Clean Water State Revolving Fund Green Project Reserve

- Final -

City of Post Falls WWTP Upgrade Project

SRF Loan #WW1401

$10,836,000

Final Green Project Reserve Justification

Categorical GPR Documentation

1. INSTALLS ADVANCED ENERGY-EFFICIENT LIGHTING (Energy Efficiency). Categorical GPR per 3.2-2: "*Projects that achieve a 20% reduction in energy consumption...*" ($111,400).

Business Case GPR Documentation

2. INSTALLS EQUALIZATION TANKS (Innovative/Energy Efficiency). Business Case GPR per Section: 4.4-1b "*Technology or approach that is not widely used in the state, but does perform as well or better than conventional technology/approaches at lower cost*". ($931,800).
3. INSTALLS PIPING FOR OFF-LINE EQUALIZATION TANK (Energy Efficiency). Business Case GPR per Section 3.2-2: "*…New POTW projects or capacity expansion projects should be designed to maximize energy efficiency… estimation of the energy efficiency is necessary for the project to be counted toward GPR"* ($204,000).
4. INSTALLS VFDs/SCADA CONTROL TECHNOLOGY (Energy Efficiency). Business Case GPR-per Section 3.4-1*: "Project must be cost effective. An evaluation must identify energy savings and payback on capital and operation and maintenance costs that does not exceed the useful life of the asset" and 3.5-8: "SCADA systems can be justified based upon substantial energy savings" and 3.5-9: "Variable Frequency Drives can be justified based upon substantial energy savings."* ($116,000).
5. INSTALLS PIPING TO REDUCE CHEMICAL USAGE (Energy Efficiency/Innovative). Business Case GPR per Section 3.4-1: *"Project must be cost effective. An evaluation must identify energy savings and payback … that does not exceed the useful life of the asset"* and Section 4.5-5a: "*Projects that significantly reduce … the use of chemicals in wastewater treatment."* ($14,600).

1. INSTALLS ENERGY EFFICIENT LIGHTING

Summary

- Energy efficiency from the installation of LED lighting.
- Estimated loan amount = $10,836,000
- Estimated energy-efficient (green) portion of loan = 1% ($111,400).

Energy Efficiency Improvements

- LED lighting is approximately 25.3% more energy efficient than a plant wide combination of typical high pressure sodium, metal halide, and fluorescent lighting for relatively the same light output.

