**OKLAHOMA FUNDING AGENCY COORDINATING TEAM**

# GUIDELINES FOR ENGINEERING REPORTS FOR WASTEWATER PROJECTS

**ENDORSED BY:**

**OKLAHOMA WATER RESOURCES BOARD**
**OKLAHOMA CITY AREA INDIAN HEALTH SERVICE**
**USDA - RURAL DEVELOPMENT - OKLAHOMA**
**OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY**
**OKLAHOMA DEPARTMENT OF COMMERCE**

**Revised: February 18, 2016**

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# ENGINEERING REPORT
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I. INTRODUCTION. Write a short statement regarding project planning. Include the proposed design period of the project.

II. PROJECT PLANNING AREA. Describe the area under consideration. The project planning area may be larger than the service area determined to be economically feasible. The description should include information on the following:

A. Location, maps, photographs, and sketches. These materials should indicate legal and natural boundaries, major obstacles, elevations, etc. It is highly recommended that a map of the system, that identifies what and where assets are located, be provided.

B. Growth areas and population trends. Specific areas of concentrated growth should be identified. Population projections for the project planning area and concentrated growth areas should be provided for the project design period. These projections should be based on historical records with justification from recognized sources. (See example table in Appendix A.) Include a description of population trends as indicated by available records, and the estimated population that will be served by the proposed wastewater collection system or expanded system.

C. Current and projected wastewater flows. Current and projected volume and strength of sewage flows both domestic and industrial (hydraulic and organic) should be provided. If a deviation is deemed necessary, a justification must be provided. Present wastewater flow rates during average and peak flow periods must be used as the basis for design. (See example table in Appendix B.)

D. Environmental concerns in the service area. Discuss all the environmental concerns or effects within the service area that must be considered in project planning. (See Environmental Report Guidelines.)

E. Community engagement. Describe the utility's approach (or proposed approach) to engage the community in the project planning process. The project planning process should help the community develop an understanding of the need for the project, the required utility operational service levels, funding and revenue strategies to meet the requirements, and other considerations.

III. EXISTING FACILITIES AND NEED FOR PROJECT. Describe the existing facilities including, at least, the following information:

A. Location and layout. Provide a site plan and schematic layout for treatment facilities.

B. Condition of existing facilities. Describe present condition; suitability for continued use; and, if any existing central facilities, for treatment; discuss the hydraulic and organic capacity, storage, and collection capabilities. Also, describe compliance with all state and federal requirements for wastewater systems including: Water Pollution Control Standards, National Pollutant Discharge Elimination System permits.

C. Health and safety. Describe any concerns and include relevant regulations and correspondence from/to Federal and State regulatory agencies such as DEQ inspection reports, Notices of Violation, and Consent or Administrative Orders. Actual copies of documents should be included in the appendices of the Engineering Report. Also, describe compliance with all state and federal requirements for handicap accessibility standards for public areas, and security standards for the protection of all wastewater facilities. This section should also discuss any improvements necessary to provide enhanced security at source or treatment facilities and improved handicap accessibility in public areas as required by the Americans with Disabilities Act.

D. System O&M. Describe the concerns and indicate those with the greatest impact such as bypasses. Investigate inflow, infiltration and leakage, management adequacy, inefficient designs, and problem elimination prior to adding additional capacity.

E. Hydraulic, design, and organic capacity. Describe the reasonable growth capacity that is necessary to meet needs during the planning period. Facilities proposed to be constructed to meet future growth needs should generally be supported by additional revenues. Consideration should be given to designing for phased capacity increases. Provide number of new customers committed to this project.

F. Water System Availability. Describe the existing water system and water treatment works, with special reference to their relationship to existing or proposed wastewater structures which may affect the operation of the wastewater system. Wastewater plans will not be approved before a community water system is approved, if one is to be installed.

G. Growth capacity. Describe the reasonable growth capacity that is necessary to meet needs during the planning period. Facilities proposed to be constructed to meet future growth needs should generally be supported by additional revenues. Consideration should be given to designing for phased capacity increases. Provide number of new customers committed to this project. Calculations for determining reasonable growth need to be included in the appendices of the Engineering Report.

H. System Mapping. The project must include location and mapping of existing and proposed facilities. The use of GPS and GIS mapping systems can be of great benefit to all wastewater systems.

IV. ALTERNATIVES CONSIDERED. This section should contain descriptions of the reasonable alternatives that were considered while planning a solution to meet the identified need(s). The alternatives should also include the do-nothing alternative where applicable. The description should include the following information for each alternative:

A. Description. Describe the facilities associated with the alternative, including treatment, wet weather flow equalization basin, pumping, collection system, discharge, and sludge handling facilities and locations.

B. Design criteria. State the design parameters used for evaluation purposes.

C. Environmental impacts. Provide a short description of environmental impacts that may preclude any alternatives. Only projects that utilize funds with a federal identity require the completion of an Environmental Report (EvR). Those current funding sources are as follows:

1. Rural Development Loan and Grant Programs for Water and Wastewater
2. Department of Commerce Community Development Block Grants
3. OWRB-DEQ State Revolving Loan Funds
4. Oklahoma City Area Indian Health Service

D. Land requirements. Identify sites and easements required. Further specify whether these properties are currently owned, to be acquired, or leased.

