS at the WTP must pump across the entire City to fill the tank, resulting in both a high amount of water loss via the existing tank fill transmission main, as well as excessive runtime on the high service pumps, resulting in excessive water and energy use beyond what is really needed.

The proposed new elevated tank will be located at the WTP, which will eliminate water loss in the fill transmission main (by being taken offline) as well as reducing the pump and motor requirements for the High Service PS (noted as reduced horsepower in the previous section). The proposed tank improvements are considered for both water use and energy use efficiency enhancement, and are divided evenly between the two categories.

Green component for water loss reduction through raw water line replacement: $7,349,000
Green component for water loss reduction through distribution line replacement: $1,250,000
Green component for water loss reduction through new EST at WTP: $753,000
Total green component for water efficiency: $9,352,000

Calculations (for page 7):

Estimated Water Loss: (from attached 2014 TWDB Water Audit form)

Total System: 49.5 miles

Project Total Pipe: 2.08 miles
% of Total System: 2.08 miles / 49.5 miles = 4.20 %

Based on the in-line metering that was accomplished to locate the leaks in the system, it is estimated that 25% of the system leakage is occurring in the project area. Therefore:

Total Real Losses: (from attached Audit report line #31): 75,223.8 kgal / year

Estimated water loss from pipe being replaced:

75,223.8 kgal / year x 25% = 18,806 kgal / year (water loss eliminate through proposed project)

75,223.8 kgal / year – 18,806 kgal / year = 56, 417.9 kgal / year (projected annual water loss)

Estimated annual water savings:

18,806 kgal / year x $6.51 / kgal (from report) = $122,427.06 / year

Savings over funding period (30 years): $122,427.06 x 30 years = $3,672,811.80

Section 4 – Energy Efficiency

Certain energy efficiency 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. For all energy efficiency business case eligible projects Section 4.1 must be completed. A common energy efficiency project that may be considered business case eligible is pumping facility improvements. For this type of project complete Section 4.2 of the worksheet. For any other energy efficiency improvement being considered for business case eligibility, complete Section 4.3.

Section 4.1 – System Information

Energy efficiency improvements to be considered for business case eligibility should provide reference to completed planning material such as energy assessments, energy audits, optimization studies and design level project information.

Reference Completed Planning/Design Material:

- [x] Project PEFR
- [x] Energy Audit to be completed during Project Planing Phase
- [ ] _____
- [ ] _____

Section 4.2 – Pumping Facility Improvements

Complete for pump and motor upgrades:

Pump Description	Existing Pump			Proposed Pump		
	Pump HP	Efficiency		Pump HP	Efficiency	
		Pump/Motor	Wire to Water		Pump/Motor	Wire to Water
Raw Water PS Pump 1	100	78.0 /65.0	55.0	150	85.0 /92.4	78.5
Raw Water PS Pump 2	100	78.0 /65.0	55.0	150	85.0 /92.4	78.5
Raw Water PS Pump 3	300	85.0 /73.0	55.0	150	85.0 /92.4	78.5
High Service PS Pump 1	100	78.0 /70.5	55.0	100	85.4 /91.7	78.5
High Service PS Pump 2	100	78.0 /72.0	56.2	100	85.4 /91.7	78.5
High Service PS Pump 3	150	78.0 /72.0	56.2	100	85.4 /91.7	78.5
High Service PS Pump 4	150	78.0 /72.0	56.2		/	
		/			/	
		/			/	
		/			/	

Total estimated energy savings from pump and motor upgrades: $ 1,314,900

Total estimated annual financial savings from pump and motor upgrades: $ 131,490

If NEMA Premium efficiency motors are to be used, provide total motor cost: $ 544,000

Total pump and motor upgrade cost: $ 1,087,000

List any other energy efficiency improvements to pumping facility (VFDs, lighting, SCADA, etc.):

Component Description	Annual Energy Savings (if known)	Annual Financial Savings (if known)	Component Cost
Add VFD to each new pump - 6 VFDs	128,280 kW-hr	$12,828	$204,000
Upgrade SCADA to automate pump operations	82,180 kW-hr	$8,218	$88,000
Hp reduction from 4 to 3 HS pumps - included in 4.2	-	-	-
25 hp reduction per pump due to new EST at WTP	493,100 kW-hr	$49,310	$753,000
Total:	703,560 kW-hr	$70,356	$1,045,000

Provide a detailed description on the following page(s) of the proposed energy efficiency improvements. Information should be specific to the equipment being proposed and calculations should be provided demonstrating substantial energy and financial savings.