LUMINAIRE ENERGY CONSERVATION SCHEDULE

		BASE			PROPOSED			TOTAL LUMINAIRES	TOTAL BASE ENERGY (W)	TOTAL PROPOSED ENERGY (W)	TOTAL NET ENERGY SAVINGS (W)
TYPE	DESCRIPTION	LAMP TYPE	WATTS / FIXTURE	UNIT MATL COST	LAMP TYPE	WATTS / FIXTURE	COST				
D	OUTDOOR ROTATING, LED STROBE WARNING LIGHT, POLYCARBONATE DOME, 120VAC, WITH WALL MOUNT BRACKET UL LISTED FOR WET LOCATIONS, BLUE LENS	INC	60	120	LED	5	145	6	360	30	330
G	4FT., 3500K, LED ENCLOSED AND GASKETED, FIBERGLASS, STAINLESS STEEL HARDWARE	(2) 3500K 32W T8	58	143	LED	60	250	26	1508	1560	-52
G3	HIGH/LOW BAY INDUCTION LIGHT WITH 280 W LAMP. FIXTURE WITH DIE CAST ALUMINUM BALLAST CASING WITH POWDER COATED FINISH FOR CORROSION RESISTANCE	MH 400W	420	300	IND	288	700	9	3780	2574	1206
M	LED WALL PACK WITH DIE-CAST ALUMINUM, BRONZE POWDER COAT FINISH.	MH 70W	78	250	LED 2272 LU	27	350	16	1248	432	816
M2	LED WALL PACK WITH DIE-CAST ALUMINUM, BRONZE POWDER COAT FINISH.	MH 150W	158	280	LED 5843 LU	75	400	2	316	150	166
N1	1 - FINNED DIE-CAST ALUMINUM RECTILINEAR LED AREA LUMINAIRE, DARK BRONZE, TYPE 4 DISTRIB., L90 RATED 60K HOURS ON 30 FT ROUND STEEL POLE.	(1) 4000K 400W MH	461	1840	LED 24199 LU	363	2876	12	5532	4356	1176
N2	2 - FINNED DIE-CAST ALUMINUM RECTILINEAR LED AREA LUMINAIRE, DARK BRONZE, TYPE 4 DISTRIB., L90 RATED 60K HOURS, RETROFIT USING EXISTING 30' ROUND STEEL POLE. PROVIDE NEW TENON MOUNT AS REQUIRED.	(2) 4000K 400W MH	922	2206	LED 48398 LU	726	4262	2	1844	1452	392
P	4 FT. 3 LAMP LED WITH CAST, LOW COPPER ALUMINUM END CAPS AND BALLAST BOX, BOROSILICATE GLASS LAMP TUBE, ALUMINUM REFLECTOR WITH WHITE BAKED ENAMEL.ED FINISH, CLASS 1, DIVISION 1/2 WITH EMERGENCY BATTERY WHERE INDICATED.	(3) 3500K 32W T8	84	1700	LED 8220 LU	73	2000	25	2100	1825	275
P2	4 FT. 4 LAMP LED WITH CAST, LOW COPPER ALUMINUM END CAPS AND BALLAST BOX, BOROSILICATE GLASS LAMP TUBE, ALUMINUM REFLECTOR WITH WHITE BAKED ENAMEL.ED FINISH, CLASS 1, DIVISION 1/2 WITH EMERGENCY BATTERY WHERE INDICATED.	(4) 3500K 32W T8	112	2200	LED 14112 LU	97	2500	10	1120	970	150
Q	STANTION MOUNTED CAST ALUMINUM LED, ENCLOSED AND GASKETED, ALUMINUM GUARD, ANGLE REFLECTOR, SUITABLE FOR WET LOCATION.	(2) 3500K 32W TT	68	350	LED 2540 LU	45	1291	2	136	90	46
X1	PHOTOLUMINESCENT EXIT SIGN		5	123	–	0	200	10	50	0	50
								COLUMN TOTAL	17994	13439	4555
										ENERGY REDUCTION	25.3%

Conclusion

- The proposed improvements are GPR-eligible as they greater than 20% more efficient than a standard installation.
- **GPR Costs**: Building LED Lighting = $98,000 (construction costs)
  Site LED Lighting = $13,400 (construction costs)
  Total = $111,400
- **GPR Justification**: Advanced fluorescent lighting and LED lighting is Categorically GPR-eligible per 3.2-2: "*Projects that achieve a 20% reduction in energy consumption…*"[1]

[1] Attachment 2 to the "April 2012 EPA Guidance for Determining GPR Eligibility"

2. INSTALLS EQUALIZATION TANKS

Summary

- Large-scale wastewater plant improvement project includes construction of influent flow equalization tank.
- Total Loan amount = $10,836,000
- Estimated Categorical energy efficient (green) portion of loan = 8.6% ($931,800)
- Estimated Average Annual Energy Savings = $44,100/year

Background

- The City of Post Falls owns and operates a Water Reclamation Facility (WRF) to reclaim municipal wastewater generated within its boundaries and from the nearby City of Rathdrum, Idaho. To meet new strict discharge limits tertiary filtration will be necessary.
- Tertiary filtration with flow equalization is the proposed project since this system will perform as well or better at a lower cost than the traditional tertiary filtration without flow equalization.
- This will result in significant energy savings.

GPR Justification

The GPR-eligibility of the proposed project was established by comparison to a Baseline Standard Practice (BSP).

- The BSP is a 12.0 mgd tertiary filtration system without flow equalization; the proposed project is an 8.76 mgd tertiary filtration system with flow equalization; final construction cost = $3,119,346.
- Flow equalization will reduce the peak flow from 12.0 mgd to 8.76 mgd (approximately 27%) and thereby reduce the size of the tertiary filtration facility and the building that would enclose it. A building that is 27% smaller will require 27% less energy for lighting, heating and ventilation.
- Flow equalization will also attenuate variations in the BOD and ammonia load making it easier to control the dissolved oxygen concentration in the aeration basins. The current dissolved oxygen set point is 3.25 mg/l. With equalization tanks attenuating variations in the load, it is estimated the dissolved oxygen set point can be reduced to 2.0 mg/l.
- The estimated energy savings are compared in the following table. The energy cost is estimated using $0.06/kW-hr, a 30 year life for the tertiary filtration building and 20 year life for the aeration system.