E. Construction problems. Discuss concerns such as subsurface rock, high water table, limited access, flood prone areas, or other conditions which may affect cost of construction or operation of facilities.

F. Cost estimates.

1. Construction.
2. Non-construction and other projects.
3. Annual operation and maintenance costs.
4. Cost effective present worth analysis. (See a sample format in Appendix C.)

G. Advantages/Disadvantages. Describe the specific alternative’s ability to meet the owner's needs within its financial and operational resources, comply with regulatory requirements, compatibility with existing comprehensive area-wide development plans, and satisfy public and environmental concerns. Use of a decision matrix considering monetary and non-monetary factors should be appropriate.

V. PROPOSED PROJECT DESIGN AND COST ESTIMATE (RECOMMENDED ALTERNATIVE). This section should contain a fully developed description of the proposed project based on the preliminary description under the evaluation of alternatives. At least the following information should be included:

A. Wastewater

1. Treatment. Describe treatment process in detail and identify location of plant and site of any discharges. Provide status of compliance with the 208 Plan (if applicable, include current revisions with copy of DEQ approval letter). For existing plants and proposed land application projects, provide a description of how sludge is managed and a copy of the approved Sludge Management Plan (if applicable, include a copy of DEQ approval letter). Also describe foundation conditions and floodplain elevations prevailing at sites of proposed structures based on geotechnical information, and the appropriate elevation of ground water in relation to subsurface structures. Show the design capacity for each existing unit, proposed unit, DEQ required capacity (OAC 252:656), and indicate if plant design meets DEQ requirement. See Appendix D. Provide a description of existing utilities, back up and/or alternate power supply.

2. Pumping stations. Identify flow capacity, type, site location, and any special power requirements and emergency operations. Also, describe foundation conditions and floodplain elevations prevailing at sites of proposed structures, and the appropriate elevation of ground water in relation to subsurface structures. Address potential clogging issues. Provide a description of existing utilities, back up and/or alternate power supply.

3. Collection system layout and hydraulic calculation. Identify general location of line improvements: Lengths, sizes, slope issues of site, and key components, and the character of the soil through which sewer lines are to be installed including NRCS soil maps and descriptions.

4. Hydraulic, design and organic calculations. This information should provide sufficient detailed calculations to determine compliance with DEQ design requirements.

5. Waste disposal. Discuss the various wastes from the wastewater treatment plant, their volume, proposed treatment, points of discharge, and/or method of disposal. Project sites shall include the following:

    a. Discussion of the various sites considered and advantages of the recommended ones.
    b. The proximity of residences, industries, and other establishments.

6. Green project reserve components (for SRF Projects Only). Identify and discuss any components of the proposed project that may qualify as "green" based on the guideline in Appendix E. Complete and attach the GPR check sheet as an appendix to the Engineering Report.

7. Stormwater Components. Identify any stormwater projects with potential to help achieve the water quality objectives of the Clean Water Act (CWA). Projects may include sustainable and comprehensive projects, such as, Low Impact Development (LID), innovative green projects and green infrastructure projects.

8. Recommended Alternative Cost Estimate. Provide an itemized cost estimate for the proposed project based upon anticipated period of construction. (For projects containing both water and waste disposal systems, provide a separate cost estimate for each system.)

    a. Development costs (e.g. pilot study, geotechnical, surveying, etc.).
    b. Construction costs (including utilities and communications).
    c. Land and rights.
    d. Legal fees.
    e. Engineering fees.
    f. Resident project representation or construction inspection fees.
    g. Environmental costs.
    h. Operation and maintenance manual as appropriate.
    i. Interest.
    j. Contingency.
    k. Refinancing.
    l. Other costs associated with the proposed project.

B. Water Reuse

1. Volume and quality of reclaimed water flow. Describe anticipated flow from wastewater treatment works to the water reuse treatment facility. For discharging facilities, the report must demonstrate how the proposed project impacts the design flow in the Oklahoma Water Quality Management Plan (208 Plan) and other applicable OPDES permit limits.

2. Treatment, category, and usage. Describe in detail the treatment processes, disinfection system, biosolids management, category of reclaimed water, usage of the reclaimed water, location of the plant, and discharge points.

3. Storage, retreatment, and chlorination. Describe in detail the type of storage (storage tank, open storage basin, or lagoon) and retreatment and chlorination, if applicable. See OAC 252:656-27-5.

4. Pumping stations. Identify the size, type, location, any special power requirements and provisions for emergency operations of all pumping stations.

5. Reclaimed water distribution system layout. Identify the general locations of line improvements, including lengths, sizes and key components. Also, include the direction of flow of all existing and proposed reclaimed water distribution lines from the point of connection with the existing or proposed treatment works or storage locations to the end user.

6. Hydraulic and design calculations. Provide supporting calculations in sufficient detail to demonstrate compliance with DEQ design requirements.

7. Other requirements. Include waste disposal, green project reserve components, and recommended alternative cost estimate as described at IV., A., 5., 6., and 8. above.

