

Revised: 01/01/04

**OKLAHOMA FUNDING AGENCY COORDINATING TEAM**

**GUIDELINES FOR  
ENGINEERING REPORTS  
FOR  
WATER PROJECTS**

**ENDORSED BY:**

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

Revised: January 1, 2004



CONTENTS

ENGINEERING REPORT  
Water Projects

- I. General
  
- II. Project Planning Area
  - A. Location, Maps, Photos, & Sketches
  - B. Environmental Resources present
  - C. Growth areas and population trends
  - D. Current and Projected Water Use Data
  
- III. Existing Facilities
  - A. Location Map
  - B. Condition of facilities
  - C. Financial status of any operating central facilities
  
- IV. Need for Project
  - A. Health and Safety
  - B. System O&M
  - C. Growth
  - D. Sewage System Available
  
- V. Alternatives Considered
  - A. Description
  - B. Design criteria
  - C. Environmental Impacts
  - D. Land requirements
  - E. Construction problems
  - F. Cost estimates
  - G. Advantages/Disadvantages



VI. Proposed Project (Recommended Alternative)

A. Project design

1. Source(s) of Water Supply
2. Water Use Data
3. Fire Flow Requirements
4. Water Rights
5. Treatment
6. Storage
7. Pumping Stations
8. Distribution Layout
9. Hydraulic Calculations
10. Capacity Funding Limitations for Drinking Water State Revolving Fund (DWSRF) Projects
11. Soils, Ground Water and Foundation Conditions
12. Waste Disposal
13. Table - showing each unit and its design capacity

B. Cost Estimate

C. Annual operating budget

1. Income
2. Operations and Maintenance Costs
3. Capital Improvements
4. Debt Repayment

VII. Conclusions and Recommendations



## ENGINEERING REPORT Water Projects

- I. GENERAL. The Engineering Report should clearly describe the owner's present situation, analyze alternatives, and propose a specific course of action, from an engineering perspective. The level of effort required to prepare the report and the depth of analysis within the report are proportional to the size and complexity of the proposed project. Projects must be modest in design, size and cost, and be constructed and operated in an environmentally responsible manner. The following should be used as a guide for the preparation of Engineering Reports for water systems in Oklahoma.
  
- 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.
  - B. Environmental Resources Present. Provide a general description of the environmental resources present. A detailed description should be included in the environmental information document.
  - C. 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.
  - D. Current and Projected Water Use Data. For existing systems, the current water use data should be used as a basis for the proposed design. If a deviation is deemed necessary, a justification must be provided.
  
- III. EXISTING FACILITIES. Describe the existing facilities including at least the following information:
  - A. Location Map. Provide a schematic layout and general service area map (may be identified on project planning area maps).
  - B. Condition of Facilities. Describe present condition; suitability for continued use; adequacy of water supply; and, if any existing central facilities, the treatment, storage, and distribution capabilities. Also, describe compliance with all state and federal requirements for water supply systems including: primary and secondary drinking water standards,

National Pollutant Discharge Elimination System permits, handicap accessibility standards for public areas such as the office, and security standards for protection of all drinking water facilities.

- C. Financial Status of any Operating Central Facilities. Provide information regarding rate schedules, annual operating and maintenance (O&M) cost, tabulation of users by monthly usage categories and revenue received for the last three fiscal years. Give status of existing debts and required reserve accounts.
- IV. NEED FOR PROJECT. Describe the needs in the following order of priority:
- A. Health and Safety. Describe 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. 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.
- B. System O&M. Describe the concerns and indicate those with the greatest impact. Investigate water loss, management adequacy, inefficient designs, and problem elimination prior to adding additional capacity.
- C. Growth. 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.
- D. Sewerage System Available. Describe the existing sewerage system and sewage treatment works, with special reference to their relationship to existing or proposed waterworks structures which may affect the operation of the water supply system, or which may affect the quality of the supply. Water plans will not be approved before a community sewage disposal system is approved, if one is to be installed.
- V. ALTERNATIVES CONSIDERED. This section should contain a description of the reasonable alternatives that were considered in planning a solution to meet the identified need. The description should include the following information on each alternative:
- A. Description. Describe the facilities associated with the alternative. Describe all feasible water supply sources and provide comparison of such sources. Also, describe treatment, storage and distribution facilities.

- 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. Include a detailed description in the environmental report. Only projects that will utilize funds that have a federal identity require the completion of an EID. Those current funding sources would be 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 plain areas, or other conditions which may affect cost of construction or operation of facility.
  - F. Cost Estimates.
    - 1. Construction.
    - 2. Non-Construction and Other Projects.
    - 3. Annual Operation and Maintenance.
    - 4. Cost Effective Present Worth Analysis. A sample format is available upon request from the Oklahoma Water Resources Board.
  - G. Advantages/Disadvantages. Describe the specific alternatives 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. A matrix rating system could be useful in displaying the information.
- VI. PROPOSED PROJECT (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. Project Design
    - 1. Source(s) of Water Supply. The applicant should describe the proposed source or sources of water supply to be developed, the

reasons for their selection, and provide the following information:

- a. Include requirements for quality and quantity.
  - b. Describe recommended source, including site.
  - c. For surface water sources, include:
    - (1). hydrologic data, stream flow and weather records.
    - (2). safe yield, including all factors that may affect it.
    - (3). maximum flood or pool elevation.
    - (4). description of the watershed, noting any existing or potential sources of contamination which may affect water quality.
    - (5). summary of the quality of raw water with special reference to fluctuations in quality.
  - d. For ground water sources, include:
    - (1). sites considered.
    - (2). advantages of the site selected.
    - (3). elevations with respect to surroundings and floodplain(s).
    - (4). character of formations through which the source is to be developed.
    - (5). geologic conditions affecting the site.
    - (6). summary of source exploration, test well depth, and method of construction; placement of liners or screen; test pumping rates and their duration; water levels and specific capacity, chemical and radiological quality of the water.
    - (7). all sources of possible contamination including but not limited to sewers and sewerage facilities, landfills, outcroppings of consolidated water bearing formations, waste disposal wells, slush pits, irrigation wells, and abandoned wells.
    - (8). industrial and other private supply. Where pertinent, use significant groundwater developments within a one mile (1.6 kilometer) radius of the proposed groundwater source, giving depths, size, protective casing depth, capacity, location, type and any available information pertaining thereto.
2. Water Use Data. Water use data shall include the following:
- a. A description of population trends as indicated by available records, and the estimated population that will be served by the proposed water supply system or expanded system.

- b. Present water consumption and the projected average maximum daily demands, and peak hourly flow shall be used as the basis of design.
  - c. Present and/or estimated yield of the sources of supply.
3. Fire Flow Requirements. Fire flow requirements shall include the following:
  - a. Requirements of the Insurance Services Office or other similar agency as to the fire flows required or recommended in the service area involved.
  - b. Fire flows which will be made available by the proposed or enlarged system.
4. Water Rights. Existing and proposed (Discuss the status of any water rights acquisition(s)).
5. Treatment. Describe process in detail and identify location of plant and site of any process discharges.
6. Storage. Identify size, type and site location. Discuss hydraulic interactions with existing facilities.
7. Pumping Stations. Identify size, type, site location and any special power requirements.
8. Distribution Layout. Identify general location of line improvements: lengths, sizes and key components.
9. Hydraulic Calculations. This information should provide sufficient detail in a tabular format to determine compliance with ODEQ design requirements. Automation tools may be used by the engineer. The submittal should include a map with a list of nodes and pipes and the associated characteristics, such as elevation of node, pipe diameter, pipe segment length, reservoir elevation, domestic and industrial water demands, pressures, fire flow, etc.
10. Capacity Funding Limitations for Drinking Water State Revolving Fund (DWSRF) Projects. The eligible capacity shall be determined using average daily flow and maximum daily flow according to population and per capita flow estimates provided by the applicant. Peak hourly flow shall be used to determine pump capacity. Project capacity must be consistent with environmental constraints and affordability.

- a. Eligible design capacity for treatment plants will be up to a period of 20 years from the estimated date of initiation of construction.
  - b. Eligible capacity for lines will be based on flow for a maximum of 40 years from the estimated date for initiation of construction.
  - c. Eligible design capacity shall be based on the local population projection for the design year and the appropriate local per capita flow.
11. Soil, Ground Water and Foundation Conditions. Soil, ground water and foundation conditions shall include a description of the following:
- a. The character of the soil through which water mains are to be installed.
  - b. Foundation conditions and floodplain elevations prevailing at sites of proposed structures.
  - c. The appropriate elevation of ground water in relation to subsurface structures.
12. Waste Disposal. Discuss the various wastes from the water 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.
  - c. Any potential sources of pollution that may influence the quality of the supply or interfere with effective operation of the water works system, including but not limited to: absorption systems, septic tanks, privies, cesspools, sink holes, sanitary landfills, refuse and garbage dumps.
13. Table. Show the design capacity for each existing unit, proposed unit, DEQ required capacity (OAC 252:626), and indicate if plant design meets DEQ requirement, as follows:

*EXAMPLE*

Unit	Existing Design	Proposed Design	DEQ Requirement (OAC 252:626)	Meets
Water Treatment Plant	500,000 GPD Plant	1 MGD Plant	n/a	n/a
Rapid Mix	40 sec detention	None	30 sec detention	Yes
Flocculation	45 min detention	None	30 min detention	Yes
Sedimentation	3 hr	6 hr	4 hr	Yes
Disinfection	15 min	30 min	30 min	Yes
Filtration	5 gal/min/ft <sup>2</sup>	3 gal/min/ft <sup>2</sup>	4 gal/min/ft <sup>2</sup>	Yes
Lagoon	1 year	3 years	2.5 years	Yes

- B. Cost Estimate. Provide an itemized estimate of the project cost based on the anticipated period of construction. Include development and construction, land and rights, legal, engineering, interest, equipment, contingencies, refinancing, and other costs associated with the proposed project. (For projects containing both water and waste disposal systems, provide a separate cost estimate for each system.)
- C. Annual Operating Budget. (For USDA-RD Projects Only)
1. Income. Provide a rate schedule. Project income realistically, based on user billings, water treatment contracts, and other sources of income.
  2. Operations and Maintenance Costs. Project costs realistically. In the absence of other reliable data, base on actual costs of other existing facilities of similar size and complexity. Include facts in the report to substantiate operation and maintenance cost estimates. Include salaries, wages, taxes, accounting and auditing fees, legal fees, interest, utilities, gasoline, oil and fuel, insurance, repairs and maintenance, supplies, chemicals, office supplies and printing, and miscellaneous.
  3. Capital Improvements. If purchasing water or if water is being treated by others, these costs should be included in O&M costs.
  4. Debt Repayments. Describe existing and proposed project financing from all sources.
- 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.