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RED RIVER VALLEY WATER SUPPLY PROJECT

SPECIFIC PLAN OF STUDY

ENGINEERING

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RED RIVER VALLEY WATER SUPPLY STUDY
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INTRODUCTION

Development of a quality water supply of sufficient quantity for the Red River Valley in North Dakota has been a subject of interest and concern to local residents, government officials, and others. On December 15, 2000, the 106th Congress passed the Dakota Water Resources Act of 2000 (DWRA), which was signed into law on December 21, 2000. Sections 5 and 8 of DWRA authorize the Red River Valley Water Supply Project (Red River Project). The Act directs the Secretary of the Interior to conduct a comprehensive study of the water quality and quantity needs of the Red River Valley in North Dakota and possible options for meeting those needs. The Engineering specific Plan of Study (SPOS) will identify tasks which when completed will assist in establishing the future water needs of the Red River Valley and the alternatives to meet those needs.

The general outline for the development of the Red River Project is provided in the Master Plan of Study (MPOS). The MPOS provides additional background, authority, scope, process, purpose, and overview of all study activities.

Purpose and Objective

The purpose of the Engineering SPOS is to develop a scope of work for the engineering tasks associated with the Red River Project. These tasks include assessing existing water systems related to defining water needs; design of water conveyance, storage, and treatment features; estimation of construction and operation/maintenance costs; and development of system operations plans. All of the features developed and designed under the Engineering SPOS can be used in combination with one or more other features to develop alternatives that meet the water supply needs of the Red River Valley.

The objective of the Engineering SPOS is to complete all engineering related tasks such that other SPOSs can be completed and the Report on the Red River Valley Needs and Options (Needs and Options Report) and the Red River Project Environmental Impact Statement (EIS) can be written.

The information developed from this SPOS expands on previous appraisal-level studies by the Bureau of Reclamation (Reclamation). These include the Red River Valley Water Needs Assessment, Phase 1A; *Appraisal Report* (April 1998), the Red River Valley Water Needs Assessment, Final Appraisal Report, Phase 1B; *Instream Flow Needs Assessment* (August 1999) and the Red River Valley Water Needs Assessment, Phase II; *Appraisal of Alternatives to Meet Projected Shortages* (January 2000). These studies concluded that significant water supply shortages exist under either Reclamation's or the Participants' year-2050 projections, even without consideration of instream flow requirements. The Phase II report identified which in-basin and inter-basin alternatives could meet the Reclamation or the Participants' year-2050 projections (shortages). In-basin alternatives involve meeting the water needs from existing water sources with~~-~~in the Red River Basin. Inter-basin alternatives involve the importation of water from another basin (Missouri River). The in-basin and inter-basin alternatives developed in the Phase II report are described in Section 2.0 of the Engineering SPOS.

The water supply shortages estimated in the Phase II report will be reexamined in the Needs and Options Report based on evaluations conducted in the Needs SPOS and the Hydrology SPOS. Water needs identified in the Needs SPOS and available water supplies identified in the Hydrology SPOS will have a direct impact on the features to be addressed in the Engineering SPOS. For this reason, all of the SPOS study tasks will need to be coordinated to assure the Needs and Options Report and EIS are~~is~~ conducted in a timely and efficient manner.

The Engineering SPOS design and cost estimating tasks will be conducted at the feasibility-level. Feasibility-level is defined as a level of detail sufficient to conduct the required environmental assessment and eventually proceed to finalizing the project. The engineering tasks will identify methods and costs to store and /or convey sources of water supply to locations with shortages as identified in the Needs SPOS. The Engineering SPOS also includes tasks to

identify potential water conservation measures including an evaluation of potential effectiveness and costs.

Engineering SPOS Organization

The Engineering SPOS covers two main study task areas; engineering tasks evaluations to satisfy water needs (Needs SPOS), and engineering analysis to develop features and alternatives to meet water demands. The Needs SPOS tasks will include analysis of water quality and implementation of potential water conservation measures to reduce water demands. The following tasks describe the specific engineering tasks to be completed as part of the Needs and Options Report.

A wide variety of resources will be required to complete the tasks listed in the Engineering SPOS. The resources will include agencies (federal, state, county and local), study teams, consultants, organizations, and academic institutions that will provide specialized and specific regional expertise in areas such as:

- Existing water system characteristics (system type, water demand, population.)
- Economic development related to industrial water use
- Safe Drinking Water Act regulations and their impact on water systems
- Water conservation
- Knowledge of past Red River Valley planning reports
- Design of water treatment, conveyance, and storage features
- Construction and O&M cost estimates
- Regional water system operations
- Others to be identified

ENGINEERING 1 – TASKS ASSOCIATED WITH OTHER SPOS's

A number of tasks in the Needs SPOS and one in the Hydrology SPOS are related to engineering and will be conducted in the Engineering SPOS. These tasks include developing a MR&I water system characteristics database, water system summary reports, analysis of potential water

conservation practices and associated water demand reductions, analysis of wastewater return flows, and developing water treatment recommendations to reduce biota transfer.

Engineering 1.1 - Database of Existing Municipal, Rural & Industrial Water System Characteristics and Summary Reports

A database of water system characteristics and data will be developed for all of the municipal, rural and industrial (MR&I) systems that potentially could be served by the Red River Project. The database will serve as the overall water system data collection tool for the Needs and Options Report. A short summary report will also be developed for some of the systems to document water system characteristics.

Engineering 1.1.1 - Develop Existing MR&I Water System Database

This task will involve the development of a water system characteristic database for all municipal, rural and industrial ~~(MR&I)~~ water systems that potentially could be served by the Red River Project. The database will be used to document water system data for use in other Needs and Options Report tasks. Some of the water system characteristics will be collected under this task while other data will come from other study tasks such as Needs 3.3, 3.4, 3.5, 4.1.1, and 4.1.2, and Engineering 1.3.

Basic MR&I water system information will be collected for all public (as defined by EPA and ND Department of Health) and industrial water systems in the study area. This will include the following information:

- Water system name and contact person
- Water system address and phone number
- Latest population data
- Water rates
- Source water type (surface, ground or purchased and from whom)
- Water treatment type

More detailed water system data will also be collected for municipalities serving over 500 residents and industrial systems. Generally, data for municipal water systems serving less than

500 will *not* be collected, but there may be exceptions. Based on past Reclamation studies, about half of the smaller systems are served by a bulk (larger) water supplier, so these water needs are accounted for in the study. The other half of smaller systems are on their own groundwater and generally have an adequate supply (quantity) of water. However, there could be isolated water quality problems that will be investigated in the study.