VI. Financial status. * Provide information regarding:

A. The current and proposed or projected rate schedules.

B. Annual operating and maintenance (O&M) cost (existing and proposed).

C. Tabulation of users by monthly usage categories.

D. Revenue received for the last three fiscal years. Financial Audits, if available, should be provided.

E. Give status of existing debts and required reserve accounts.

F. Prepare a schedule of short-lived assets and a recommended annual reserve deposit to fund replacement of short-lived assets such as pumps, paint, and small equipment. Short-lived assets include those items not covered under O&M, however, this does not include long-lived assets such as water tank or treatment facility replacement that should be funded with long-term financing. (See Appendix F.)

*Required and reviewed only by USDA – Rural Development funded projects.

VII. Conclusions and Recommendations. Provide any additional findings and recommendations that should be considered in development of the project. This may include recommendations for special studies; highlight the need for special coordination; a recommended plan of action to expedite project development; etc. Discuss the anticipated funding source and provide anticipated project timeline.

# APPENDIX A

## Population Projections

Data Sources:

For County Population Data: http://okcommerce.gov/assets/files/data-and-research/decennial-census/1890_2010_Decennial_Census_Population_by_Place_by_County.xlsx

For Incorporated Place Population data: http://okcommerce.gov/assets/files/data-and-research/decennial-census/2000_2010_Oklahoma_Incorporated_Place_Population.xlsx
- Select Change 2000 to 2010

The downloads contain census data for 2000 and 2010.

Example: Town of Hanna

| | 2000 | 2010 | Change | % Growth |
|---|---|---|---|---|
| Hanna | 133 | 138 | 5 | 3.7 % |

Using the compound amount formula $F = P(1+r)^n$

Where F: future population, P: present population, r: growth rate, n: term in years

$(F/P)^{1/n}-1 = r$ $(138/133)^{1/10}-1 = r$ $0.003697 = r$

Since the 2010 census the population has increased by 3 people.

Change the formula as follows:

$$F=P_{2010}\,(1+r)^n$$

$$F_{2025} = 138(1+0.003697)^{25\text{ years}} = 152\text{ people}$$

| Population Growth at Design Life (Persons) | | | |
|---|---|---|---|
| Present Pop. Year 2010 | Pop. added by this project | Total Pop. of this project | Future Pop. at design life year 2035 |
| 138 | 0 | 141 | 152 |

****Other population projections are acceptable if accompanied by appropriate rationale and documentation.**

# APPENDIX B

## Wastewater Flow Projections

Projected Wastewater Flow: Average Daily Flow calculated from 12 months of readings taken from the influent flow meter. Using current data, the average flow per person is:

19320 gpd/210 persons = 92 gpcd
Adding the new homes served by this project
92 gpcd x 27 persons = 2484 gpd

Using the same formula as population growth at 20 year design life (Appendix A), calculate daily estimate flow at 20 years.

$F = (19320 + 2484)\text{gpd} \times (1+0.002348)^{20\text{years}} = 22{,}851 \text{ gpd}$

Using the same formula as population growth at 20 year design life, calculate increase in homes.

$F = (70 + 8) \text{ homes} \times (1+0.002348)^{20\text{years}} = 82 \text{ homes}$

| Wastewater Flow at Design Life<br>(gallons per day)<br>Average Daily Flow* | | | | |
|---|---|---|---|---|
| Present | Added users | Total | | 20 Years |
| 19,320 | 2,484 | 21,804 | | 22,851 gpd |
| Wastewater Flow at Design Life<br>(gallons per day)<br>Maximum Daily Flow = 2.5 X Average Daily Flow* | | | | |
| Present | Added users | Total | | 20 Years |
| 38,640 | 4,968 | 43,608 | | 45,702 gpd |
| Wastewater Flow at Design Life<br>(gallons per hour)<br>Peak Hourly Demand = 1 gpm per hour x 60 min. | | | | |
| Homes | Added homes | Total homes | Homes at 20 years | 20 years |
| 70 | 8 | 78 | 82 | 4,920 gph |

*****Flow rates for existing facilities must be documented, i.e., flow study.

# APPENDIX C

## Cost Effective Present-Worth Analysis Format

Cost Effective Present-Worth Analysis is a tool that compares feasible alternatives in order to :

- Ensure modesty in cost and design.
- Compare options and ensure the best choice for both taxpayers and the borrower.

**Present Worth (PW) = [Capital Cost] + [Uniform Series Present Worth]$_{\mathbf{O\&M}}$ – [Single Payment Present Worth]$_{\mathbf{Salvage\ Value}}$**

1. Determine **Discount Rate Factor (i)**.
   - Use the “real” Federal Discount Rate
     - Appendix C of OMB Circular A-94
   - What is a real rate versus a nominal rate?
     - Nominal includes market inflation
     - Real removes expected inflation
   - The rate is based on a calendar year: www.whitehouse.gov/omb/circulars_a094_a94_appx-c/

*Example: The 20 yr real rate is 1.2% for 2015.*

2. Determine **Capital Cost.** Capital Cost is the estimated construction cost for the alternative shown in the Engineering Report.

