Clean Water State Revolving Fund Green Project Reserve

Teton Valley Regional Wastewater Facility Project (City of Driggs) $10,650,000

Categorical GPR Documentation

1. INSTALLS INFLUENT SALSNES FILTER TO REDUCE DOWNSTREAM AERATION AND POWER REQUIREMENTS (Energy Efficiency). Categorical GPR per 3.2-2: *projects that achieve a 20% reduction in energy consumption*; (Innovative) per 4.5.5: *projects that significantly reduce the volume of residuals* ($550,000).
2. INSTALLS NEW ENERGY-EFFICIENT VFDS ON INFLUENT PUMPS AND AERATION BLOWERS (Energy Efficiency). Categorical per GPR 3.2-2: *projects that achieve a 20% reduction in energy consumption* ($240,000).

Business Case GPR Documentation

3. INSTALLS TERTIARY FILTRATION TO REDUCE UV DISINFECTION ENERGY OUTPUT REQUIREMENTS (Energy Efficiency). Business Case GPR per 3.4: *projects that are cost effective* ($250,000).
4. INSTALLS INNOVATIVE MULTI-STAGE ACTIVATED BIOLOGICAL PROCESS (Innovative). Business Case GPR per 4.5-5b: *projects that minimize chemicals and residuals*. Also Categorical GPR per 3.2-2: *projects that achieves a 20% reduction in energy consumption* ($1,300,000).
5. INSTALLS SCADA FOR REMOTE MONITORING & CONTROL (Energy Efficiency). Business Case per GPR 3.5-8: *SCADA systems can be justified based on substantial energy savings* ($335,000).

Prepared by the State of Idaho SRF Loan Program
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1. Treatment Process Selection – Salsnes Filter

Summary

- The Salsnes Filter by Blue Water Technologies - is a new product for primary treatment in a wastewater plant.
- The Salsnes Filter removes 40-70% TSS and 20-40% BOD, produces insignificant inert residuals, eliminates the need for standard primary treatment, and significantly reduces the blower power requirements of the second stage[1].
- Loan amount = $10,650,000
- Estimated Categorical energy efficient (green) portion of loan = 5% ($550,000)
- Annual Energy savings = 20%

Background[2]

- The Teton Valley Regional Wastewater Facility services the communities of Victor and Driggs along with the unincorporated areas of Teton County around and between the two communities. The total population served is around 3,400 people.
- The current treatment consists of two aerated ponds along with two settling ponds and is rated at a flow of 600,000 gallons per day. Dry weather flows average around 350,000 gallons per day with wet weather flows reaching up to 1 million gallons per day at times. The facility was last upgraded in the late 90's.
- The main purpose of this project is to allow the WWTP to meet existing and soon-to-be-imposed permit effluent requirements, including BOD, TSS, and ammonia-nitrogen. The new permit has a very strict ammonia limit due to the pristine water in which the effluent discharges.
- An amendment to the Facility Plan was completed in 2011. The amendment investigated utilizing the Salsnes filter technology for primary treatment in lieu of other alternatives. The amended report and the technology has been evaluated and approved by the Idaho Department of Environmental Quality.

Results[3]

- The MSABP design with Salsnes filters assumes a 30% removal of BOD from the WWTP. This results in a 30% reduction of the oxygen required by the MSABP for BOD treatment.
- MSABP design requires 1.5 pounds of O_2 per pound of BOD loading and 4.6 pounds of O_2 per pound of ammonia (NH_3) loading. The design criteria for this project assume influent BOD to be 250 mg/L and influent ammonia to be 35 mg/L. This equates to an actual oxygen requirement (AOR) of 4,025 lbs/day at 0.9 MGD average daily flow. Accounting for site conditions and other design aspects, this yields a total air flow requirement of 1,250 SCFM (standard cubic feet per minute) for the MSABP process blowers.
- By reducing the BOD load to the MSABP basin by 30% (i.e. to 175 mg/L), the total AOR reduces to 3,180 lbs/day for 0.9 MGD, which equates to a 21% reduction in the AOR requirement compared to the non-Salsnes filter option.

[1] 2/1/11 Correspondence with L. Scott Rogers, P.E., President, Aqua Engineering
[2] 2011 Amendment to Facility Wastewater Plan, City of Driggs
[3] 2/9/11 Correspondence with L. Scott Rogers, P.E., President, Aqua Engineering

TREATMENT PROCESS SALSNES FILTER (CONT'D)

- Again accounting for the same site conditions, the total air flow requirement for the blowers would be 1,000 SCFM or 20% less than the non-Salsnes filter option. The exact energy savings associated with this reduction in air flow will depend on the specific type and model of blower selected. However, using basic assumptions to calculate required energy, a 20% reduction in air flow would result in a 20% reduction of the required energy to operate the blower.

