

RUS PRELIMINARY ENGINEERING REPORT - OUTLINE GUIDE

Reference: RUS Bulletin 1780-3 Preliminary Engineering Report – Wastewater Facilities

Executive Summary

Summarize the current system facilities, problems, needs, alternatives considered, selected alternative, project cost and the public health benefits of the proposed project.

1. General
 - a. Project Description, including description of area under consideration for RD financial assistance
 - b. Environmental Considerations
 - c. Summary of Alternatives Considered
 - d. Recommended & Selected Alternative
2. Project Planning Area
 - a. Location
 - i. Project Planning Area (narrative description and map of boundaries)
 - ii. Project Service Area (narrative description and map of boundaries)
 - iii. Maps, Legal Boundaries, Topography, Major obstacles, etc.
 - b. Environmental Resources Present
 - i. Land Use/Important Farmland/Formally Classified Land
 - ii. Wetlands
 - iii. Floodplains: 500-year Base Flood Elevations@ building sites
 - iv. Cultural Resources
 - v. Biological Resources
 1. Threatened & Endangered Species; Migratory Birds; etc.
 - vi. Water Quality Issues
 - vii. Coastal Resources
 - viii. Socio-Economic/Environmental Justice Issues
 - ix. Miscellaneous Issues
 1. Air
 2. Noise
 3. Transportation
 - c. Population History, Growth Areas & Population Trends
3. Existing Facilities
 - a. Location Map, Site Plans, System Maps & Narrative Descriptions
 - b. History of System Elements
 - i. Discussion of age, date of construction or date of last upgrade or improvement
 - c. Conditions of Facilities – Describe present condition & include:
 - i. Infiltration/Inflow Analysis – EPA Guidance
 1. Quantity of I/I from the existing collection system
 - a. From plant influent metering records

- ii. Describe compliance with Clean Water Act & applicable State requirements
 - d. Financial Status of Existing Facilities
 - i. Current Rate Schedule
 - ii. Annual Operations & Maintenance Costs – Detailed Breakdown
 - iii. Other Capital Improvement Programs
 - iv. Tabulation of Users by Monthly Usage Categories
 - 1. Determination of Equivalent Domestic Units (EDUs)
 - v. Existing Debts
 - vi. Reserve Accounts
- 4. Need for Project
 - a. Health, Sanitation & Security
 - i. Narrative
 - ii. Regulatory Agency Correspondence
 - 1. Non-compliance & Administrative Orders
 - b. System O&M
 - i. Narrative Description of Concerns
 - ii. Quantification of Infiltration & Inflow
 - iii. Management Adequacy
 - iv. Comprehensive Design & Performance Evaluation
 - c. Growth
 - i. Narrative of capacity necessary to meet reasonable 20-year growth projection
 - ii. Facilities needed to support reasonable growth demands
 - 1. Average Day | Maximum Day | Peak Hour Flow rates
 - iii. Phased Capital Improvements to meet incremental demands
 - iv. Number of new customers committed to support project
- 5. Alternative Considered
 - a. Description of reasonable alternatives considered in providing solutions to meet identified needs
 - i. Building new facilities
 - ii. Optimizing operations of existing facilities
 - iii. Rehabilitation & upgrades to existing facilities
 - iv. Interconnection with other existing systems
 - v. Development of small cluster (decentralized) or individual facilities
 - b. Each Alternative shall be an integrated solution including:
 - i. Complete description of all elements associated with the Alternative
 - 1. Treatment requirements and appropriate technologies
 - 2. Collection system elements
 - a. Interceptors, Lift Stations, Force mains, collection sewers
 - ii. Design Criteria
 - 1. Parameters used to evaluate Alternative's ability to meet needs
 - iii. Map
 - 1. System map including locations of all facilities
 - iv. Environmental Impacts