*Example: Total construction costs for a water treatment plant (WTP) rehabilitation are $1,000,000.00. Total non-construction costs are $156,900 (engineering report = $8500; all other engineering fees = $80,400; legal fees = $26,000; environmental information document = $10,000; land = $20,000; geotechnical testing = $12,000). Total capital costs = $1,156,900.*

3. Determine **Uniform Series Present Worth $_{\mathbf{O\&M}}$.** Uniform Series Present Worth $_{O\&M}$ is the present worth of the operation and maintenance costs for the alternative. These costs are assumed to be constant for the life of the project.
   - Determine the annual operation and maintenance cost (A).
   - Determine the present worth of the operation and maintenance for the life of the project (PW $_{O\&M}$).
   - These costs are assumed to be constant for the life of the project.

$$PW_{O\&M} = \frac{A\,[(1 + i)^{N} - 1]}{i(1 + i)^{N}}$$

PW $_{O\&M}$ = present worth of O&M series
A = annual O&M value (assumed constant)

i = discount rate
N = number of years in evaluation period

*Example: The WTP has an annual O&M cost of $50,000.*

*N = 20 years (in most cases), i = 0.012, A = $50,000*
$PW_{O\&M} = A * 17.69 = \$50,000 * 17.69 = \$884,365$

4. Determine **Uniform Series Present Worth $_{SLA}$** for Short Lived Assets. Uniform Series Present Worth $_{SLA}$ is the present worth of the short lived assets for the alternative. Short lived assets should be included in the life cycle cost when deemed appropriate by the consulting engineer and/or the funding agency.

5. Determine **Salvage Value**. Salvage Value is only needed if the useful life is longer than the planning period, otherwise if the useful life is equal to the planning period, the salvage value is zero.

   - Start with useful life of facility or infrastructure.
   - Assume straight line depreciation and 20 year analysis.
     - salvage value at 20$^{th}$ year = capital cost * (years of service remaining at end of planning horizon / total useful life).

$PW_{\text{salvage value}} = F (1 + i)^{-N}$

$PW_{\text{salvage value}}$ = present worth of salvage value
F = future salvage value
i = discount rate
N = number of years in evaluation period

*Example: N = 20 years (in most cases),*
*i = 0.012*
*If the WTP has a useful life of 30 years (at 20 years, there is 10 years remaining) and a capital cost of $1,156,900, then F = 1/3 * ($1,156,900) = $385,633.*

$PW_{\text{salvage value}} = \$385,633 (1 + 0.012)^{-20} = \$303,780$

6. **Present Worth (PW) for each alternative = [Capital Cost] + [Uniform Series Present Worth]$_{O\&M}$ + [Uniform Series Present Worth]$_{\text{Short Lived Asset}}$ - [Single Payment Present Worth]$_{\text{Salvage Value}}$**

*Example: Therefore, Present Worth (PW) for the alternative = [Capital Cost] + [Uniform Series Present Worth]$_{O\&M}$ – [Single Payment Present Worth] $_{SV}$*
*= $1,156,900 + $884,365 – $303,780 = $2,345,045*

# APPENDIX D

## Proposed Design Parameters

| Unit | Existing Design | Proposed Design | DEQ Requirement (OAC 252:656) | Meets |
|---|---|---|---|---|
| Wastewater Plant | 500,000 GPD Plant | 1 MGD Plant | n/a | n/a |
| Aeration | 1,300 $ft^3$/lb peak $BOD_5$ | 1,500 $ft^3$/lb peak $BOD_5$ | 1,500 $ft^3$/lb peak $BOD_5$ | Yes |
| Reactor Volume | 10 hr hydraulic detention | 20 hr hydraulic detention | 18 hr hydraulic detention | Yes |
| Clarifier | 700 gal/$ft^2$/day hydraulic overflow rate | 1,000 gal/$ft^2$/day hydraulic overflow rate | 1,000 gal/$ft^2$/day hydraulic overflow rate | Yes |
| Lagoon-primary cell | none | 60 days retention | 60 days retention | Yes |
| Lagoon-secondary cell | none | 60 days retention and 120 days retention in system | 60 days retention and 120 days retention in system | Yes |

ORF-000
Rev-03/16

**Oklahoma Clean Water State Revolving Fund**
**Green Project Reserve (GPR)**
**Checklist**

## Purpose

The Oklahoma Water Resources Board (OWRB) Clean Water State Revolving Fund (CWSRF) loan program's GPR checklist is a tool to aid loan applicants and consultants in determining the green components of any given project, identifying both green performance targets and submittal materials that will be used for the implementation of the green components. It is also a tool to aid OWRB staff in tracking the implementation of the GPR throughout Oklahoma.The components presented in this checklist are based on Section 212 (Publicly Owned Treatment Works) projects. Please use the attached EPA GPR crosswalk for Section 319 (Non-point source pollution prevention) projects, and Section 320 (Comprehensive conservation management plan - National Estuary program) projects, as described in the Clean Water Act.

