

Scope of Work for the Wastewater / Reclaimed Water Control System Master Plan and Operation Improvements

Prepared for
**Washoe County
Community Services Department**

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Exhibit A: Scope of Work for the Wastewater / Reclaimed Water Control System Master Plan and Operation Improvements

This exhibit is to the Agreement, between Jacobs Engineering Group, Inc. (Consultant), and Washoe County Community Services Department (County), for engineering and consulting services related to the preparation of a master plan for the County's wastewater and reclaimed water control system. The official name for the project will be the WCCSD Wastewater/Reclaimed Water Control System Master Plan and Operation Improvements, hereinafter referred to as the "Project."

Introduction

The County currently operates and maintains a variety of wastewater, reclaimed water, and wind monitoring facilities that are monitored and/or controlled by a variety of independent Supervisory Control and Data Acquisition (SCADA) systems. Much of the communication and controls infrastructure is reaching end of operational life or obsolescence. As a result, there is a disparate mix of SCADA and telemetry hardware, software, and programming. The County is requesting proposals to develop a Master Plan that evaluates the existing system and its use by staff, evaluates improvement alternatives, identifies a preferred approach to remedying existing deficiencies, and establishes standards for future development of SCADA and telemetry infrastructure.

This SCADA Evaluation and Master Plan includes the following facilities:

Wastewater Treatment

- South Truckee Meadows Water Reclamation Facility
- Cold Springs Water Reclamation Facility
- Lemmon Valley Wastewater Treatment Plant

Wastewater Lift Stations

- South Truckee Meadows Lift Station 1 - SW Vista
- South Truckee Meadows Lift Station 2 - Montreux
- South Truckee Meadows Lift Station 4 - Steamboat
- South Truckee Meadows Lift Station 5 - Dorothy Towne
- South Truckee Meadows Lift Station 6 - Arrow Creek
- Cold Springs Lift Station 1 - Diamond Peak
- Cold Springs Lift Station 2 - Sophia
- Hidden Valley Lift Station 1 - Hidden Meadows
- Hidden Valley Lift Station 2 - Hidden Canyon
- Mayberry Lift Station 1
- Southern Comfort Lift Station 1
- Spanish Springs Lift Station 1 - Pebble Creek

Reclaimed Water / Irrigation

- Damonte Wind

- Rio Wrangler Wind
- South Meadows Wind
- Steamboat Wind
- Trademark Wind
- Veterans Wind
- Wilbur May Wind
- Field Creek Pump Station
- South Truckee Meadows Pump Station
- Reclaimed Water Tank 2 - Arrow Creek
- Wolf Run Pond
- Wadsworth Well 1

Consultant's Team

Consultant will contract with Sierra Controls (Subconsultant) to provide existing system review and needs assessment and alternatives identification.

Consultant will review and identify needs and alternatives for South Truckee Meadows and Cold Springs Water Reclamation Facilities and Lemmon Valley Water Treatment Plant.

Subconsultant will review and identify needs and alternatives for wastewater lift stations and reclaimed water sites.

Consultant will evaluate alternatives and develop SCADA Master Plan Technical Memorandum (TM).

Consultant's Scope of Work

This SCADA Evaluation and Master Plan includes review, assessment, evaluation, and recommendations corresponding to the following functional areas:

Supervisory Control Network – Determine improvements to existing network (servers, workstations, networking equipment) for managing SCADA information and sharing with other software platforms across the County's business network. Develop plan to mitigate network security issues and layer network topology to accommodate future system expansion.

SCADA Software – Determine improvements to SCADA software to facilitate simple operation and improve alarm notification and data reporting of County reclaimed water and wastewater systems. Consultant will develop plan to implement a HMI integrated data repository dedicated for O&M manuals and documentation including databases and file management system software allowing users to access asset documentation from HMI graphic animation links.

Compliance Reporting Data Integration – Determine improvements to integrate manually entered lab, flow, and water quality data into a common countywide compliance reporting data repository or alternatively combine with historical database (where limited current operations data resides). Develop data entry standards including custom fields, views, and tables to facilitate a consistent and efficient approach to manual data recording and report generation. Consultant will interview City of Sparks staff at Truckee Meadows Water

Reclamation Facility (TMWRF) and up to 6 independent laboratories providing compliance reporting data to the County to determine common approach for automatic collection of lab data from independent laboratories into compliance reporting data repository to eliminate duplicate manual entry by the County.