The water system characteristics database will include the following information for ***large*** (over 500 population served) and industrial water systems:

- Number of user connections and type (domestic, commercial, industrial, or institutional)
- Annual, monthly and daily average raw water diversion (pumpage)
- Annual, monthly, and daily average treated water demand (if applicable)
- Annual use in millions of gallons (past 15 years)
- Average daily and monthly water demand/usage (past 15 years)
- Peak daily and weekly use and timing
- Source description including available volume, diversion capacity and water quality and water rights/permits (surface water or groundwater)
- Water treatment facilities including capacity and type (filtration, iron/manganese removal, disinfection (type, rate, residual), etc.)
- System storage (number, type, and volume)
- Additional demands (fire flow, contract, etc.)
- Water rate structure and billing rates
- General configuration (urban, rural, etc.)
- Summary of existing and anticipated water system challenges
- Condition of distribution system, age, replacement schedule, materials of components, estimated leakage rates
- Status of water conservation program (if any) including whether users are metered
- Wastewater system annual, monthly and daily maximum surface water discharges (return flow quality and quantity)
- Average daily, monthly and annual wastewater flows

More detailed data may be required from some small (under 500 served) water systems if water quantity or quality deficiencies are identified.

The water system characteristic data may also be gathered from a number of other resources such North Dakota State Department of Health, Minnesota Department of Natural Resources, Environmental Protection Agency, published Consumer Confidence Reports, and other published resources, as needed.

Engineering 1.1.2 - Develop MR&I Water System Summary Reports

This task will include the development of water system summary reports for each water system servingover a population ofover 500 in the study area. There may be other smaller water systems for which summary reports will be required because of special circumstances that arise during the study. The summary reports describe the basic attributes of the system in a narrative format. The reports will cover water system location (city and county), population, water source, water rights or permits, type of treatment, identify bulk service to or from other systems, and other important system characteristics. Similar documentation was developed for some of the systems evaluated in the Phase II report and will be upndated for this study.

Engineering 1.1.3 - Review Existing MR&I Water System Database and Summary Reports

The MR&I water system database and summary reports will be reviewed prior to being used for other study tasks. Reclamation and/or study teams will review the database, incorporate changes where appropriate, and finalize the database for use in other study tasks.

Engineering 1.2 - Impact of Water Conservation Measures on Water Demand in Red River Valley

A Water Conservation Potential Assessment (WCPA) will be conducted on some of the MR&I water systems in the Red River Valley study area to determine what impact water conservation will have on future water demand. This task will evaluate the current water conservation practices (measures) in the Red River Valley study area to establish a baseline of current water conservation practices. The WCPA will be conducted on the MR&I water systems that have

been shown to have potential water shortage problems in Reclamation's Phase II appraisal-level report. Much of the required data for this analysis is collected under Engineering task 1.1.

The WCPA will evaluate potential water conservation practices that could be reasonably implemented in the Red River Valley. This task will analyze the status of each water system's water conservation practices to establish the current baseline condition, recognizing that each system is unique. Each water system would then be evaluated to identify potential water conservation measures that could be implemented to further reduce water demand. The WCPA will assess the use and acceptability of current and potential water conservation practices in order to determine the impact these have on water consumption by various MR&I categories. The information developed in this task will be carried over into the Needs SPOS to assist in the quantification of water demands and needs for the Red River Valley. The information will also be used later in the Engineering SPOS to assist in developing a detailed water conservation feature that willwhich would be included in all alternatives developed to satisfy the water needs in the Red River Valley.

Engineering 1.2.1 – Baseline Water Conservation Practices

This task will involve an evaluation to determine what forms of water conservation or use reduction the MR&I water systems in the study area are currently practicing. This information will be collected through direct contracts (meeting, mailing, telephone, etc) with various water systems, as well as discussions with the State Health Departments and other Sstate agencies. Generally, only those MR&I water systems in the Red River Valley that may have a water shortage problem, based on the Phase II Report, will be evaluated in this task.

The practices for each MR&I water system in the study area will be identified and their impact (reduction in water use) documented. Potential water use reduction measures that have been considered or used in the past in order to meet past drought conditions will also be investigated and documented.

Engineering 1.2.2 -Water Conservation Potential Assessment

WCPA study will be conducted to evaluate potential water conservation practices (measures) that could be reasonably implemented in the Red River Valley service area. These potential

water conservation practices will be compared to the practices currently being used by each MR&I water systems to identify future opportunities to reduce water demand, as described in Engineering 1.2.3. Various water conservation publications and reports will be researched to identify potential water conservation practices and costs that may be applicable to the Red River Valley. The WCPA will not only identify potential water conservation measures, but will evaluate the likely acceptance of each measure in the Red River Valley. The WCPA will also document water conservation implementation costs for each measure so the cost of a water conservation feature (see Engineering 1.2.3) can be established. The WCPA will breakdown both construction (up-front) and annual water conservation costs for each potential water conservation measure.

For comparative purposes in the WCPA, water conservation practices will be divided into two areas of evaluation, supply management and demand (consumption) management. Supply management water conservation measures may include water metering (do they have metering), optimizing system water pressure, water auditing and leak detection, an active repair/replacement program for the water distribution system, as well as other supply related measures. Demand management water conservation measures may include public education programs, enforcement of water codes, low-water-use landscaping, retrofitting of in-home water fixtures, conservation-oriented water rates, wastewater reuse (landscape watering of public areas), as well as other demand related measures. The WCPA will also sub-divided potential water conservation measures by water service type, such as residential or commercial.

Engineering 1.2.3 - Analysis of WCPA and Development of Water Conservation Feature

This task will use the WCPA results and develop a water conservation feature to be included in all Needs and Options Report alternatives. The WCPA will evaluate a number of potential water conservation measures (above what is currently being practiced) and estimate the implementation costs based on $/1,000 gallons. The water user costs (supply only) for each alternative (Table A-1, Appendix A) estimated in the Phase II Report ranged from $0.17 to $1.37 per 1,000 gallons, depending on the repayment method. The least costly alternative's costs ranged from $0.17 to $0.32 per 1,000 gallons. The cost of providing an alternative source of water to the Red River Valley is defined as the "marginal costs", which based on the Phase II

Report, is between $0.17 and $0.32 per 1,000 gallons. The results of the WCPA for each potential water conservation measure will be compared to the "marginal cost" of additional supply, and only those measures that are equal or less will be included in the water conservation feature. Generally, only those MR&I water systems in the Red River Valley that may have a water shortage problem, based on the Phase II Report, will be evaluated in this task. All MR&I systems in the study area would benefit from water conservation, but their reduced water use would not significantly affect the size of the Red River Project; therefore, these were not included in the analysis.