## How to Use the Checklist

The following checklist is provided as a resource for CWSRF loan program applicants and consultants. The CWSRF loan program may accept components and technologies other than those listed in the attachment EPA CWSRF GPR Specific Guidance upon OWRB staff review and approval. Applicants are encouraged to introduce additional innovative green technologies in the proposed projects. The Checklist should be provided to the consultants by Loan applicants' staff at the earliest possible stage of the project planning process, ideally during pre-application consultation.

## How to Submit the Checklist

It is the applicant's responsibility to obtain the necessary approvals and permits, and to properly design, build and effectively operate and maintain the proposed facilities covered in the Engineering Report (ER) or planning document. Loan applicants should return a completed copy of the checklist with their ER. The completion of the Checklist is equally valuable for projects that do not meet the GPR, since it will help OWRB staff to track the implementation of the various features within the GPR.

Contact for more Information: Lori Johnson, Assistant Chief, FAD or Your OWRB project engineer @405-530-8800

## I. CWSRF Loan Applicant Information

Loan Number (if assigned):__________________________________________________
Applicant Name: ____________________________________________________________
Project Name/Location: _______________________________________________________
Latest date this list was last updated by the Applicant: ___________________________________

## II. Categories

Please mark, from the categories below, all the GPR components that are proposed for the project.

### 1. Energy Efficiency Components:

***Definition:*** *Energy efficiency is the use of improved technologies and practices to reduce the energy consumption of water quality projects, use energy in a more efficient way, and/or produce/utilize renewable energy.*

*Projects that achieve a 20% reduction in energy consumption are categorically eligible for GPR, energy savings < 20% requires a business case. (Sample business cases are in attachment)*

| N/A | Yes | |
|---|---|---|
| ( ) | ( ) | a. Site plan for facilities includes sustainable building components. |
| ( ) | ( ) | b. The design includes an energy reduction plan with at least a 20% reduction goal |
| ( ) | ( ) | c. The Treatment Facility participates in EPA energy star program[1] |
| ( ) | ( ) | d. Project utilizes high efficiency fixtures, energy star components in heating, ventilating, and air conditioning (HVAC) equipment, Power Smart technology |
| ( ) | ( ) | e. Project utilizes a SCADA system to reduce overall energy consumption by 20% and enhance process control. (Please show in business case the energy and cost saved in $$$numbers) |
| ( ) | ( ) | f. Use of renewable energy alternatives (e.g., geothermal, solar, off grid, Hydro Wind) (Categorical) |
| ( ) | ( ) | g. Project proposes to use high efficiency pumps (achieve 20% reduction in energy consumption) (categorical-documentation required) |
| ( ) | ( ) | h. Infiltration/Inflow (I/I) correction projects that save energy from pumping and reduced treatment costs and are cost effective. Projects that count toward GPR cannot build new structural capacity. These projects may, however, recover existing capacity by reducing flow from I/I (business case required) |
| ( ) | ( ) | i. Collection system Infiltration/Inflow (I/I) detection equipment (Categorical) |

## 2. Water Efficiency Components:

***Definition:*** *EPA's WaterSense program defines water efficiency as the use of improved technologies and practices to deliver equal or better services with less water. Water efficiency encompasses conservation and reuse efforts, as well as water loss reduction and prevention, to protect water resources for the future.*

| N/A | Yes | |
|---|---|---|
| ( ) | ( ) | a. The project utilizes on site stormwater management/rain harvesting (e.g., green roof, permeable paving, on-site drainage, rain garden) (Categorical) |
| ( ) | ( ) | b. Recycling and water reuse projects that replace potable sources with non-potable sources, Extra treatment costs and distribution pipes associated with water (Categorical) |
| ( ) | ( ) | c. The project incorporates water use reduction measures (e.g., low consumption fixtures, grey water systems, and stormwater irrigation measures) (Categorical) |
| ( ) | ( ) | d. The Treatment Facility participates in EPA's Water sense Program. |
| ( ) | ( ) | e. Gray water, condensate and wastewater effluent reuse systems (where local codes allow the practice) (Categorical) |
| ( ) | ( ) | f. Installing any type of water meter in previously unmetered areas<br>(i) If rate structures are based on metered use<br>(ii)Can include backflow prevention devices if installed in conjunction with water meter (Categorical) |
| ( ) | ( ) | g. Replacing existing broken/malfunctioning water meters, or upgrading existing meters, (Categorical) with:<br>(i) Automatic meter reading systems (AMR), for example Advanced metering infrastructure (AMI), Smart meters<br>(ii) Meters with built in leak detection<br>(iii)Can include backflow prevention devices if installed in conjunction with water meter replacement |
| ( ) | ( ) | h. Water efficient landscaping (e.g., drought resistant and/or native plantings, use of non-potable water for irrigation, high efficiency irrigation |

## 3. Green Infrastructure Components:

***Definition:*** *Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale green infrastructure consists of site- and neighborhood-specific practices, such as bioretention, trees, green roofs, permeable pavements and cisterns.*

**N/A** **Yes**

( ) ( ) a. Implementation of green streets (combinations of green infrastructure practices in transportation right-of-ways), for either new development, redevelopment or retrofits including: permeable pavement[2], bioretention, trees, green roofs, and other practices such as constructed wetlands that can be designed to mimic natural hydrology and reduce effective imperviousness at one or more scales. Vactor trucks and other capital equipment necessary to maintain green infrastructure projects. (Categorical)

( ) ( ) b. Wet weather management systems for parking areas including: permeable pavement[2], bioretention, trees, green roofs, and other practices such as constructed wetlands that can be designed to mimic natural hydrology and reduce effective imperviousness at one or more scales. (Categorical)

( ) ( ) c. Offsite reuse of either treated wastewater or a bio solids treatment process Significantly reduces residuals disposal.