Benefits

- The filter was chosen for primary treatment due to the downstream energy savings, minimal residuals for disposal, simple operation, small footprint, ease of installation, and cost-effectiveness.
- With the Salsnes Filter no waste sludge is produced in the process with only a small amount of compressed and dewatered screenings that can be land filled.
- Eliminates the need for a primary settling tank.

Conclusion

- The process achieves > 20% reduction in blower energy consumption; in addition, there is a significant reduction in the amount of residuals produced.
- **GPR Costs:** Salsnes Filter by Blue Water Technologies = $550,000
- **GPR Justification**: Categorically eligible for GPR per Section 3.2.2[4] (Energy Efficient) as the process achieves a 20% reduction in blower energy consumption; also eligible for GPR per Section 4.5.5 (Innovative) due to the lack of residuals produced[5].

[4] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 9.
[5] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 12

2. New Pumps and Motors

Summary

- All pumps and blowers are new and are to be equipped with VFD's and premium high efficiency motors to conserve energy and enhance the operability of the treatment process.
- Estimated loan amount = $10,650,000
- $240,000 new high efficiency pumps and blowers
- Estimated Categorical energy efficiency (green) portion of loan = 2% ($240,000)
- Estimated annual energy savings > 20%.

Background

- All pumps and blowers are anticipated to be equipped with VFD's and premium high efficiency motors to conserve energy and enhance the operability of the treatment process.
- All other equipment incorporates small motors (<2 HP) to operate screens, grit removal, disc filter backwash pumps, and other minor equipment that is typically packaged from the manufacturer.

Results

- Equipment that contains VFDs and/or high efficiency motors are the new influent lift station pumps and the MSABP process air blowers.
- Even the small motors (<2 HP) in other equipment will be high efficiency motors.

Calculated Energy Efficiency Improvements

- Equipment anticipated to be installed with VFDs is as follows:
- Influent Lift Station Pumps: Three 10 HP pumps @ $20,000 each = $60,000
- MSABP Process blowers: Three 50 HP blowers @ $60,000 each = $180,000

Conclusion

- **GPR Costs**: New high efficiency pumps and blowers = $240,000
- **GPR Justification**: All pumps and motors are Categorically GPR-eligible by Section 3.2-2[6]: premium energy-efficient models are specified for new construction.

[6] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 9.

3. Treatment Process Selection – Tertiary Filter

Summary

- Tertiary Disc Filters
- Estimated energy efficiency (green) portion of loan = 2% ($250,000)
- Estimated annual power savings = 31,536 kWh (43%) = $3152 per year
- Estimated annual cost savings = $6,894 per year (energy savings + lamp replacement)
- Estimated useful life savings = $250,500 (annual + capital cost savings).

Background

- The addition of the tertiary filter allows the design UV transmissivity (or the ease at which UV light can pass through the water) to increase from 55% to 65%.
- The energy savings is not completely linear, but UV disinfection suppliers indicate the increase in transmissivity would reduce energy consumption, O&M costs, and upfront equipment capital costs.
- Without the tertiary filter standard UV design transmissivity ratings = 55%; design number of lamps required = 112 lamps; standard UV equipment capital costs = $248,000.
- Without the filter the average channel width = 28 inches; annual lamp replacement costs = $9,020.

Results

- With the tertiary filter the standard UV design transmissivity ratings = 65%; design number of lamps required = 64 lamps; standard UV equipment capital costs = $170,500.
- With the filter the average channel width = 16 inches; annual lamp replacement costs = $5,280.

Calculated Energy Efficiency Improvements[7]

- Without the tertiary filter the average power draw = 8.4 kW; annual power draw = 73,584 kWh = Annual Energy Costs (@$0.10/kWh) = $7,359.
- With the filter the average power draw = 4.8 kW; annual power draw = 42,048kWh = Annual Energy Costs (@$0.10/kWh) = $4,205.
- Therefore, with the tertiary filter, the UV disinfection unit uses only 57% of the power required without the filter = 42,048 kWh /73,584 kWh = .57, resulting in an annual cost saving = $3,154.
- Thus, with the tertiary filter, the UV system is more energy-efficient resulting in an annual power savings of 31,536 kWh.

Conclusion

- At 10 cents per kW, UV energy reductions from the tertiary filter will save up to $3,154 per year while annual lamp replacement savings will be $3,740 for annual cost savings of $6,900 and 25-year cost savings of $172,500. Lower initial lamp purchase costs of $78,000 results in an overall useful life saving of $250,500.
- **GPR Costs**: Tertiary filter = $250,000

[7] 2/9/11 Correspondence with L. Scott Rogers, P.E., President, Aqua Engineering

- **GPR Justification**: Categorically GPR-eligible per Section 3.2-2[8]: greater than 20% reduction in energy use; also GPR-eligible per Section 3.4-1: cost effective as cost *(of the filter)* is recovered over the useful life of the process.