Asset Management Database – Investigate existing County asset management tools and coordinate with County and/or third party to review and assist with countywide asset tagging scheme and plan for asset database integration into GIS, SCADA software, and County O&M work orders.

Remote Power Monitoring – Determine improvements required to provide remote power monitoring at reclaimed water and wastewater sites including signals for generator fuel level, running status, and power usage. Develop conceptual design for backup power systems.

Treatment Facility Motor Starters, Telemetry, Controllers, and Instrumentation – Determine improvements to facility motor starters, programmable logic controllers (PLCs), and process instrumentation including analyzers, meters, valves, and actuators at the South Truckee Meadows, Cold Springs, and Lemmon Valley treatment facilities.

Remote Site Motor Starters, Telemetry, Controllers and Instrumentation – Consultant with coordinate with Subconsultant to determine improvements to wastewater lift stations and reclaimed water sites. Remote site telemetry network improvements will be determined to provide a connection to master polling location(s) that is reliable, secure and easy to maintain. Motor starters, control system instrumentation, and site controllers nearing obsolescence or end of operational life will be identified and replacement recommendations will be provided.

Task 1 – Existing System Review

Consultant will document the existing SCADA system components from the supervisory control network down to facility PLCs and summarize all major SCADA and communications equipment by type, location, and condition. Consultant will document condition and expected remaining operational life of existing process instrumentation. Consultant will prepare site investigation templates including investigation items for the functions noted above:

- Supervisory Control Network
- SCADA Software
- Compliance Reporting Data Integration
- Asset Management Database
- Remote Power Monitoring
- Site Controllers
- Electrical Systems
- Process Instrumentation

Kickoff Meeting (Workshop #1) and Site Investigation

Consultant will facilitate a kickoff meeting at County offices with County engineering and information technology (IT) staff to define the desired outcomes for each of the functions

noted above. During the kickoff meeting, Consultant will facilitate discussion to gain endorsement of project goals, work plans, and schedule for this evaluation and planning effort. Consultant will provide an overview of the existing SCADA system infrastructure including how the system is currently operated and maintained and its current condition, configuration, functionality and adequacy with input from Subconsultant and County staff. The kickoff meeting will last approximately three hours and will be attended by two to three members of Consultant's team and a Subconsultant representative.

Consultant will prepare an initial set of SCADA Evaluation goals and an initial delivery plan (implementation schedule) for review. Goals established will revolve around system reliability and redundancy, security, accessibility, ease of use, reporting needs, streamlining operations, existing standards, and staff capabilities and availability.

Immediately following the Kickoff Meeting, Consultant will tour reclaimed water and wastewater facilities to gather SCADA system information. Site investigation scope includes three days for two members of Consultant's staff and 1-2 members of Subconsultant's staff. Consultant will coordinate site investigation schedule and facility access with County and operations staff.

Consultant will interview City of Sparks operations staff at TMWRF to investigate TMWRF's compliance reporting data tools and workflows. Interview will be approximately two hours in duration will be attended by two members of Consultant's staff and County staff.

Consultant will interview up to 6 independent laboratories providing compliance reporting data to the County to determine lab capabilities and industry data formatting standards for automatic data export into compliance reporting data repository. Each interview will be via teleconference and approximately one hour in duration. Interviews will be attended by two members of Consultant's staff and County staff.

Consultant will provide kickoff meeting notes, trip notes, photos and simple diagrams summarized in a trip report.

Task 1 Deliverables

1. Workshop #1 Meeting Summary.
2. Final site investigation notes, details, photos, and simple diagrams will be provided via technical memorandum (TM) deliverable in Task 7.

Task 2 – As-built Documentation

Consultant will investigate existing electrical and process components and provide as-built documentation including electrical one-line diagram and process and instrumentation diagram (P&ID) for all wastewater and reclaimed water sites except South Truckee Meadows Water Reclamation Facility, Cold Springs Water Reclamation Facility, and wind sites.

Task 2 Deliverables

1. As-built electrical one-line diagrams and P&IDs for sites noted above.

Task 3 – SCADA Network Topology Design

Consultant will coordinate with County IT and develop a countywide control system network Ethernet/IP addressing scheme including network layering and subnetting. Design will include all Ethernet/IP compatible reclaimed water and wastewater components.

