TRANSMITTAL

SCADA SYSTEM UPGRADE

City of Reedley, Public Works

2880 Gateway Oaks Drive, Suite 300
Sacramento, California 95833
P. 916.565.4888
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Date:	March 7, 2019
Subject:	Agreement
Project No.:	
Copies To:	Jeff Martin, Penny Carlo

Address:	1733 Ninth Street Reedley, CA 93654
Attention:	Martha S. Cardoso Wastewater Systems Supervisor

The following items are:

☐ Requested   ☐ Report   ☐ Cost Estimate   ☐ Calculation

☒ Enclosed   ☐ Test Result   ☐ Check Print   ☐ Other

☐ Sent Separately   ☐ Specification   ☐ Progress Estimate

Via: Hand Delivered

No. of Copies	Description
1	Executed copy of agreement

These data are submitted:

☒ At your request   ☐ For your review   ☐ For your files

☐ For your approval   ☐ For your action   ☐ For your information

Sincerely,

CAROLLO ENGINEERS, INC.

Cristyn Page
Office Administrator

City of Reedley

Public Works Department
1733 Ninth Street
Reedley,CA 93654
(559) 637-4200 Ext. 214
FAX 637-2139

March 27, 2019

Carollo Engineers, Inc.
c/o Cristyn Page
2880 Gateway Oaks Dr., Suite 300
Sacramento, CA   95833

Attached please find the Agreement between the City of Reedley and Carollo Engineers for the for the SCADA System Upgrade – Phase II Project. The City Manager has signed the agreement and we need for your officers to sign their portion.

Please return a hard copy at your earliest convenience. If you have any questions or concerns, please feel free to contact me at (559) 637-4233

Sincerely,

Martha S. Cardoso
Wastewater Systems Supervisor

EXHIBIT "A"

TASK ORDER NO. 2

CITY OF REEDLEY, CALIFORNIA
(OWNER)

AND

CAROLLO ENGINEERS, INC.
(ENGINEER)

This Task Order is issued by the OWNER and accepted by ENGINEER pursuant to the mutual promises, covenants, and conditions contained in the Agreement between the above named parties dated the 23rd day of January, 2019, in connection with:

SCADA System Upgrade – Phase II
(Project)

PROFESSIONAL INTEGRATION/PROGRAMMING SERVICES
(Task Order No. 2)

BACKGROUND

During the summer of 2008 Carollo implemented a new SCADA system for the City's WWTF. It is based on the Wonderware Intouch 10.0 software platform and Modicon Quantum PLCs connected via a combination of Ethernet and Modbus Plus networking. Additionally, an existing Intouch system is in place that monitors two offsite facilities called "Hotel" and "Reed Avenue" communicating via MDS 9810 serial radios.

While the above system has served the City well for almost 10 years, it has come time to replace the system with current technologies not only to replace hardware well past its life expectancy, but also to replace dated operating systems and applications with current state of the art technologies. This update is important from a security standpoint as well.

The existing servers are executing a copy of Microsoft Server 2003R2 in a "bare metal" configuration (not virtualized) and the workstations are running a copy of Microsoft Windows XP Professional. Both of these operating systems are beyond end of life and no longer supported by Microsoft. Each server is configured to be what was then called a "terminal server" and each of the workstations are required to initiate a terminal server session in order to have access to the SCADA graphics. A Wonderware application called Active Factory is installed locally on each workstation and is responsible for providing trending capabilities. It is configured to access data from the Wonderware Historian.

Currently, machine OWS2 located in the Control Room, is configured with an analog modem and software called SCADAlarm. Its function is to "dial out" or alert designated personnel of significant plant alarms. This machine also makes two calls per day (one at 0900 hours and another at 2100 hours) to help verify analog phone line condition.

Per Carollo's recommendation in February of 2014 a GPS based time server was added to the existing SCADA system. This is a rack mounted machine that's only purpose is to keep extremely accurate time via a GPS radio link (thus requiring no Internet connection) and respond to client machines asking for accurate time sync data. It is known as a Stratum 1 time source and has been in service for a number of years and will continue its critical function/role with the new SCADA system update.

Remote access, a critical capability that allows operators access the SCADA system while not onsite as well as equally important vendor access to diagnose system issues has been in service for quite some time. It is a system comprised of an ISP (Internet Service Provider) as well as a Cisco Adaptive Security Appliance, model 5506-X provided and configured by Carollo.