Detailed Description (attach additional pages if necessary):

The green project with respect to energy efficiency improvements involves five key areas, including replacement of pumps and motors with NEMA premium efficiency motors, the addition of a VFD to each of the existing pumps proposed for replacement, upgrade of the SCADA control systems, and a recommended consolidation of pumping systems, and a reduction in overall high service pump size due to relocating the new elevated tank to the WTP site.

NEMA replacement - The existing pumps were designed to operate as medium-voltage, with across-the-line starting motors, which requires approximately 3-5 times the starting amperage to start each pump for operation. By replacing the existing medium-voltage system with specifically designed, new low-voltage NEMA premium efficiency motors, the daily energy usage to operate each of the individual pump stations is expected to significantly decrease, with the anticipated energy savings being able to offset a large portion of the expected construction debt service.

VFD – The existing pumps are all designed to operate with across-the-line motors, which require a starting amperage of 3-5 times the normal operating amperage. With a VFD, the starting amperage matches the normal operating amperage, which significantly reduces starting power demand, especially for pumps that need to routinely start and start multiple times in a day. In addition, the pumps currently operate in a start/stop fashion, which causes fluctuations in operation of the treatment processes, which negatively impacts performance of the WTP. The addition of VFDs at each of the City's pump stations is expected to further reduce energy consumption by a minimum of 20% of current energy usage by "smoothing" out operation of the pump stations and subsequent treatment processes.

SCADA – The existing SCADA system allows for remote monitoring of processes at the WTP and pump stations, but actual operation of the treatment and pump processes is still a manual operation. By upgrading the SCADA system to provide automated operation of key treatment and pump processes, the typical peaking and low flow impacts to system operations can be reduced, if not eliminated altogether, substantially reducing peak energy usage.

Consolidation – The existing Raw Water PS consists of three pumps and the high service pump stations at the WTP consist of two pairs of pumps. Completion of the proposed WTP improvements will reduce the total number of high service pumps from four to three pumps.

Tank Improvements – Construction of new elevated tank at the WTP site will allow for elimination of the failing existing tank, elimination of use of the existing elevated tank fill main which leaks continually, and major reduction of required pumping improvements at the High Service PS.

Section 4.3 – Other Energy Efficiency Improvements

Complete this section for energy efficiency improvements other than those listed above. Provide reference to applicable sections of EPA GPR guidance (TWDB-0161) that demonstrate GPR eligibility. Provide a detailed description of the proposed energy efficiency improvements indicating the reason for the project, problems being addressed, resulting benefits, anticipated savings, etc. The description should also include information that is specific to the equipment being proposed and calculations demonstrating substantial energy and financial savings. Energy and financial savings should be quantified to the extent possible. If the project consists of multiple green components, individual component costs should be provided. Supporting information, calculations and/or documentation should be attached as necessary.

Guidance Reference:

3.5-4, 5 - Construction of new elevated tank at the WTP site will allow for elimination of the failing existing tank, elimination of use of the existing elevated tank fill main which leaks continually, and major reduction of required pumping improvements at the High Service PS

Detailed Description of proposed improvements:

The City's existing elevated tank is located on the southwest end of the City whereas the existing WTP is located on the northwest end. In order to fill the existing elevated tank, the existing High Service PS at the WTP must pump across the entire City to fill the tank, resulting in both a high amount of water loss via the existing tank fill transmission main, as well as excessive runtime on the high service pumps, resulting in excessive water and energy use beyond what is really needed.

The proposed new elevated tank will be located at the WTP, which will eliminate water loss in the fill transmission main (by being taken offline) as well as reducing the pump and motor requirements for the High Service PS (noted as reduced horsepower in the previous section). The proposed tank improvements are considered for both water use and energy use efficiency enhancement, and are divided evenly between the two categories.

Green component for new NEMA motors and pumps: $1,087,000
Green component for VFDs for pumps: $204,000
Green component for SCADA automation improvements: $88,000
Green component for hp reduction due to EST relocation: Included in NEMA motor savings
Green component for pump consolidation due to EST relocation: $753,000
Total green component for energy use efficiency: $2,132,000