The potential water demand reduction associated with the implementation of additional water conservation measures may vary from system to system depending on the current state of their water conservation activities. The WCPA will establish a standard future level of water conservation that can be economically justified and likely to be accepted in the Red River Valley. The end result from the WCPA analysis will be the determination of a water demand percent reduction for each MR&I water system evaluated. This percentage reduction will be reflected in the water demand estimates conducted in Needs 6.1.

A water conservation feature will then be developed using those WCPA water conservation measures that are less than or equal to the marginal cost and are likely to be accepted in the Red River Valley. This task will define the general scope and cost of the water conservation feature and provide this information for further refinement under Engineering 5.11, which will fully develop the feature including narrative description and costs. The water conservation feature will be included in all of the alternatives developed in the Needs and Options Report.

Engineering 1.2.4 - Review of WCPA and Water Conservation Feature

The WCPA, related analysis, and water conservation feature, as developed under Engineering 1.2.1 through 1.2.3, will be reviewed prior to being used in the Needs SPOS, Section 6 (Future MR&I Water Demands). Reclamation and/or study teams will review the task products, incorporate changes where appropriate, and complete the task products for use in other Needs SPOS tasks.

Engineering 1.3 - Compile Wastewater Quantity and Quality Data

Information on existing MR&I wastewater systems will be compiled and updated as needed. The effluent (return flow discharge) quality, volume and release timing for each MR&I water system will be compiled to evaluate the impact on the surface water quality, especially on aquatic environment, water-based recreation and downstream water users. Water quality parameters to be collected shall include those required under the Environmental Protection Agency National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES controls water pollution by regulating point sources that discharge pollutants under the Clean Water Act (CWA).

The existing wastewater quantity and quality data will be updated and new data will be compiled, as needed, for each MR&I wastewater system that discharges into surface water in the Red River Valley. The North Dakota and Minnesota State Health Departments and EPA will be the primary contact points for current effluent data (return flows). The Hydrology SPOS will be modeling the water quantity and quality of wastewater return flows. Water quality modeling will estimate the effects of effluent return flows on receiving water quality at each study point under present and future conditions.

Assumptions regarding return flows were made in the hydrology modeling ~~in~~of previous Red River Valley studies. These assumptions will ~~need to~~ be re-evaluated in this phase of the study. The previous studies assumed that return flows could be estimated at 85 percent of the water system demand during the November-April period and 65 percent during the May-October period. The depletion data included some variability including the amount of lawn watering, age of a system (influences how much it leaks), soil type (deep perculation from lawn and park irrigation and system leaks vary according to soil type) and climate.

Engineering 1.3.1 - Effluent Quantity and Quality of Return Flows for MR&I Systems

This task will involve compiling monthly historic (15 years of data if available) quantity and quality data on the effluent wastewater being released from treatment facilities. Data from each wastewater treatment facility contributing return flows to surface water sources in the Red River Valley will be compiled including seasonal (monthly or more frequently if needed) information.

Key issues concerning effluent water quality will be identified for each wastewater treatment system. This may include an evaluation of some wastewater treatment facilities to identify final effluent quality deficiencies based on a review of NPDES permit reports. The evaluation may include an analysis of the wastewater treatment systems for improved management skills, adequate financing, appropriate technology, and better wastewater treatment system operation and maintenance, plus requirements for upgrading. The wastewater treatment systems will be evaluated with particular attention to improving the quality and reducing the risks for downstream water users.

Engineering 1.3.2 - Analysis of Wastewater Return Flows

The Hydrology SPOS will require data on the volume and timing of return flows as part of the hydrology model data inputs. This task will include an analysis of the historic wastewater effluent treatment flow rates to determine an accurate methodology for modeling future return flows. Some MR&I systems in the study area will likely have increasing water use in the future. This will result in corresponding increases in return flow discharges into surface waters. This analysis will assist in establishing the ratio between the volume of water withdrawals and wastewater effluent discharge (water being discharged from a wastewater treatment facility, i.e. return flow) for each MR&I system. This ratio will be used in the hydrology quantity and quality modeling to reflect the contribution of return flows to the surface water resources in the study area.

Engineering 1.3.3 - Review Wastewater Return Flows

The wastewater return flow products generated in Engineering 1.3.2 will be reviewed prior to being used in the Hydrology SPOS as described in Hydro 3.5 and 5.1. Reclamation and/or study teams will review the return flow data analysis, incorporate changes where appropriate, and provide the final task data for use in Hydrology SPOS.

Engineering 1.4 - Development of Water Treatment Technology Recommendations to Reduce Biota Transfer

This task involves the identification of specific water treatment technologies that will reduce potential biota of concern (Biota SPOS). These recommendations will eventually be used in the

design of all water treatment and conveyance features associated with the reduction of biota transfer.

Engineering 1.4.1 – Develop Water Treatment Technology Recommendations to Reduce Biota Transfer

This task will be conducted in conjunction with the tasks described in the Biota SPOS. The task will include:

- Research on water treatment technologies and their effectiveness against biota of concern.
- Evaluation of water treatment technologies based on biota removal criteria.
- Development of recommendations on water treatment technologies to reduce biota transfer.

Engineering 1.4.2 – Review Water Treatment Technology Recommendations to Reduce Biota Transfer

The water treatment technology recommendations will be reviewed prior to being used in the Biota and Engineering SPOS. Reclamation and/or study teams will review the recommendations; incorporate changes where appropriate, and provide the final recommendations for use in other SPOS tasks.

ENGINEERING 2 - DEVELOPMENT OF ALTERNATIVES AT THE APPRAISAL-LEVEL FOR SELECTION IN EIS

The Environmental SPOS and EIS process describe~~s~~ a series of tasks to select the reasonable alternatives that meet the water needs within the Red River Valley. This process includes development of an alternative selection process (selection criteria) that identifies alternatives that are practical and feasible from a technical and economic standpoint. Previously studied and new alternatives will be developed at the appraisal-level of detail and an evaluation conducted based on the selection criteria. Those alternatives selected will be designed at the feasibility-level as described in Sections 5 and 6 of the Engineering SPOS.

Engineering 2.1 - Summarize Data from Previously Studied Appraisal-Level Alternatives

This task involves summarizing data from previously studied alternatives and providing that data to the interdisciplinary team, as described in the Environmental SPOS. The interdisciplinary team will use the previously mentioned selection criteria to choose practical and feasible alternatives for further study.