( ) ( ) d. The project provides enhanced waste diversion facilities (e.g., on-site recycling, on-site composting) (Categorical)

( ) ( ) e. Establishment or restoration of permanent riparian buffers, floodplains, wetlands and other natural features, including vegetated buffers or soft bioengineered stream banks(categorical)

( ) ( ) f. The project beneficially utilizes recycled materials. (Categorical)

( ) ( ) g. Low-impact development (LID).

( ) ( ) h. Downspout disconnection to remove stormwater from combined sewers and storm sewers (Categorical)

## 4. Environmentally Innovative Project (EIP) Component

***Definition:*** *Environmentally innovative projects include those that demonstrate new and/or innovative approaches to delivering services or managing water resources in a more sustainable way.*

( ) ( ) a. Utility Sustainability Plan consistent with EPA's SRF sustainability policy.

( ) ( ) b. Greenhouse gas (GHG) inventory or mitigation plan and submission of a GHG inventory to a registry (such as Climate Leaders or Climate Registry)
(i). EPA Climate Leaders: http://www.epa.gov/climateleaders/basic/index.html
(ii). Registry: http://www.theclimateregistry.org/

( ) ( ) c. Construction of US Building Council LEED certified buildings or renovation of an existing building on POTW facilities.

( ) ( ) d Decentralized wastewater treatment solutions to existing deficient or failing onsite wastewater systems

**Total Present worth Cost Analysis Component:**

To properly evaluate a project's long-term costs, a Total Present Worth (TPW) cost analysis of feasible alternatives is strongly recommended. TPW cost for each alternative includes Construction Cost, Non construction Cost (e.g., Engineering, Inspection, Legal, Land, Easements, Soils/Foundation Testing, Permits, O& M Manual and Other cost), estimated annual operation and maintenance (O&M) costs during the service life (for example 20 years) discounted to its present value and added to the Construction & Non construction Cost together known as TPW*. The resulting TPW allows participants to assess the true cost of construction projects. **Prepare a comparison of the selected alternative for the project with and without the proposed GPR components.**

**SRF Loan Programs will provide the participant/applicant an estimated interest rate to be used in the life- cycle analysis.*

5. **Cost Estimate for Green Project Components:**

Provide a cost estimate for the green infrastructure project or components. (Add pages if necessary)

| (Description) | (GPR Component) | (Cost $$) |
|---|---|---|
| i.______________________________ | _________________ | ______________ |
| ii.______________________________ | _________________ | ______________ |
| iii.______________________________ | _________________ | ______________ |
| | **Total:** | ______________ |

6. **Please describe the problems with the existing system and explain the technical and financial benefits of using green components included in the project. (Please add pages if necessary)**

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

1. For more information on energy star see http://www.energystar.gov/index.cfm?c=government.wastewater_drinking_water
2.For more information on LEED (Leadership in Energy and Environmental Design) certification see http://www.usgbc.org/LEED/LEED_main.asp
3. For more information on green building see http://www.epa.gov/greenbuilding/

(Attachment-2)