1. Description of **unique** direct and indirect impacts on resources for the specific alternative elements.
- v. Land Requirements
 1. Identify site areas and easements required
 2. Status of land/easement acquisition (owned, to be acquired or leased)
- vi. Construction Problems
 1. Discuss subsurface rock, high water table, limited site access, etc. affecting construction cost or facility operations
- vii. Cost Estimates
 1. Construction: estimate projected cost at time of construction
 2. Non-Construction: All other elements of “Total Project Cost”
 3. Annual Operation & Maintenance
- viii. Advantages/Disadvantages
 1. Narrative of how the alternative meets owner’s need with respect to financial, managerial & operational resources
 2. Narrative of alternatives ability to complies with regulatory requirements
 3. Describe how alternative satisfies public and environmental concerns
6. Selection of an Alternative
 - a. A Present Worth (Life Cycle Cost Analysis) of all feasible alternatives considered.
 - i. Total Capital Cost (Construction & Non-Construction)
 - ii. Present Worth of Annual O&M cost
 - iii. Present Worth of Salvage Values of facilities at end of Loan period or 20-year LCCA period.
 - iv. PW Analysis using “real” federal discount rate (from OMB Circular A-94 Appendix C)
 - v. Matrix/Tabular comparison of PW cost elements & Total PW value
 - b. Non-monetary factors considered to determine alternative selection with PW values within 5% of each other.
7. Proposed Project (Recommended Alternative)
 - a. A fully developed description of the proposed project for construction
 - b. Project Design
 - i. Collection System Layout
 1. System map with locations of line construction or improvement with lengths & sizes. Other key components.
 - ii. Pumping Stations
 1. Size: Building dimensions/area | maximum pumping capacity | number & rated capacity of pump units
 2. Type: Conventional Construction | Prefabricated Factory Built
 3. Location: Site location & a preliminary site plan | Existing Site Elevation
 4. Special Power requirements: Standby Generator | 3-Phase power availability

- iii. Treatment Process Facilities
 - 1. Detailed Process description
 - 2. Site location & a preliminary site plan
 - 3. Process residual waste disposal description
 - 4. Design Capacity: Hydraulic & Contaminants
 - a. Annual Ave. Day | Maximum Day | Peak Hour Capacity
- c. Total Project Cost Estimate
 - i. Itemized estimate & details of project cost elements at projected time of expenditure or project construction award date.
 - 1. Refer to Template and Table resource section for typical list of details
- d. Annual Operating Budget

Provide the Owner's most recent annual operating budget (Appendix)

 - i. Income: Estimates based on proposed rate structure
 - 1. Proposed rate schedule when facilities are completed
 - a. Separate existing customer revenues from proposed/future new customer revenues
 - b. Separate Residential from Non-residential customers and proposed rates for all categories of users
 - 2. Use 60 gallons per capital per day/ 4,500 gallons per residential connection per month in unless historical records support higher wastewater contributions (Annual Average Day flow basis)
 - 3. Evaluate large wastewater use customers' impact on economic viability of project. (i.e. impacts of loss of revenue)
 - ii. Operations & Maintenance Costs
 - 1. Most recent annual O&M cost details of existing system
 - 2. Projected annual O&M cost details of improved system (i.e. after construction of proposed alternative)
 - 3. Minimum details:
 - a. Salaries & Benefits
 - b. Wholesale wastewater treatment services contract fees
 - c. Taxes
 - d. Accounting & Auditing fee for services
 - e. Legal Fees
 - f. Interest on debt
 - g. Utility expenses (Power, telephone, gas, etc.)
 - h. Chemicals
 - i. Office supplies
 - j. Printing
 - k. Miscellaneous or Other Expenses
 - iii. Debt Repayment
 - 1. Tabulate & describe existing debt/proposed debt from all sources
 - 2. Debt Service payment and term remaining

- a. All RUS/RD financing shall be assumed Loan ONLY.
 - iv. Reserves
 - 1. Debt Service Reserve
 - a. Include as 1/10 of annual RUS Loan payment amount
 - 2. Short-Lived Asset Reserve
 - a. Provide a table of Short-Lived Assets
 - i. Assets, equipment and material expected provide a minimum of 5-yr useful service & not covered in Annual O&M expenses
 - ii. Provide 5-yr, 10-yr & 15-yr asset classes
 - iii. Provide current replacement/restoration cost of each asset
 - b. Develop an annual reserve amount necessary to provide funds sufficient to replace/restore assets over life of RUS Loan
- 8. Conclusions & Recommendations
 - a. Engineer's recommendation for additional studies if necessary
 - b. Project Schedule –Time Line – Implementation Plan
 - i. Procurement plan if multiple construction contracts
 - ii. Projection of time/duration of all activities to progress from Preliminary Design Phase through Post-Construction Phase/Warranty Inspection.
 - iii. Realistic time/duration estimates of all reviews and approvals required from local, state and federal agencies
 - iv. Realistic time/duration estimate to obtain all permits necessary to start construction
- 9. Appendices
 - a. Include all documentation of studies, report, evaluations, modeling results, I/I Analysis, other documentation, etc., that support information presented in the body of the report.