	BSP Energy Usage (kW-hrs/yr)	**GPR Energy Usage (kW-hrs/yr)**	**Energy Savings (kW-hrs/yr)**	**Annual Savings**	**Total Savings Over lifetime**
Tertiary Filtration Building[i]	308,000	225,000	83,000	$49,80	$149,400/ 30 yr lifetime
Aeration	3,188,000	2,536,000	652,000	$ 39,120	$ 782,400/20 yr lifetime
Total	---	---	735,000	$ 44,100	$ 931,800

[i] Lighting, heating, ventilation

Conclusion

- **GPR Justification:** Business Case GPR-eligible (Innovative) per Section 4.4-1b[2]: "*Technology or approach that is not widely used in the state, but does perform as well or better than conventional technology/approaches at lower cost"*.
- **GPR Costs:** The GPR eligible cost is the cost of the energy saved = $ 931,800

[2] Attachment 2 to the "April 2012 EPA Guidance for Determining Project Eligibility".

3. Installs Piping For Off-line Flow Equalization

Summary

- The wastewater plant improvement project includes constructing a new influent flow equalization tank. Installation of piping that allows the tank to be operated in an off-line mode reduces pumping costs by 50%.
- Total Loan amount = $10,836,000
- Estimated energy efficient (green) portion of loan = 1.9% ($204,000)
- Estimated Average Annual Energy savings = $6,800

Background

- The City of Post Falls owns and operates a Water Reclamation Facility (WRF) to reclaim municipal wastewater generated within its boundaries. It also treats wastewater from the City of Rathdrum, Idaho. Strict new discharge limits will require a tertiary filtration system (to be built next phase).
- The equalization tanks can be operated in two modes: in-line or off-line. In the in-line mode, all of the flow goes to the equalization tank and is pumped out. In the off-line mode only the flow above the average flow rate is diverted into the equalization tank. The remainder of the flow bypasses the equalization tank via a gravity pipeline. To operate in the off-line mode additional piping is required.

GPR Justification

- The GPR-eligibility was established by comparison of the proposed project to a Baseline Standard Practice (BSP). The BSP is In-Line Flow Equalization in which all of the flow is pumped.
- The proposed project is Off-Line Flow Equalization. This involves construction of a pipeline that permits 50% of the influent to flow by gravity thereby reducing pumping costs by 50%.
- The estimated average annual energy savings and the cost for the BSP and Equalization Tank Gravity Bypass are summarized in the following table. The corresponding cost savings are estimated using an energy cost of 0.06$/kWh.

	BSP	Project[i]
Construction cost	$495,000	$329,150
Average Annual Energy Savings	----	$6,800
Payback Period	----	6.0 years
Eligible GPR $ = 30 year life x $6,800 **= $204,000**		

[i] Equalization Tank Gravity Bypass piping construction costs (to enable Off-Line Flow Equalization)

Conclusion

- The Off-Line Equalization Tank Piping is GPR eligible because it is cost effective by a Business Case.
- **GPR Costs:** Off-Line Equalization Tank Piping = $204,000 (construction cost)
- **GPR Justification:** Business Case GPR-eligible (Energy Efficiency) per Section 3.4-1: *"Project must be cost effective. An evaluation must identify energy savings and payback on capital and operation and maintenance costs that does not exceed the useful life of the asset"*[3].

[3] Attachment 2 of the "April 2012 EPA Guidance for Determining Project Eligibility".

4. COMBINED VFD/SCADA CONTROL TECHNOLOGY

Summary

- Energy efficient practices incorporated in the design of the WWTP upgrade include the installation of variable frequency drives (VFDs) for the equalization tank mixers and pumps. SCADA control technology will be installed to control the VFDs.
- Total Loan amount = $10,836,000
- Estimated energy efficient (green) portion of loan = 1.0% ($116,000)
- Estimated Average Annual Energy savings = $16,326

Background

- An equalization tank is used in the wastewater treatment process to reduce the variability of flow and loads entering the treatment plant. Mixers inside the tank keep solids suspended and the influent blended. The water level in the tank is variable. Less mixing energy is needed when the tank is low compared to when it is full. VFDs are be used to match the energy input to the volume of water in the tank. SCADA control technology is used to determine and control the correct mixing rate.
- Pumps are used to pump the water from the equalization tank into the treatment plant at a constant rate. VFDs are used to match the pumping rate to the flow rate needed. SCADA control technology is used to determine and control the correct pumping rate.