**<u>Sample calculation for energy and cost savings for SCADA control:</u>**

| Project # | LS # | kWh Consumption for Current Run Times/yr | Energy Cost/yr | Excessive kWh Consumption/yr | kWh Consumption/yr after SCADA | Energy Cost/yr | Cost Savings | Energy Savings | Eligible Costs | |
|---|---|---|---|---|---|---|---|---|---|---|
| E1 | 20 | 111,521 | $ 104,829.74 | 7,806 | 103,715 | $ 97,491.66 | $ 7,338.08 | 7% | $ 4,500.00 | Efficiency Calc: |
| E4 | 48 | 50,093 | $ 47,087.42 | 1,503 | 48,590 | $ 45,674.80 | $ 1,412.62 | 3% | $ 4,500.00 | |
| Sub 1 | 82 | 3,335 | $ 3,134.90 | 200 | 3,135 | $ 2,946.81 | $ 188.09 | 6% | $ 4,500.00 | (Total Run Hours - Excess Run Hours)/Total Run Hours |
| | 109 | 35,292 | $ 33,174.48 | 706 | 34,586 | $ 32,510.99 | $ 663.49 | 2% | $ 4,500.00 | |
| Sub 4 | 17 | 4,792 | $ 4,504.48 | 144 | 4,648 | $ 4,369.35 | $ 135.13 | 3% | $ 4,500.00 | |
| Sub 5 | 27 | 15,570 | $ 14,635.80 | 1,246 | 14,324 | $ 13,464.94 | $ 1,170.86 | 8% | $ 4,500.00 | |
| Sub 6 | 64 | 170,718 | $ 160,474.92 | 8,536 | 162,182 | $ 152,451.17 | $ 8,023.75 | 5% | $ 4,500.00 | |
| Sub 8 | 8 | 113,280 | $ 106,483.20 | 3,398 | 109,882 | $ 103,288.70 | $ 3,194.50 | 3% | $ 4,500.00 | |
| Sub 9 | 49 | 24,749 | $ 23,264.06 | 990 | 23,759 | $ 22,333.50 | $ 930.56 | 4% | $ 4,500.00 | |
| | 61 | 27,594 | $ 25,938.36 | 1,656 | 25,938 | $ 24,382.06 | $ 1,556.30 | 6% | $ 4,500.00 | |
| | 74 | 6,693 | $ 6,291.42 | 67 | 6,626 | $ 6,228.51 | $ 62.91 | 1% | $ 4,500.00 | |
| | 76 | 27,213 | $ 25,580.22 | 816 | 26,397 | $ 24,812.81 | $ 767.41 | 3% | $ 4,500.00 | |
| Sub 9b | 68 | 39,127 | $ 36,779.38 | 2,739 | 36,388 | $ 34,204.82 | $ 2,574.56 | 7% | $ 4,500.00 | |
| Sub 11 | 34 | 18,015 | $ 16,934.10 | 1,081 | 16,934 | $ 15,918.05 | $ 1,016.05 | 6% | $ 4,500.00 | |
| | 36 | 19,590 | $ 18,414.60 | 1,763 | 17,827 | $ 16,757.29 | $ 1,657.31 | 9% | $ 4,500.00 | |
| | 42 | 12,440 | $ 11,693.60 | 871 | 11,569 | $ 10,875.05 | $ 818.55 | 7% | $ 4,500.00 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **System-Wide TOTALS** | | **680,022** | **$ 639,220.68** | **47,602** | **632,420** | **$ 607,710.50** | **$ 31,510.18** | **7%** | **$ 72,000.00** |
| LS # | Total Run Hours | Excess Run Hours | % Excess | | | | | | |
| 20 | 7708 | 572.1 | 7% | | | | | | |
| 48 | 4645 | 154 | 3% | | | | | | |
| 82 | 1967.8 | 119 | 6% | | | | | | |
| 109 | 4961.5 | 78 | 2% | | | | | | |
| 17 | 584.3 | 15.9 | 3% | | | | | | |
| 27 | 2574.8 | 207.5 | 8% | | | | | | |
| 64 | 4984.2 | 234.2 | 5% | | | | | | |
| 8 | 3022.4 | 87.1 | 3% | | | | | | |
| 49 | 4419.6 | 173.1 | 4% | | | | | | |
| 61 | 3986.9 | 229.4 | 6% | | | | | | |
| 74 | 790.6 | 6.4 | 1% | | | | | | |
| 76 | 5407.5 | 169.6 | 3% | | | | | | |
| 68 | 2923.1 | 211.9 | 7% | | | | | | |
| 34 | 6837.3 | 411.8 | 6% | | | | | | |
| 36 | 4058.2 | 356.2 | 9% | | | | | | |
| 42 | 4069.2 | 283.5 | 7% | | | | | | |
| NOTES: | | | | | | | | | |
| Project specs call for SCADA units to consist of: | | | | | | | | | |
| | Siemens Intralink LC150 (or similar) | | | | | | | | |
| | MDS iNET900 Data Transmission Unit | | | | | | | | |
| Estimate cost per SCADA unit = $4,500 per correspondence from local Distributor | | | | | | | | | |
| (Municipal Pump & Control) | | | | | | | | | |

(Attachment-2)

## Guidance on Energy Efficiency Business Case for Wastewater Pumping Systems for Green Project Reserve

Modifications, retrofits or replacement of existing wastewater pumping systems that achieve a 20% increase in energy efficiency will categorically qualify for the Green Project Reserve (GPR) Projects that do not achieve a 20% increase in energy efficiency can also count towards the GPR if they have a business case showing how the project significantly improves energy efficiency. Information to be included in a business case for wastewater pumping stations is provided below.

Business cases for wastewater pumping systems must include information that demonstrates that energy efficiency is the primary goal of the project. They should clearly show that: 1) the most energy efficient equipment is being used in the project, 2) that energy efficient design and operational considerations and practices are followed, 3) the percent increase in energy efficiency and KWH saved, and 4) why further energy efficiency improvements cannot be achieved.

1) Energy Efficient Equipment : The business case shall demonstrate that selected equipment is of the highest efficiency suitable for the project. The following are examples of standards or guidelines to be met:

- Selection of new or replacement electrical equipment should meet or exceed energy efficiency standards set forth by professional engineering and manufacturers associations such as the National Electrical Manufacturers Association (NEMA).

- If it is not possible to select new electrical equipment that can meet or exceed energy efficiency standards then applicants must provide acceptable evidence of why this could not be achieved, with rationale for selecting alternate equipment if the goal of energy efficiency is to be achieved.