**Colorado Department of Public Health & Environment
Water Quality Control Division**

Wastewater Preliminary Engineering Report Guidance & Review Checklist Form

Name of Project:
 Applicant Name, Address & Phone Number:
 Consultant Name, Address & Phone Number:
 WQCD Project Manager:
 District Engineer:

Section (Suggested Outline)	Necessary Elements (Guidance)	Addressed on Page (Applicant)	Complete (CDPHE Reviewer)
(1) Executive Summary	Briefly summarize the system needs, selected alternative, overall costs, and environmental benefits of the proposed project.		
(2) Planning Conditions	This section should contain an overview of the significant regional features defining the context of the report and proposed project. Displaying much of the information in map and tabular formats is highly recommended for ease of review and discussion.		
(2.1) Planning Area	Include map(s) of the current and projected service area for the 20-year planning period; identify environmental features such as streams, lakes, wetlands, and floodplains for the <u>entire</u> planning area. <i>This documentation does not require field surveys and may be obtained from existing data sources such as the National Wetlands Inventory, FEMA and USGS. All or parts of this discussion may be referenced if covered in the Environmental Assessment Report in accordance with the National Environmental Policy Act (NEPA).</i>		
(2.2) 208 Plan Coordination	If the proposed project is within the boundaries of a 208 Agency or regional council of governments (COG), address conformance with the 208 Plan in relation to service area boundaries, population projections, and whether or not the project is identified in the 208 Plan.		
(2.3) Growth Areas and Population Trends	Summarize population projections for the project planning area for a 20-year planning period; compute and compare recent growth rates with projected growth rates; compute estimated increases in equivalent residential units (EQRs); identify growth boundaries and specific areas of concentrated growth; and reference information sources.		
(2.4) Wastewater Flow Forecasts	Briefly summarize current flows and projections (average day, peak day, and peak hour) for the project planning area for a 20-year period; infiltration and inflow impacts; and flow reduction measures such as water conservation practices.		
(2.5) Waste load Forecasts	Identify waste load projections for major effluent parameters such as BOD, TSS, ammonia, phosphorus, metals, etc.		

(3) Description of Existing Facilities	This section should provide a description of the existing treatment and collection facilities.		
(3.1) Service Area Features	On the planning area map, identify the locations of municipal and industrial treatment plants, sludge management areas and facilities, pretreatment plants, pumping sites and any significantly developed areas served by onsite or unconventional systems.		
(3.2) Area Discharge Permits	Identify all other discharge permits for facilities discharging to the same stream segment as the existing treatment facilities.		
(3.3) Facilities Layout and Description	Provide a schematic layout and describe existing facilities including design capabilities and condition of existing treatment processes. Highlight dates major system components were constructed and remaining useful life.		
(3.4) Wastewater Flows	Describe the existing wastewater flows/influent characteristics (including toxic pollutants), discharge permits, and overload conditions. Identify any combined sewer systems, locations of bypasses and overflows. Discuss and analyze the average, peak, dry and wet weather flows. Provide information on current infiltration and inflow as well as flow reduction impacts.		
(3.5) Financial Status and Users	Discuss the financial status of the current wastewater system including O & M costs, existing debt, rate structure and other capital improvement programs. Also include a tabulation of volumes used by types of users (e.g., residential, commercial, industrial) for the most recent typical fiscal year.		
(4) Project Purpose and Need	This section should document the <u>applicable</u> reasons for considering modifications to the existing facilities.		
(4.1) Compliance	Include a discussion of the system's current and future discharge permit compliance status.		
(4.2) Security	Identify any vulnerability assessment concerns.		
(4.3) Operation and Maintenance (O&M)	Identify O&M issues such as operational constraints, water loss and adequate controls.		
(4.4) Growth	Identify growth related needs such as approaching 80% of design capacity and expanding for proposed future growth; considerations for phasing capacity increases and consolidating systems. Provide reasons for projected future growth during the planning period; identify support by additional revenues and local and regional planning.		