The Path Forward – SCADA System Requirements/Functional Specifications

Carollo recommends that much of the nearly decade old hardware be replaced. Without attempting to build a complete bill of materials, the list would include all three SCADA servers, the Network Attached Storage device, one of the 10/100 modules in what is called the SCADA Information Network Ethernet switch to a more industry standard 10/100/1000 module and the UPS and its associated auxiliary battery module. The existing time server and remote access technologies (as described above) will continue to see service in the new system.

In addition to replacing the aging hardware with new, the software system architecture has evolved in the last few years to include virtualization. Figure 1.2 below shows a graphical representation of the existing software architecture in a (non-virtualized) environment.
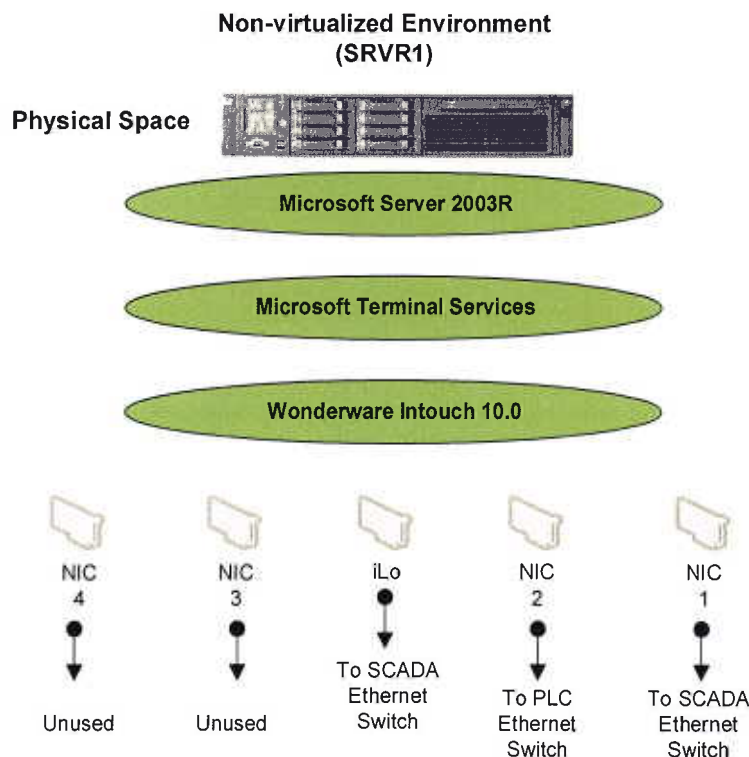
Non-Virtualized Environment

As mentioned above, this older computing environment is classified as a "bare metal" system in that the operating system installed on the server hardware is also responsible for executing all installed applications, including the critical SCADA software. A significant issue of this original method is that an errant software module of any of the third-party applications could cause the

entire system to fail. Additionally, backups made of this system for disaster recovery suffer from the fact that, because computer hardware changes so rapidly, recovery of the environment is very time consuming and complicated.

In comparison, the current industry standard virtualized environment is shown below in Figure 1.3.
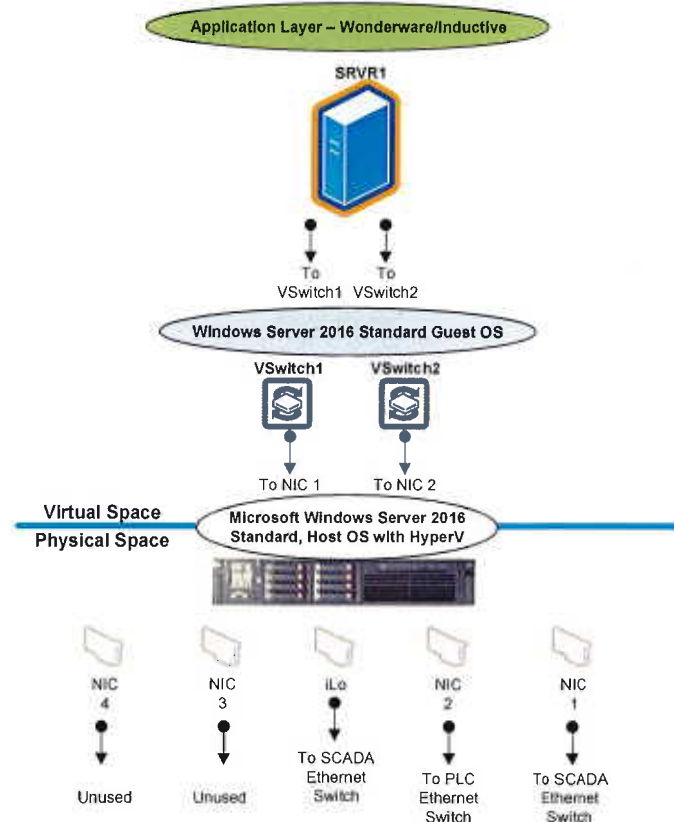
Standard Virtualized Environment