The Bureau of Reclamation Red River Valley Water Needs Assessment, Phase II; *Appraisal of Alternatives to Meet Projected Shortages* (January 2000) report developed eleven alternatives, at the appraisal-level of detail, which met the MR&I water needs of the Red River Valley. These alternatives did not include the additional needs described in the DWRA, which are water quality, aquatic environment, recreation, and water conservation measures nor did they consider other valley needs and resources within the state of Minnesota, except the cities of Moorhead, East Grand Forks, and Breckenridge.

The alternatives were divided into three groups: "no-action", in-basin, and inter-basin. The "no-action" alternative is required in a EIS and is defined below. The in-basin alternatives use water resources within the Red River Basin. The inter-basin alternatives propose a transport of water from the Missouri River to the Red River Basin.

The Phase II report defined two projected water needs: Reclamation's projected 2050 MR&I needs and participant's projected 2050 MR&I needs. All of the alternatives (except "no-action") in the Phase II report met the water needs as projected by Reclamation. Only the alternatives proposing inter-basin transfer of ~~the~~ Missouri River water meet the water needs using the participants projected 2050 MR&I needs. The Phase II Report developed (sized) the alternatives using Reclamation's water need projections.

The following is a short summary of the "no-action" alternative and the eleven alternatives developed in the Phase II report.

> **Alterative 1 - No Action (Future Without)** - The National Environmental Policy Act (NEPA) requires that a No Action alternative be considered in the EIS. The No Action alternative represents the most likely future condition if no new major federally funded water supply project is constructed.

In-Basin Alternatives

Alternative 2 - Kindred Reservoir - The main feature is the construction of a new water supply reservoir on the Sheyenne River near Kindred, North Dakota ~~(ND)~~. The alternative also includes a pumping plant and pipeline to upper Red River, additional surface storage in 22,000-acre-foot ring dike, and distribution and delivery to rural water systems.

Alternative 3 - Enlarged Lake Ashtabula - The main feature involves raising the height and increasing the conservation pool level of Baldhill Dam on the Sheyenne River near Valley City, ND, to increase water storage. The alternative also includes a pumping plant and pipeline to upper Red River, additional surface storage in two 22,000-acre-foot ring dikes, development of Spiritwood Aquifer well field, and purchase of some irrigation water rights for rural water system use.

Alternative 4 - Groundwater Expansion - The alternative generally involves the development of groundwater resources in the North Dakota Red River Basin. The alternative includes a pumping plant to distribute surface water from the Sheyenne River to the upper Red River, two 22,000-acre-foot ring dikes, a new well field in the Spiritwood Aquifer, purchase of 30% of existing irrigation groundwater water rights, a 10,000-acre-foot aquifer storage and recovery system, and numerous desalinization plants (total capacity 45 million gallons per day) using water from the Dakota Aquifer.

Inter-basin Transfer Alternatives

Alternative 5 - Bismarck to Fargo Pipeline - The alternative involves importing Missouri River water via a pipeline from Bismarck to Fargo. The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on Missouri River near Bismarck, branch pipeline to the upper Red River, two ring-dike reservoirs for pipeline re-regulation, and surface-water diversions and distributions for rural water systems.

Alternative 6 - Lake Oahe to Wahpeton Pipeline - The alternative involves importing Missouri River water via a pipeline from Lake Oahe south of Bismarck, ND, to the vicinity of Wahpeton, ND. The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on Lake Oahe near Linton, ND, a ring-dike reservoir for pipeline re-regulation, and surface-water diversions and distributions for rural water systems.

Alternative 7 - Garrison Diversion Unit Supply Works to Sheyenne River - This alternative involves importing Missouri river water to the upper Sheyenne River utilizing existing Garrison Diversion Unit principal supply works. Four sub-alternatives were developed for this option.

Alternative 7A - The alternative includes a pumping plant on McClusky Canal to deliver water to New Rockford Canal, a biota treatment plant (as defined in Chapter 5 of the Phase II report) at the end of New Rockford Canal, a pipeline from New Rockford Canal to the upper Sheyenne River, a pumping plant and pipeline to the upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 7B - The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on McClusky Canal to deliver water to the upper Sheyenne River, a pumping plant and pipeline to the upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 7C - The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on McClusky Canal to deliver water to New Rockford Canal, a second biota treatment plant at the end of New Rockford Canal with pipeline discharging into the upper Sheyenne River, a pumping plant and pipeline to the upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 7D - The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on the McClusky Canal to deliver water to the upper Sheyenne River with an additional 25-cfs pipeline delivering water treated to remove biota to the Grand Forks area, a pumping plant and pipeline to the upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 8 - Western Red River Valley Pipeline - This alternative involves importing Missouri River water via a system of closed pipelines from the Garrison Diversion Unit principal supply works to cities, industries, and rural water systems of the Red River Valley. The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant at the end of New Rockford Canal with pipeline delivery of water treated to remove biota to most sites within the study area.

Engineering 2.2 - Development of New Appraisal-Level Alternatives

New alternatives to meet the water needs of the Red River Valley may be identified through the public scoping process and through further study. New alternatives that meet the water needs of the Red River V~~v~~alley will be developed (design and cost estimates) at the appraisal-level. This task will also involve summarizing the data of the new alternatives and providing that data to the interdisciplinary team (along with the previously developed Phase II alternatives), as described in the Environmental SPOS. The interdisciplinary team will use the previously mentioned selection criteria to recommend which alternatives are practical and reasonable and should be studied further.

Engineering 2.2.1 - Identification of New Alternatives

Through the public scoping process and further study, new alternatives to meet the present and future water needs of the Red River Valley may be identified. Those newly proposed alternatives, which meet the future needs of the Red River V~~v~~alley, will be developed at the appraisal-level.

Engineering 2.2.2 - Design Criteria and Basis of Cost Estimates

The new alternatives will be developed using the same methodology as was used in the Phase II report so valid comparisons can be made of all appraisal-level alternatives. The Phase II report will be reviewed to assure that the same level of detail and basis for cost estimates are used for the new alternatives.

Engineering 2.2.3 - Design and Cost Estimates for New Alternatives

The new alternatives identified in Engineering task 2.2.1 will be designed using the criteria used in the Phase II report and as described in Engineering task 2.2.2. The costs estimates will be based on the unit costs used in the Phase II report and as described in Engineering task 2.2.2. Engineering costs will include capital construction costs and operation and maintenance costs. The design and cost data will be provided for the alternative development task (DEIS 5.5) in the Environmental SPOS.

Engineering 2.3 - Review Appraisal-Level Alternatives

The appraisal-level alternatives developed under Engineering 2.1 and 2.2 will be reviewed prior to being provided for use in the Environmental SPOS tasks. Reclamation and/or study teams will review tasks, incorporate changes where appropriate, and provide final task products for use in the Environmental SPOS.