[8] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 9.

4. Treatment Process – Multi Stage Activated Biological Process

Summary

- Multi-stage Activated Biological Process (MSABP™) technology by Aquarius is an innovative and advanced process for treatment of municipal wastewater.
- Estimated loan amount = $10,650,000
- Estimated energy efficient (green) portion of loan = 12.2% ($1,300,000)

Background[9]

- MSABP™ was piloted at the facility and performed as designed; the 12 stage, media based biological process uses only diffused air to treat wastewater.
- No Secondary Settling is required (MSABP does not need clarification).
- No Return Sludge Pumping or monitoring of sludge age – just daily checking of process.
- Hydraulic and Organic Shock Load Stability.
- High quality tertiary effluent.
- MSABP technology meets the strict new ammonia limits proposed by USEPA in the discharge permit.
- This wastewater treatment system has been approved by the Idaho Department of Environmental Quality.

Innovative Treatment Description[10]

- The process produces no residual or waste sludge, eliminating the need for solids handling equipment.
- The process eliminates the need for chemical addition for sludge conditioning (polymers etc.).
- The process is energy-efficient in that it does not require sludge return pumping associated with the clarification step of typical activated sludge mechanical wastewater treatment.
- In addition, there is no need for solids dewatering, transporting, and disposal, saving energy for both running equipment and hauling sludge offsite for disposal.

Conclusion

- The MSABP system eliminates the need for chemical addition for sludge conditioning.
- The MSABP system significantly minimizes the generation of residuals.
- Energy Efficient Operation = 60 % to 80 % of the energy requirement of other technologies.
- **GPR Costs**: MSABP = $1,300,000
- **GPR Justification**: The process is GPR-eligible per Section 4.5-5: an *innovative treatment technology*[11].

[9] 2/16/11 Correspondence with IDEQ IFRO
[10] 2/1/11 Correspondence with L. Scott Rogers, P.E., President, Aqua
[11] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 12.

5. SCADA Control Technology

Summary

- Off-site electronic sensing and control of the treatment plant and lift stations is essential due to the remote location of these facilities.
- Estimated loan amount = $10,650,000
- Estimated energy efficiency (green) portion of loan = 3% ($335,000)
- Estimated annual energy savings $100,000 per year.

Background/ Results[12]

- The SCADA system is part of the project both at the plant and for remote lift stations.
- FEED PUMPS: The feed pumps to the plant will be controlled through a PLC (programmable logic controller which is part of the SCADA system) that is both tied to a level sensor and VFD's (variable frequency drives) on the pumps. The SCADA PLC on the feed pumps and VFDs will significantly reduce feed pump cycling, thereby greatly reducing energy consumption.
- MSABP: The aeration system will be tied to dissolved oxygen levels in the MSABP tanks and aeration header through PLC's; these control air flow and aeration blower VFDs. Thus, SCADA monitors and controls tank oxygen levels and pressure in the aeration header.
- TERTIARY FILTERS: The tertiary filters are controlled through the PLC / SCADA system. A level sensor measures water level in the influent tank. Rising water is detected by the SCADA PLC, indicating that the filters are blinding; the system then automatically initiates disc cleaning.
- UV DISINFECTION: The SCADA system controls the UV system through flow and transmissivity PLC monitoring. The UV lights in the UV disinfection system have their intensity controlled depending upon the how well the light is penetrating the water.
- PLANT: Through a computer based Graphical User Interface (GUI) program the plant's processes will be monitored and observed remotely. The SCADA GUI will save energy through reduced travel to and from the plant

Calculated Energy Efficiency Improvements[12]

- FEED PUMPS: For the feed pumps it is estimated 10% reduction of power use over a typical float / on-off system. Utilizing 15 HP feed pumps would save approximately $5,000 per year.
- MSABP: Optimizing the air supplied saves significant energy: 150 HP blower @ 20% savings = $20,000 per year.
- TERTIARY FILTERS: The SCADA ensures backwashing is based on need, not time; saving = $5,000 per year.
- UV DISINFECTION: SCADA monitoring/ control of UV light cycling and intensity = $3,000 savings per year
- PLANT: Remote SCADA control saves labor and travel costs = 1 person one trip per day at 10 miles per day = $65,000 per year in labor costs; travel cost @ $0.51 per mile = $2,000 per year = total saving of $67,000/yr.

Conclusion

- The system results in a cost savings of $100,000 per year in energy and labor costs = payback of 3.35 years.
- **GPR Costs:** SCADA = $335,000
- **GPR Justification:** The SCADA is GPR-eligible per Section 3.5-8[13]: *SCADA systems can be justified based on substantial energy savings*.

[12] 2/9/2011 Correspondence with Aqua Engineering

[13] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 10.