Task 3 Deliverables

1. County approved Ethernet/IP addressing spreadsheet for wastewater and reclaimed water sites.

Task 4 – System Needs and Alternatives Identification

The purpose of this task is to document the condition and deficiencies of SCADA system components in a partial technical memorandum (TM). Deficiencies will be assigned a criticality rating.

System Deficiency Criticality Rating

System deficiencies will be assigned criticality ratings as follows:

- **Priority 1 – Immediate Replacement Recommended**
Equipment is obsolete, non-functional, or inadequate for planned expansion.
- **Priority 2 – Partial Component Replacement or Obsolescence Planning Recommended**
Equipment is nearing end of life or does not leverage current technology.
- **Priority 3 – No Deficiency**
Equipment is currently manufactured and will be supported in the foreseeable future.

Consultant will develop potential recommendations and alternatives to be considered to address the system deficiencies identified, improve efficiency, and/or provide better stewardship of County operations.

Functional Area Alternative Evaluation:

- **Supervisory Control Network**
Consultant will evaluate alternatives including disaster recovery, network redundancy, and remote access. Disaster recovery alternatives will include the following:
 1. Emergency Operation Center
 - a. Remote control of countywide facilities via standalone HMI and data servers.
 2. Disaster recovery suite
 - a. Realtime backup of historical SCADA data and virtual infrastructure. Includes workstation with standalone HMI and data servers.
- **SCADA Software**
Consultant will evaluate alternatives including asset, energy, and workflow management software modules to reduce operational costs and increase efficiency.
- **Compliance Reporting Data Integration**
Up to three alternatives will be evaluated to develop manual data entry tools and templates.

- **Asset Management Database**

Up to three alternatives will be evaluated.

- **Remote Power Monitoring**

Up to three alternatives will be evaluated. Improvements to backup power systems to provide remote status and control will be evaluated using cost to benefit analysis.

- **Treatment Facility Motor Starters, Telemetry, Controllers, and Instrumentation**

Equipment nearing obsolescence or end of operational life will be identified and replacement recommendations will be provided. No alternatives will be defined or evaluated.

- **Remote Site Motor Starters, Telemetry, Controllers and Instrumentation**

No telemetry method alternatives will be defined or evaluated as the current licensed narrow band radio telemetry system provides a cost-effective and reliable telemetry solution. No motor starter, instrumentation, or site controller alternatives will be defined or evaluated.

Workshop #2

Consultant will facilitate Workshop #2 at County offices to (a) review system needs and (b) endorse recommendations not requiring alternatives, (c) identify alternatives for evaluation, and (d) review and select new SCADA features for future consideration and implementation. Consultant will also review non-cost evaluation criteria to obtain endorsement from the County.

Up to three members of Consultant's team and a Subconsultant's representative will attend the workshop of three to four hours in length. Consultant will prepare meeting notes upon completion of the workshop.

Task 4 Deliverables

1. Partial TM to be finalized in Task 7 including system deficiencies, recommendations, and alternatives.
2. Workshop #2 Meeting Summary.

Task 5 – Alternatives Evaluation

Consultant will evaluate the alternatives identified in Workshop #2 on both a cost and non-cost basis. Cost comparisons will be made on a 20-year lifecycle basis and Net Present Value and will include capital and forecast O&M costs as applicable. Consultant will perform non-cost evaluations using the criteria endorsed during Workshop #2. Consultant will evaluate and score each alternative. Consultant will facilitate a conference call with County staff to review cost comparisons, adjust, and select preferred alternatives for implementation.

Workshop #3

Consultant will facilitate Workshop #3 at County offices to review the evaluations performed and ultimately select the preferred alternatives for implementation. Up to three members of Consultant's team and a Subconsultant's representative will attend the workshop of three to four hours in length. Consultant will prepare meeting notes upon completion of the workshop.

Task 5 Deliverables

1. Partial TM to be finalized in Task 7 including information in Task 4 and alternatives evaluation including County selections.
2. Workshop #3 Meeting Summary.