ENGINEERING 3 – COMPILE DESIGN DATA FROM OTHER SPECIFIC PLANS OF STUDY

Reclamation, the State of North Dakota, Garrison Diversion Conservancy District, Corps of Engineers and others have completed a number of studies and reports, concerning the availability of an adequate water supply in the Red River Valley. These studies have been developed for a variety of reasons and the results will be used in the Needs and Options Report, where appropriate. The assumptions used in developing the studies will be identified to determine its usefulness. The adequacy of data will be judged to determine whether it is compatible with this feasibility-level study.

As the Needs and Options Report progresses, data will be developed under other SPOSs which will be required to complete some of the Engineering SPOS tasks. These items are defined in other SPOSs, but provided below is a partial list of SPOS products which will be required for some Engineering SPOS tasks.

Engineering 3.1 - Design Data from Needs SPOS

Design data developed from Needs SPOS tasks will be needed to complete some Engineering SPOS tasks. The design data includes, but are not limited to:

- Existing and future MR&I water demands (monthly and peaks)
- The geographic distribution of existing and future water demands
- Current and future water quality issues related to SDWA regulations, supply concerns, health issues, etc
- Future water needs associated with aquatic environment and recreation

Engineering 3.2 - Water Supply Source Characteristics from Hydrology SPOS

The water supply source characteristics will be used to determine if the potential source, or combination of sources, will meet water demands for each study point (MR&I system). The Hydrology SPOS tasks will take water demand information for each study point (water system) and model their impact on available water supply sources and identify shortages. Where shortages exist, characteristics of potential additional water sources will be evaluated to determine if and how these additional water sources could meet shortages. These characteristics include but are not limited to:

- Water quality and quantity data on existing Red River Valley water sources including streams, rivers, lakes, reservoirs and aquifers
- Identification of all water supply shortages, their source, time period, and location
- Water quality and quantity data on inter-basin water sources including streams, rivers, lakes, reservoirs and aquifers
- Identification of additional sources of water supply

Engineering 3.3 - Design Data from Biota Transfer SPOS

This task involves collection of design data developed in the Biota Transfer SPOS. Engineering 1.4 (Development and Review of Water Treatment Technology Recommendations to Reduce Biota Transfer) involves the investigation of biota containment methods which reduce biota transfer for alternatives considering water supply sources outside the Red River basin or that contain introduced biota. These containment methods may include water treatment facilities, other facilities, or special operational criteria.

Engineering 3.4 - Review of Design Data from other SPOS Tasks

Engineering 3.1 through 3.3 involve the collection of design data produced from other SPOS tasks. Reclamation and/or study teams will review the design data to assure it is adequate to proceed with the associated Engineering tasks.

ENGINEERING 4 – DESIGN CRITERIA FOR FEATURES

Water treatment, conveyance, and storage features will be designed as part of the alternative development process. Design criteria will be developed to assure feasibility-level design consistency between similar features. Given the complexity and size of the Needs and Options Report, a number of entities will be working simultaneously on similar features, and a clearly established design criterion will minimize discontinuities in the design phase. ~~The d~~Design criteria will also be used to ensure that work done in previous studies is consistent with new work and that these efforts are comparable.

Listed in the following subsections and various types of engineering features which were previously investigated in the Phase II Report. Depending on which alternatives are selected for further study (as described in the EIS SPOS, task 5.4), this list of features could be reduced or expanded.

Engineering 4.1 - Develop Design Criteria for Pipelines

Some of the alternatives will include some type of pipeline conveyance system. Design criteria will be developed for each of the following pipeline characteristics or features:

- Alignment
- Excavation
- Bedding
- Backfill
- Depth of Cover
- Thrust Restraint
- Pipe Materials
- Pipe Pressure Classes
- Fittings and Specials
- Pipe Joints
- Operating Pressure
- Corrosion Protection
- Mainline Valves
- Air Vacuum/Air Release Valves
- Blowoffs
- Pipeline Access Manholes
- Turnout Service Connections
- Vaults
- Roadway Crossings
- Utility Crossings
- Wetlands and Creek Crossings
- Metering Facilities
- Monumentation
- Hydraulic Design

Engineering 4.2 - Develop Design Criteria for Pumping Plants

A review of the elevations in the study area indicate that pumping may be required to convey water from sources of supply to the location of potential water users. Design criteria will be developed for the following items:

- Capacity and pressure requirements (pipeline characteristics, flow rates, system pressure requirements)
- Piping and valves
- Electrical service
- Support facilities
- Building type and size requirements
- Pumping plant configuration
- Standby power requirement
- Type of pumping plant based on size (horsepower)
- Types of pumps (fixed verses variable speed, for example)
- Supervisory control requirements (manned, unmanned, remote operation)
- Other design criteria as needed

Engineering 4.3 - Develop Design Criteria for Water Treatment Facilities

Existing and new raw water sources will have varying chemical and biological characteristics. In accordance with the SDWA regulations, the type of water treatment will depend upon source water characteristics and water system size (population served and per capita water demand). Design criteria will be developed to address treatment needs based on raw water quality and biological characteristics, inflow and supply rates, and treatment methodologies. The design criteria will be developed for each of the following treatment processes, if needed, in a treatment plant.

- Capacity
- Piping and valves
- Electrical service
- Support facilities
- Building type and size requirements
- Treatment plant configuration
- Standby power requirement
- Pretreatment requirements
- Filtration requirements

- Disinfection requirements including residual management (dosage rates)
- Removal requirements (iron or manganese, for example)
- Softening
- Advanced treatment process requirements (exceeds Maximum Contaminant Level of a trace element, for example)
- Liquid and solids residuals (sludges, backwash water, reverse osmosis concentrate)
- Other treatment process requirements
- Legal and regulatory requirements

The design criteria will also be used to design and estimate the cost of modifying existing water system treatment facilities that have deficiencies.

Engineering 4.4 - Develop Design Criteria for Canals

Some of the alternatives will include open channel conveyance facilities such as those using the existing Garrison Division Unit principal supply works. This task will establish design criteria for canals to convey sufficient capacity of water to meet the needs of the Red River V~~v~~alley, including possible rehabilitation of existing canals. Design criteria for canals will include the following channel characteristics.