2) Energy Efficient Design Practices and Considerations: The business case shall demonstrate that all energy efficient design practices and considerations suitable for the project were used. The following are general examples of design considerations where energy efficiency could be demonstrated:

- Pumping systems should be designed to operate in their most efficient zone. Pumps should be selected to operate close to the Best Efficiency Point (BEP) on a pump curve defined as the point with maximum efficiency of the pump. Choose pumps that result in the lowest friction head loss and ensure that pumps are properly sized for the pumping system.
- Pumping systems should be designed to reduce flows to be pumped where possible.
- Reduce pipe friction and lower head losses to reduce the energy needed for pumping. Note that repair and replacement of the collection system piping does not qualify as “green” except in the most dramatic infiltration/inflow cases.
- Where appropriate for energy efficiency purposes, use distributed control systems to operate the most efficient combination of pumps, and at the proper pump speeds, for needed flow rates and pressures.

3) Energy Savings: Comparing the energy requirements of the existing system with the energy requirements of the proposed upgrades yields the increase in energy efficiency. Business cases for energy efficient wastewater pumping projects should calculate the increase in energy efficiency as follows:

$$\frac{\text{kWh/year used prior to the upgrade} - \text{kWh/year used after the upgrade}}{\text{kWh/year used prior to the upgrade}}$$

The answer is expressed as a percentage improvement. The business case should clearly report the kWh/year saved by the project.

4) Energy Saving Justification: Business cases that demonstrate significant energy efficiency improvements will utilize all practical opportunities to improve energy efficiency. Consequently, each business case should discuss why the project cannot achieve a higher level of energy efficiency. One possible answer is that prior energy efficiency improvements have elevated the operation to a point where the remaining gains represent a smaller improvement.

Sample Calculation for energy and cost savings for Pumps:

| Demonstrating Energy and Cost Savings for Pumps | | |
|---|---|---|
| | | |
| Pump Parameter | Comparison Pump | New Pump ( Proposed Pump, Spec) |
| Maufacturer | EPA Region 6 Criteria | |
| Voltage/ Phase | 240/3 | |
| Motor Efficiency, % | 89 | |
| Pump Efficiency | 72.5 | |
| Power usage, Kw-Hr/Yr | 283,021 | |
| Power Cost, $/Yr | 0.09 | |
| Operational Cost, $/Yr | 25472 | |
| Savings, $/Yr | N/A | |
| Base Standard Efficiency, % | 77 | 0 |

New Standard Grade Efficiency: Pumps -72.5%; Motors-89% : 0.725*0.89=0.65

Adding 20% efficiency to the standard grade Efficiency:

| | |
|---|---|
| Base Std. Efficiency, % | 77 |

# APPENDIX F

## Examples List of Short-Lived Asset Infrastructure

| **Estimated Repair, Rehab, Replacement Expenses by Item within up to 20 years from Installation** | |
|---|---|
| **Drinking Water Utilities** | **Wastewater Utilities** |
| **Source Related**<br>• Pumps<br>• Pumps Controls<br>• Pump Motors<br>• Telemetry<br>• Intake/Well Screens<br>• Water Level Sensors<br>• Pressure Transducers<br>**Treatment Related**<br>• Chemical Feed Pumps<br>• Altitude Valves<br>• Valve Actuators<br>• Field & Process Instrumentation Equipment<br>• Granular Filter Media<br>• Air Compressors & Control Units<br>• Pumps<br>• Pumps Motors<br>• Pump Controls<br>• Water Level Sensors<br>• Pressure Transducers<br>• Sludge Collection & Dewatering<br>• UV Lamps<br>• Membranes<br>• Back-up Power Generators<br>• Chemical Leak Detection Equipment<br>• Flow Meters<br>• SCADA Systems<br>**Distribution System Related**<br>• Residential and Small Commercial Meters<br>• Meter Boxes<br>• Hydrants & Blow Offs<br>• Pressure Reducing Valves<br>• Cross Connection Control Devices<br>• Altitude Valves<br>• Alarms & Telemetry<br>• Vaults, Lids, and Access Hatches<br>• Security Devices and Fencing<br>• Storage Reservoir Painting/Patching | **Treatment Related**<br>• Pump<br>• Pump Controls<br>• Pump Motors<br>• Chemical Feed Pumps<br>• Membrane Filters Fibers<br>• Field & Process Instrumentation Equipment<br>• UV Lamps<br>• Centrifuges<br>• Aeration Blowers<br>• Aeration Diffusers and Nozzles<br>• Trickling Filters, RBCs, etc.<br>• Belt Presses & Driers<br>• Sludge Collection and Dewatering Equipment<br>• Level Sensors<br>• Pressure Transducers<br>• Pump Controls<br>• Back-up Power Generator<br>• Chemical Leak Detection Equipment<br>• Flow Meters<br>• SCADA Systems<br>**Collection System Related**<br>• Pump<br>• Pump Controls<br>• Pump Motors<br>• Trash Racks/Bar Screens<br>• Sewer Line Rodding Equipment<br>• Air Compressors<br>• Vaults, Lids, and Access Hatches<br>• Security Devices and Fencing<br>• Alarms and Telemetry<br>• Chemical Leak Detection Equipment |