GPR Justification

- The GPR-eligibility of VFDs and SCADA control technology was established by comparison to a Baseline Standard Practice (BSP). The BSP is to operate the mixers and pumps continuously at full speed.
- The proposed project is to operate the mixers and pumps with VFDs and use SCADA technology to match the mixing and pumping rate to the water depth in the tank and the flow rate needed.
- The estimated annual energy costs are summarized in the table. The corresponding cost savings are estimated using an energy cost of 0.06$/kWh. The simple payback period was based on an installed cost of $5,000 per VFD (0 to 20 hp) and $10,000 per VFD (20 to 50 hp). The useful life of a VFD is greater than 10 years.

Energy Savings			
	BSP	**VFDs/SCADA**	**Savings**
Equalization Tank Mixers	459,876 kW-hr/yr	229,938 kW-hr/yr	229,938 kW-hr/yr
Equalization Tank Pumps	59,495 kW-hr/yr	17,326 kW-hr/yr	42,169 kW-hr/yr
Total Energy Savings			272,107 kW-hr/yr
			$ 16,326/yr

The payback period is 6.7 years.

Conclusion

- The use of VFDs and SCADA control technology is GPR-eligible because it is cost effective as shown above.
- **GPR Costs**: (All numbers are final construction costs)

VFDs for Equalization Tank Mixers & Pumps	$ 60,000
SCADA System	$ 55,000
Total	$ 116,000

- **GPR Justification**: Business Case GPR-eligible (Energy Efficiency) per Section 3.4-1*: "Project must be cost effective. An evaluation must identify energy savings and payback … that does not exceed the useful life of the asset"*; Section 3.5-8 *"SCADA systems can be justified based upon substantial energy savings";* and Section 3.5-9 *"Variable Frequency Drives can be justified based upon substantial energy savings."*

5. Installs Piping to Reduce Chemical Usage

Summary

- Chemical feed piping is installed that allows the chemicals to be applied at a more optimum point in the process thereby reducing chemical usage by 50%.
- Total Loan amount = $10,836,000
- Estimated energy efficient (green) portion of loan <1 % ($14,600)

Background

- The Water Reclamation Facility (WRF) nitrifies. Nitrification will lower the pH if there is insufficient alkalinity to buffer it. The WRF supplements the alkalinity by adding magnesium hydroxide.
- Half of the treatment process at the WRF employs denitrification which recovers enough alkalinity that adding magnesium hydroxide would not be necessary for that portion of the treated flow. However, the WRF does not have the piping in place to dose the magnesium hydroxide to only part of the flow.
- By installing chemical feed piping from the headworks, chemical can be added to only the portion of the flow which needs it.

GPR Justification

- The GPR-eligibility of the chemical feed piping was established by comparison to the Baseline Standard Practice (BSP). The BSP is to continue adding chemical to the entire flow.
- The GPR case is to install chemical feed piping that will provide the ability to dose chemical at a more optimum point in the process thereby reducing chemical usage by approximately 50%.
- The estimated annual chemical usage is summarized in the table below. The corresponding cost saving is based on current chemical use of 90 gal/day (reduced to 45 gal/day) at a cost of $ 2.17/gallon.

	BSP	GPR	Savings
Magnesium Hydroxide	$71,285/yr	$35,642/yr	$35,642/yr
Chemical feed piping	NA	$14,600	NA
Payback Period			0.4 years

Conclusion

- The installation of the chemical feed piping is GPR eligible because it is cost effective (as shown).
- GPR Costs: Chemical feed piping = $14,600
- GPR Justification: Business Case GPR-eligible (Innovative) per Section 4.5-5a: "*Projects that significantly reduce or eliminate the use of chemicals in wastewater treatment;"* and Section 3.4-1: *"Project must be cost effective. An evaluation must identify energy savings and payback on capital and operation and maintenance costs that does not exceed the useful life of the asset".*