- Route geology as it relates to the need for channel lining for water loss and analysis of water quality related to dissolved minerals
- Channel prism geometry
- Channel velocity
- Depth of flow
- Control gates
- Method of traversing existing or potential canal slide areas (open cut or pipe)
- Supervisory control system
- Maintenance and safety requirements
- Other design criteria as needed

Engineering 4.5 - Develop Design Criteria for Storage Facilities

Most water supply systems utilize some type of storage facilities to improve system efficiency by balancing inflow rates, managing peak hourly and daily demands, and providing for fire fighting flows requirements. Storage could include dams, ring dikes, pipe-storage, above-ground reservoirs, and below-ground reservoirs.

Engineering 4.5.1 - Develop Design Criteria for MR&I Storage Facilities

This task involves developing design criteria for storage facilities associated with pipeline conveyance systems for finished water MR&I systems. These storage facilities would be configured as either above-ground or below-ground tanks. Design criteria for tanks will be developed so the most cost effective type of tank is selected base on the following:

- Siting
- Tank shape and materials
- Construction materials
- Volume (Peak hourly flow and fire flow requirements, if applicable)
- Hydraulic grade requirements (height)
- Controls and telemetry communications

Engineering 4.5.2 - Develop Design Criteria for New and Rehabilitation of Existing Dams

This task involves developing design criteria for construction of new or the rehabilitation/modifications of existing dams and reservoirs. Two alternatives developed in the Phase II report involved construction of a new dam on the Sheyenne River and the raising of an existing dam (Baldhill Dam) on the Sheyenne River. Design criteria will be developed for the following characteristics or features of the dams:

- Cross Sectional Embankment Geometry
- Seepage Control
- Fish Passage
- Riprap protection
- Emergency Spillway and control gate requirements

- Telemetry and monitoring
- Operational requirements (Safety)
- Other design criteria as needed

Engineering 4.5.3 - Develop Design Criteria for Ring Dike Storage

This task involves developing design criteria for the construction of ring dikes for some of the alternatives. Previous ~~Red River Valley~~ studies proposed using ring dikes due to the relatively flat terrain of the Red River Valley. The design criteria will consider the dike configuration, operating plan, and associated impacts on water quality. Design criteria will be developed for the following ring dike characteristics and features:

- Cross Sectional Embankment Geometry
- Seepage Control
- Riprap protection
- Emergency Spillway and control gate requirements
- Telemetry and monitoring
- Operations – Algae growth and taste/order control
- Operational requirements (Safety)
- Other design criteria as needed

Engineering 4.6 - Develop Design Criteria for System Instrumentation and Control

This task involves developing design criteria for system instrumentation and control for all of the alternatives with the exception of "no action". The requirements for instrumentation and control will depend on the specific configuration of facilities included in each alternative. Depending on the complexity of the Red River Project, a master control station may be required to monitor and control the overall water system from one primary location. System instrumentation and control design criteria will be developed for the following facilities:

- Open channel conveyance systems
- Water treatment plants
- Pumping plants

- Biota containment facilities
- Water storage facilities
- Well fields or aquifer recharge sites

Engineering 4.7 - Develop Design Criteria for Biota Control Systems

This task involves developing design criteria for all biota control systems that may be required in some alternatives. The design criteria will cover specific biota of concern and establish control measures or facility requirements. Refer to Engineering task 1.4 for recommendations on water treatment technologies to reduce biota transfer.

Engineering 4.8 - Develop Design Criteria for Well Fields

This task involves developing design criteria for well fields. Some of the alternatives include obtaining additional water from groundwater sources. These groundwater sources may be related to aquifer recharge areas or may be additional well field development in previously underutilized aquifers. Design criteria will be developed for each of the following features associated with a well field:

- Well sizing based on aquifer characteristics
- Well types and collection system configuration
- Operational and maintenance requirements
- Other design criteria as needed

Engineering 4.9 - Develop Design Criteria for Aquifer Recharge Systems

This task involves developing design criteria for aquifer recharge systems. Some of the alternatives include obtaining additional water from groundwater sources that will be recharged with other sources of water. Design criteria will be developed for each of the following features associated with an aquifer recharge area:

- Aquifer recharge siting and design requirements
- Evaluation of water quality of recharge water and water treatment methods

- Operational and maintenance requirements
- Other design criteria as needed

Engineering 4.10 - Develop Design Criteria for No-Action Alternative

This task involves developing design criteria for the no-action alternative. The scope of the no-action alternative is defined in Environmental SPOS task 5.4. Based on this definition, design criteria will be developed for all water system features that will require design and cost estimating.

Engineering 4.11 - Review Design Criteria

Products developed from Engineering 4.1 through~~and~~ 4.10 will be reviewed prior to being used in Engineering 5. The tasks will be reviewed by Reclamation and/or study teams, incorporate changes where appropriate, and final design criteria summarized and used in the tasks outlined in Section 5 of the Engineering SPOS.

ENGINEERING 5 – DESIGN OF FEATURES TO BE INCLUDED IN ALTERNATIVES

Tasks to develop alternatives at the appraisal-level are described in Section 2 of the Engineering SPOS. These alternatives are provided to the interdisciplinary team (described in the Environmental SPOS) and a selection process is applied~~conducted~~ to identify the practical and reasonable~~feasible~~ alternatives for further study. The alternatives for further study will be recommended by the interdisciplinary team and feasibility-level designs will be conducted on the alternative features as described in this section of the Engineering SPOS. The level of design will be sufficient to secure funding for the project and assess environmental impacts of the alternatives.

The following subsection discusses the types of features that will be designed. One or more of these features will be combined into alternatives, which will meet the water needs of the Red River Valley. The feature designs will be conducted using the design criteria developed under Section 4 and water sources and shortages identified in other SPOSs. Depending on which

alternatives are selected for further study (as described in the EIS SPOS, task 5.4), the list of features to be designed could be reduced or expanded.

Engineering 5.1 - Design of Pipeline Conveyance Features

The following steps will be taken to design various pipeline features. The criteria developed in Engineering 4.1 will be used for all pipeline designs.

- Identify geographic location of water source and end user
- Develop possible routes from water source to water users as identified in the Needs SPOS using USGS topographic maps (7.5 minute) or GIS database as the base maps
- Determine capacities needed for each segment of pipeline system to satisfy the needs identified in the Needs SPOS
- Using USGS quad maps, develop ground and pipe profiles for various pipeline segments
- Perform a hydraulic analysis to develop pipe sizes and pressure classes using capacity requirements and pipeline profiles
- Conduct hydraulic analysis to determine need for auxiliary features including pump stations, storage reservoirs, pressure relief valves, and other appurtenances
- Disinfection requirements considering disinfection by-products and possible need to re-disinfect to maintain residual
- Estimate construction, operation, and maintenance costs

Engineering 5.2 - Design of Pumping Plants

The following steps will be taken to design pumping plants included in various alternatives. The criteria developed in Engineering 4.2 will be used for all pumping plant designs.