Task 6 – STMWRF SCADA System Conceptual Design

Consultant will develop a control system basis of design report for the following County capital improvements projects:

- South Truckee Meadows Water Reclamation Facility – Plant Expansion

Basis of design report conceptual drawings for this project will include site plans and network block diagrams indicating existing conditions and new construction. Consultant will coordinate control system design with plant expansion design team.

Task 6 Deliverables

1. Control system basis of design report for STMWRF expansion.

Task 7 – SCADA System Evaluation and Implementation Planning Report

Upon completion of Workshop #3, Consultant will develop a phased approach for implementing the recommended improvements including a 20-year wastewater/reclaimed water capital improvements plan. Consultant will develop Class 4 (+50%/-30%) cost estimates for implementation and a draft implementation schedule.

Consultant will prepare a draft SCADA Master Plan Technical Memorandum (TM) to include:

- Findings from Subtasks 1, 2, and 3
- Recommended improvements
- 20-year capital improvements plan
- Class 4 cost estimates and phasing for implementation
- Operation and maintenance requirements

Consultant will submit the draft SCADA Evaluation TM to County for review. Consultant will facilitate a conference call to receive and discuss County comments. Consultant will incorporate comments and submit 5 PE stamped copies of the final TM.

Task 7 Deliverables

1. Conference Call Meeting Summary.
2. Final SCADA Evaluation TM.
3. Class 4 cost estimate.

Task 8 – Compliance Reporting Data Integration Plan

Subtask 8.1

Consultant will research, develop, and propose common approach for automatic collection of lab data from independent laboratories into compliance reporting data repository to eliminate duplicate manual entry by the County. Consultant will develop data entry templates including custom fields, views, and tables to facilitate a consistent and efficient approach to manual data recording and report generation. Data entry standards will be developed to accommodate the following:

1. Ease of access for data input and report generation
2. Report Standardization
3. Error correction/prevention of data input to provide consistent output

Subtask 8.2

Consultant will coordinate with County and independent laboratories to implement data integration plan.

Task 8 Deliverables

1. Data Integration Plan TM.
2. Data entry templates.

Task 9 – O&M Documentation and Operational Data Reporting Integration Plan

Consultant will develop file structure, storage method, and SCADA integration plan for countywide control system O&M documentation and operational data reporting. Plan will include major reclaimed water and wastewater components.

1. Consultant coordinate with County staff to develop up to 12 report templates for key process data to assist operations staff in locating utility problems.
2. Consultant will implement improvements to accommodate O&M documentation and operational data report access from the HMI. HMI graphics representing major equipment will include animations with hyperlinks to O&M documentation, applicable operational data reports, and asset management data. Consultant will facilitate workshops with County operations staff prior to and following implementation. Workshops will be webinars of up to 2 hours in length and allow operator interaction with sample HMI application containing graphics and workflows to be incorporated in County's control system network.

Task 9 Deliverables

1. O&M Documentation and Operational Data Reporting TM.
2. Operational data reporting templates (Up to 12 total).
3. HMI integration of O&M documentation, operational data reports, and asset management data.

Task 10 – Asset Naming and Tagging Plan

Consultant will coordinate with County and/or third party to review and assist with development of naming conventions and a tag numbering template consisting of a concatenation of fields including site, facility, process, and loop numbering as a minimum. Review and coordination will include, but will not be limited to, inventorying, naming and tag numbering for wastewater and reclaimed water sites, facilities, processes, instrumentation, and equipment. Consultant's effort for this task is limited to 20 hours.

Task 10 Deliverables

1. None.

Task 11 – Remote Power Monitoring Plan

Consultant will develop template for backup power systems at reclaimed water and wastewater sites. Deliverables will include a process and instrumentation diagram (P&ID) and functional descriptions to provide the following information as a minimum:

1. Typical alarms
2. Configuration
3. Functionality and operations

Task 11 Deliverables

1. Typical backup power system P&ID.

Task 12 – Temporary Equipment SCADA Integration Plan

Consultant will develop template for portable telemetry systems with generic programming and signals facilitating remote status and control of temporary systems and/or pilot systems from the County's control system network. Design will accommodate multiple portable telemetry system deployments of varying type in varying locations inside County's wastewater and reclaimed water service area.

Task 12 Deliverables

1. Shop drawings including typical portable telemetry system control panel drawings, wiring diagrams, and bill of materials.