(5) Assessment of Alternatives	This section should contain a description of the reasonable alternatives (no action, building new centralized facilities, optimizing the current facilities, interconnecting with other existing facilities, and developing centrally managed small cluster or individual facilities) that were considered in planning a solution to meet the identified needs. Consolidation of treatment facilities should be evaluated in accordance with WQCD Policy on Consolidation of Domestic Wastewater Treatment Works. The alternatives should be consistent with those considered in the environmental review. Mitigation measures necessary to avoid or minimize any adverse environmental effects must be integrated into the project design. <u>Complete assessments should be grouped by alternative and should include information requested in (5.1) through (5.8) below:</u>		
(5.1) Description	Describe and compare all feasible wastewater treatment technologies including new technologies that have been thoroughly tested and installed or piloted with successful operating and compliance track records, and the facilities including collection facilities (systems and alignments, including infiltration and inflow aspects) associated with each alternative.		
(5.2) Design Criteria	State the design parameters, including effluent limitations, used for evaluation purposes of each alternative. The parameters must comply with state regulatory requirements and the State of Colorado’s Design Criteria Considered in the Review of Wastewater Treatment Facilities (Ref. WQCD Policy 96-1).		
(5.3) Environmental Impacts	Describe direct and indirect impacts <u>unique</u> to each alternative on floodplains, wetlands, wildlife habitat, historical and archaeological properties, etc., including any projected permits and certifications.		
(5.4) Land Requirements	Identify sites and easements, as well as permits and certifications required for each alternative, and specify if the properties are currently owned, to be acquired, or leased by the applicant.		
(5.5) Construction Problems	Discuss concerns such as subsurface rock, high water table, limited access, or other conditions that may affect cost of construction or operation of a facility for each alternative.		
(5.6) Operational Aspects	Discuss, in general terms, the staffing requirements, certification level requirements, and the expected basic operating configuration and process control complexities for each alternative.		
(5.7) Cost Estimates	Provide cost estimates for each alternative including breakdowns for construction, non-construction, and annual operations and maintenance, as well as a present worth analysis for each alternative. A reasonable discount rate should be used for determining the present worth of the uniform series of O&M values (in today’s dollars) and the salvage value.		
(5.8) Advantages/ Disadvantages	Describe, in a narrative format, how each alternative affects the applicant’s current and future needs with respect to financial, managerial, and operational		

	resources; how each alternative complies with regulatory requirements and existing comprehensive area-wide development plans; and how each alternative satisfies public and environmental concerns. Summarize, in a matrix rating system, the advantage and disadvantages of each alternative for clarity.		
(6) Selected Alternative	This section should contain the description of the chosen alternative. Include basic hydraulic profiles, basin sizes, detention times, etc. The Water Quality Control Division considers this as a 10% design submittal.		
(6.1) Justification of Selected Alternative	Demonstrate the recommended alternative is the most favorable based on monetary and non-monetary considerations covered in section 5 above. Address whether or not the technology is addressed in the state design criteria. Typically, any new technology or technologies not yet used in Colorado require a submission to the Technical Services Unit (TSU) for the New Technologies Committee.		
(6.2) Technical Description	Describe the major features - treatment plant, collection lines, and lift stations; schematic flow diagram; unit processes and sizes; sewer length and sizes; preliminary effluent limits; design criteria – detention times, overflow rates, process loadings, removal efficiencies, initial design flow, reserve capacity, adequate collection system capacity (existing and proposed); pre-treatment needs; flood proofing requirements; final bio-solids disposal options and costs; and cost saving/pollution prevention measures such as energy conservation and sale of biosolids.		
(6.3) Costs	Provide more detailed project related capital costs, operation and maintenance budget – staffing, training, materials, electricity, lab expenses, residual disposal etc.; replacement costs; compare current and proposed user rates; and 20-year cash flow projection spreadsheet.		
(6.4) Project Implementation	Hold a public meeting with 30-day notice period and summarize outcome; financing recommendations; required legal arrangements and/or intergovernmental agreements; a schedule and/or time line required for the general implementation steps outlined below in 6.4a-6.4e. (Some of these time lines will overlap.)		

(6.4a) Preliminary Effluent Limits (PEL) Application and Site Application	Include as part of the implementation plan, the PEL and site applications and associated time schedule with those activities. Typically there should be 4-6 weeks for application and receipt of PEL's. Site approval is typically 6-8 weeks once the Division receives a complete application. PEL's must be a part of a complete site application. Signatures required in the site application typically require the applicant to get on the meeting agendas of the Management Agencies, County Commissioners and Local Boards of Health.		
(6.4b) Process Design	This report should be submitted after site application approval and prior to final design. Include date and time frame (minimum WQCD review time is 30 days). (Ref. WQCD Policy 96-1; Sec. 1.3.0)		
(6.4c) Final Design	Include approximate date and time frame (minimum Division review time is 45 days). (Ref. WQCD Policy 96-1; Sec.1)		
(6.4d) Discharge Permit	Minimum application time is 180 days prior to discharge. (Ref. WQCD Regulation 61).		
(6.4e) Miscellaneous Permits	Indicate the need for storm water permit application and any 401/404; CDOT and railroad permit applications and time schedules.		
(6.4f) Plan of Operation and Operation and Maintenance (O&M) Manual	The Water Pollution Control Revolving Fund requires a Draft Plan of Operation by construction start, a draft O&M Manual by 50% construction and a final O&M by construction completion. Separate guidance on these documents is available upon request.		

Prepared By: _____
Reviewed By: _____ Date: _____