- Determine the best site and sizing of pumping plants based on pipeline hydraulic modeling design (Engineering 5.1)
- Determine operating criteria for pumping plants
- Develop a database of various capacity and head requirements for pumping plants to be used in estimating costs (include construction, operation and maintenance)

Engineering 5.3 - Design of MR&I Water Treatment Facilities

The Needs SPOS will provide data on water quantity and quality needs of each water system in the Red River Valley. Existing and future water treatment requirements of each water system will be evaluated to determine whether these systems have adequate water treatment or whether these existing water treatment facilities need to be modified or abandoned. If additional new sources of water are needed, then water treatment facilities will be designed for those sources of water. The following steps will be taken to design various MR&I related water treatment facilities. The criteria developed in Engineering 4.3 will be used for all MR&I water treatment designs. The criteria are as follows:

- Identify water treatment objectives of water treatment facility (SDWA primary and secondary standards)
- Identify water treatment processes required to meet objectives include limiting disinfection by-products
- Determine best site for water treatment facility
- Determine capacity for water treatment facility
- Determine operating criteria for water treatment facility
- Develop a database of water treatment facilities to be used to estimate costs (include construction, operation and maintenance)
-

Engineering 5.4 - Design of Canal System Features

The following steps will be taken to design various canal features. The criteria developed in Engineering 4.4 will be used for all canal designs.

- Identify what segments of existing Garrison Diversion Unit principal supply works canals will be used for each specific alternative
- Identify new canal alignments
- Determine capacities needed for each segment of canal system to satisfy needs identified in Needs SPOS
- Evaluate canal prism geometry, including existing and potential slide areas, and perform a hydraulic analysis to develop canal sizes

- Conduct hydraulic analysis to determine the need for auxiliary features including pump stations, energy ~~dissipators~~dissipaters, canal gates, etc.
- Using existing soils data, determine geology of the area, determine configuration of a stable channel section, and need for channel lining
- Determine what type of control system will be required to operate canal system
- Estimate construction, operation and maintenance costs (costs will include the repair costs of using existing canal features and the federal cost of abandoning unused portions of principal supply works)

Engineering 5.5 - Design of Storage Facilities

The following tasks relate to design of a wide-variety of storage facilities including dams, ring dikes, above-ground reservoirs, and below-ground reservoirs.

Engineering 5.5.1 - Design of MR&I Storage Facilities

Many of the alternatives will require design of above-ground and below-ground water storage tanks. The criteria developed in Engineering 4.5.1 will be used for all storage tank designs and will include the following steps.

- Determine best site and sizing of storage tanks based on pipeline hydraulic modeling (Engineering 4.1)
- Determine operating criteria for storage tanks
- Develop a database of various types, capacity and height of storage tanks to be used in estimating costs (include construction, operation and maintenance)

Engineering 5.5.2 - Design of New and Modification of Existing Dams

Two of the previously studied alternatives involved design or modification of a dam. These included a new dam on the Sheyenne River as described in Alternative 2 in the Phase II Report and modification of an existing dam as described in Alternative 3 of the Phase II Report. The design will be conducted in accordance with design criteria as outlined in Engineering 4.5.2 and involve the following activities.

- Identify potential sites
- Determine stage - area - storage relationship for reservoir site using USGS quad maps or previous studies
- Determine the optimum storage based on historical flows, net evaporation and downstream flow requirements
- Determine height requirement for dam for optimum storage and for raw water storage needed for water supply and flood considerations
- Determine area required
- Determine dam embankment geometry
- Determine operating plan for storage facility
- Determine possibility of permitting and requirements for mitigation
- Develop costs for construction, operation, maintenance, and mitigation

Engineering 5.5.3 - Design of Ring Dike Storage

A number of alternatives will require the design of various size ring dikes. The design will be conducted in accordance with design criteria as outlined in Engineering 4.5.3 and involve the following activities.

- Identify volume needed to meet raw water demands
- Identify potential sites
- Determine height of dikes required considering storage needs for water supply and flood considerations
- Determine reservoir area required
- Determine dike embankment geometry
- Determine operating plan for storage facility
- Develop costs for construction, operation and maintenance

Engineering 5.6 - Design of System Instrumentation and Control

All of the alternatives will require the design of some type of system instrumentation and controls to efficiently operate facilities included in each alternative, with the exception of No-

Action alternative. The design will be conducted in accordance with design criteria as outlined in Engineering 4.6 and involve the following activities.

- Identify all alternative features or facilities which have monitoring or control functions and make a determination as to whether those functions need to be monitored or controlled remotely
- Select which alternative features or facilities will be connected into the supervisory control and data acquisition (SCADA) system
- Investigate available communication alternatives and make a communication system selection based on cost effectiveness and reliability
- Investigate available SCADA systems and select a system which meets the needs of each alternative
- Develop costs for construction, operation and maintenance

Engineering 5.7 - Design of Biota Control Systems

Biota control systems will be designed for some alternatives. The design will be conducted in accordance with design criteria as outlined in Engineering 4.7 and involve the following activities.

- Identify biota control objectives
- Develop a database of control systems to be used to estimate costs (include construction, operation and maintenance) and operational reliability
- Determine best sites for component of the biota control system
- Determine flow capacity of each component
- Determine operating criteria for the system and each component

Engineering 5.8 - Design of Well Fields

This task involves designing well fields to meet additional water needs. Some alternatives include obtaining additional water from groundwater sources. These groundwater sources may be related to aquifer recharge areas or may be additional well field development in previously

underutilized aquifers. The design will be conducted in accordance with the design criteria as outlined in Engineering 4.8 and involve the following activities.

- Identification of well field sites based on information provided in Hydrology SPOS
- Determine required well field capacity based on Needs SPOS
- Determine operating criteria for features including groundwater table monitoring
- Develop a database of similar well fields to be used to estimate costs (include construction, operation and maintenance)

Engineering 5.9 - Design of Aquifer Recharge Systems

This task involves designing aquifer recharge systems to meet additional water needs. Some alternatives include obtaining additional water from groundwater sources through the development of aquifer recharge areas. The design will be conducted in accordance with the design criteria as outlined in Engineering 4.9 and involve the following activities.