Task 13 – Cold Springs SCADA System Conceptual Design

Consultant will develop a control system basis of design report for the following County capital improvements projects:

- Cold Springs Water Reclamation Facility – Headworks Expansion
- Emergency Operations Center or Disaster Recovery Suite

Basis of design report conceptual drawings for each project will include site plans and network block diagrams indicating existing conditions and new construction. Cold Springs design to include infrastructure, network layering, and subnetting allowing for future expansion of control system network.

Task 13 Deliverables

1. Control system basis of design report for Cold Springs Water Reclamation Facility expansion.
2. Control system basis of design report for Emergency Operations Center.

Project Management Services

Consultant will provide the following project management services will be provided in this scope of work:

1. Resource planning and team organization.
2. Meeting coordination including scheduling, agenda, and minutes.
3. Task progress coordination with County, Consultant, and Subconsultant.
4. Quality control of deliverables prior to task completion.

Future Services

The services described below are not included in this Scope of Work but can be performed if requested and approved by County and Consultant. Time, scope, and fee have not been budgeted for the tasks listed hereunder. Authorization to proceed shall be in the form of an amendment to this Agreement or a separate agreement specifying the work to be performed and the additional payment for such services rendered.

- SCADA Software screen standards or development
- SCADA policies and procedures
- SCADA roles and responsibilities
- SCADA System design (outside of scope included in tasks above)
- Training
- Additional workshops besides those listed above
- Additional items noted to be excluded within the scope of services

Schedule

A preliminary milestone schedule for this Scope of Work is as follows:

Milestone	Target Start	Target Finish
Task 1 – Existing System Review	11/1/18	12/28/18
Task 2 – As-built Documentation	1/7/19	3/1/19
Task 3 – SCADA Network Topology Design	1/7/19	3/1/19
Task 4 – System Needs and Alternatives Identification	1/7/19	2/1/19
Task 5 – Alternatives Evaluation	2/4/19	3/1/19
Task 6 – STMWRF SCADA System Conceptual Design	3/4/19	3/29/19
Task 7 – SCADA System Evaluation and Implementation Planning Report	4/1/19	5/31/19
Task 8 – Compliance Reporting Data Integration Plan	1/7/19	5/31/19
Task 9 – O&M Documentation and Operational Data Reporting Integration Plan	4/1/19	6/30/19
Task 10 – Asset Naming Plan	6/17/19	6/30/19
Task 11 – Remote Power Monitoring Plan	7/1/19	7/11/19
Task 12 – Temporary Equipment SCADA Integration Plan	7/14/19	7/31/19
Task 13 – Cold Springs SCADA System Conceptual Design	7/1/19	7/31/19

All work under this Scope is expected to be completed by July 31, 2019. If the work is delayed beyond the reasonable control of Consultant, Consultant reserves the right to request a scope and fee modification for additional administrative and support time.

Compensation

Compensation for services described herein will be on a time and materials basis for a total not-to-exceed budget of \$422,800. Compensation is based on hourly bill rates included in Exhibit B. This total fee will not be exceeded without prior authorization from County. A breakdown of the estimated fee is summarized in table below. County understands and agrees that individual tasks may be completed either under or over budget and that Consultant can reallocate budgets within and across tasks provided the total authorized estimated fee is not exceeded. County is not obligated to compensate the Consultant for work beyond the authorized budgets nor is the Consultant obligated to incur costs that exceed the authorized budgets.

Task	Budget
Task 1 – Existing System Review	\$55,000
Task 2 – As-built Documentation	\$46,900
Task 3 – SCADA Network Topology Design	\$23,000
Task 4 – System Needs and Alternatives Identification	\$52,000
Task 5 – Alternatives Evaluation	\$30,000
Task 6 – STMWRF SCADA System Conceptual Design	\$20,000
Task 7 – SCADA System Evaluation and Implementation Planning Report	\$28,500
Task 8 – Compliance Reporting Data Integration Plan	\$56,700
Task 9 – O&M Documentation and Operational Data Reporting Integration Plan	\$61,300
Task 10 – Asset Naming Plan	\$4,400
Task 11 – Remote Power Monitoring Plan	\$15,000
Task 12 – Temporary Equipment SCADA Integration Plan	\$15,000
Task 13 – Cold Springs SCADA System Conceptual Design	\$15,000