- Identification of aquifer recharge sites based on information provided in Hydrology SPOS
- Determine available recharge capacity/rate of recharge sites based on Hydrology SPOS
- Identification of recharge water source including water quality and quantity
- Determine operating criteria for features
- Develop a database of similar recharge sites to be used to estimate costs (include construction, operation and maintenance)

Engineering 5.10 - Design of Water Systems Features for No-Action Alternative

This task includes the design and cost estimating of any water system features identified under the ~~n~~No-action alternative. These design activities may include addressing existing water systems deficiencies that will need to be resolved under the No-action alternative. These deficiencies will be related to meeting the requirements under the Safe Drinking Water Act or meeting an identified water demand. Section 5 of the Environmental SPOS defines the alternatives that will be evaluated in the EIS, including a description of the No-action alternative.

This description will include a specific list of actions and water system facilities which will be impacted in the future in the absence of a Red River Project. The design criteria developed in Engineering 4.10 will be used in this task.

Engineering 5.11 - Water Conservation Feature

This task involves the development of a water conservation feature that will be included in all of the feasibility-level alternatives presented in the Needs and Option Report. The water conservation feature will be based on the work completed in Engineering 1.2 (Impact of Water Conservation Measures on Water Demand in The Red River Valley). The task will identify all water system components to be constructed or rehabilitated under this feature and their estimated costs (construction and O&M).

Engineering 5.12 - Development of Alternatives from Features

Each of the alternatives identified for further study (Section 5 EIS SPOS) is composed of one or more physical features as identified in Engineering 5.1 through 5.11. This task involves developing a narrative description of each of the alternatives for inclusion in the Needs and Option Report.

Engineering 5.13 - Review of Feature Design and Alternative Descriptions

The features designed in Engineering 5.1 through 5.11 and the alternation descriptions developed in Engineering 5.12 will be reviewed prior to being evaluated in the draft Environmental Impact Statement. Each of the features and alternatives will be reviewed by Reclamation and/or study teams to assure they are adequately designed in accordance with the design criteria established in Section 4 and are sized appropriately to meet the water shortage needs as defined in other SPOS's. The feature designs or alternative descriptions will be revised where appropriate, and the final products provided for use in the draft Environmental Impact Statement.

ENGINEERING 6 – COMPILE COST ESTIMATES FOR ALTERNATIVES

In Engineering 5, designs and cost estimates are~~were~~ prepared for all of the water system features that comprise the alternatives identified for further study in the Environmental SPOS.

This task will compile the cost estimates for each of the alternatives as described in Engineering task 5.12. The engineering costs will include construction, operation and maintenance.

Engineering 6.1 - Construction Cost Estimates

Construction costs estimates for all alternatives, as described in Engineering 5.12, will be compiled from the cost estimate work completed in Engineering tasks 5.1 through 5.11. Construction costs will be presented as "total project costs" that include contract cost, contingencies, and non-contract costs (engineering, administration, legal, etc.). The construction costs will also be subdivided into those costs that are subject to repayment and those cost which are a federal responsibility. Refer to the Financial SPOS for more detail on how the costs will be distributed.

Engineering 6.2 - Operation and Maintenance (O&M) Cost Estimates

This task involves estimating annual O&M costs for each of the alternatives described in Engineering 5.12 and compiled from the cost estimates prepared in Engineering tasks 5.1 through 5.11. These costs will be specified by facility type such as, distribution pipeline facilities, pumping plants, treatment plants, and major convey systems. O&M costs would include labor, power, chemicals, equipment, parts/repairs, and replacement. The O&M costs will also be subdivided into those costs that are a federal responsibility and water users responsibility. Refer to the Financial SPOS for more detail on how the costs will be distributed.

Engineering 6.3 - Summarize Alternative Cost Estimates

The alternative feature cost estimates as described in Engineering 6.1 and 6.2 will be summarized as part of a section in the Needs and Options Report.

Engineering 6.4 - Review Alternative Cost Estimates

The alternative cost estimates as described in Engineering 6.1 and 6.2, and summarized in 6.3, will be reviewed prior to being provided as data to other SPOS tasks. Reclamation and/or study teams will review the cost estimates to assure they ~~are~~ adequately represent the costs of the

alternative features. Based on the comments provided, the alternative feature cost estimates will be revised where appropriate, and the final data provided for other SPOS tasks.

ENGINEERING 7 - SYSTEM OPERATIONS

This task involves developing general system operation plans for each alternative evaluated in the EIS. The information provided in the system operation plans will be used to evaluate the alternative and assess the level of risks associated with the typical operational activities based on issues addressed in the EIS.

Engineering 7.1 - Development of System Operation Plans

System operation plans will be developed for all alternatives ~~to~~ evaluated in the EIS. These plans will include a discussion of what portions of the water system will be operated by what entities, special seasonal (winter) operating conditions, summary discussion of normal operating procedures, and a review of the master control system. The operating plans will identify system security features to prevent water system intrusions.

The inter-basin alternatives may have special system operation requirements related to biota transfer concerns. These special requirements will need to identify specific operational safeguards and costs related to biota containment.

The system operation plans will identify what emergency action plans will be developed for each alternative. Emergency action plans will be required for potentially reasonably foreseeable unplanned events that could jeopardize the ability of the system to treat/deliver water or contaminate a watercourse. These emergency plans will also cover security breeches related to possible contamination of raw or finished water supplies.

Engineering 7.2 - Review of System Operation Plans

System operation plans developed under Engineering 7.1 will be reviewed prior to being used in the evaluation of alternatives in the EIS. Each of the system operation plans will be reviewed to assure they adequately describe the operational characteristics of the system. The system

operation plans will be revised where appropriate, and the final products provided for use in the EIS.

ENGINEERING 8 – PREPARATION OF ENGINEERING APPENDIX

An Engineering Appendix will be developed which compiles and documents all of the study activities completed under the Engineering SPOS.

Engineering 8.1 - Prepare Engineering Appendix

The following products will be included in the Engineering Appendix to document the Engineering SPOS activities:

- Tasks in Support of Needs and Hydrology SPOS's
    - MR&I Database and Water System Summary Reports
    - Water Conservation
    - Wastewater Return Flows
    - Biota Transfer Reduction Techniques
- Development of Appraisal-Level Alternatives for selection in the EIS
- Summary of Design Criteria
- Design Report for each Feature
- Development of Alternatives from Features
- Cost Estimates for each Alternative (Construction and O&M)
- System Operation Plans for each Alternative
- Conclusions
- Review and Comment Appendix

Engineering 8.2 - Review of Engineering Appendix

Reclamation and/or study teams will review the Engineering Appendix to assure that it adequately describes the activities completed in the Engineering SPOS.

Engineering 8.3 - Complete Engineering Appendix

Reclamation will incorporate~~d~~ the review comments where appropriate and complete the Engineering Appendix. The appendix will be included as a reference to the Needs and Options Report.