A virtualized environment is now the standard of the Information Technology industry. It brings to the table many advanced features that can fully utilize the hardware potential as well as isolate the various application software from one another. In other words, if a virtual operating system with its application fails, other virtual operating systems continue to operate. The single most important feature virtualization brings to the SCADA system environment is the ability to easily create a backup of all of the effort required to create a fully functional system. This backup can then be easily transferred to a new hardware platform (called the host platform) and capture all of the many hours that go into the configuration of a SCADA application, i.e., user names and passwords, all of the graphics, historical data, etc.

Recommendation (SCADA Hardware)
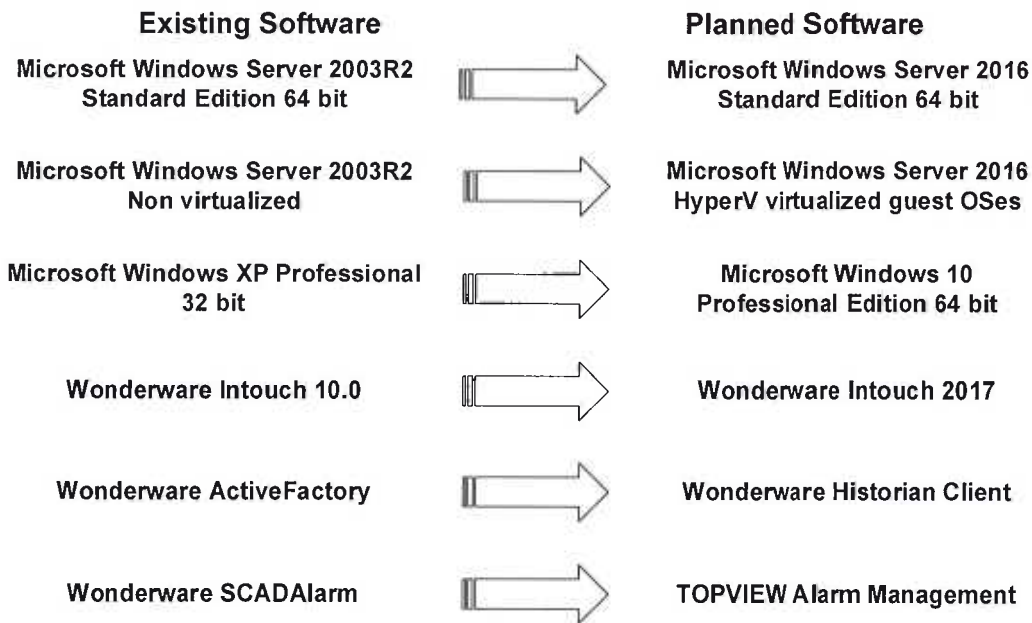Carollo recommends the City proceed with implementing a virtualized environment as part of the planned SCADA system upgrade.
As SCADA Alarm is no longer a supported application, Carollo recommends replacing the existing SCADA alarm with Top View Alarm notification software. To leverage existing POTS lines, in addition to the software, an IP PBX would be installed to interface the software output to the POTS lines.

We recommend utilizing TopView for the following reasons:

- Reliable operation when utilizing Virtual Environments.
- Reliable failover handing with selected SCADA application.
- Adequate tools to integrate with selected SCADA application.
- Strong local support capability.

To support all of the new features and benefits of current software, the versions will be updated and/or replaced as follows in Figure 1.4.

| Existing Software		Planned Software
Microsoft Windows Server 2003R2 Standard Edition 64 bit	→	Microsoft Windows Server 2016 Standard Edition 64 bit
Microsoft Windows Server 2003R2 Non virtualized	→	Microsoft Windows Server 2016 HyperV virtualized guest OSes
Microsoft Windows XP Professional 32 bit	→	Microsoft Windows 10 Professional Edition 64 bit
Wonderware Intouch 10.0	→	Wonderware Intouch 2017
Wonderware ActiveFactory	→	Wonderware Historian Client
Wonderware SCADAlarm	→	TOPVIEW Alarm Management

Lift Station Integration

The existing SCADA system includes a totally separate SCADA application (not part of the WWTF SCADA application) which currently monitors the "Reed Avenue" and "Motel" lift stations.

The goal will be to migrate all of the existing lift station monitor and control over to the existing WWTF SCADA. Combining the two applications will provide a unified view of all wastewater assets for the utility.

Current SCADA Control Console is shown in Figure 1.5.
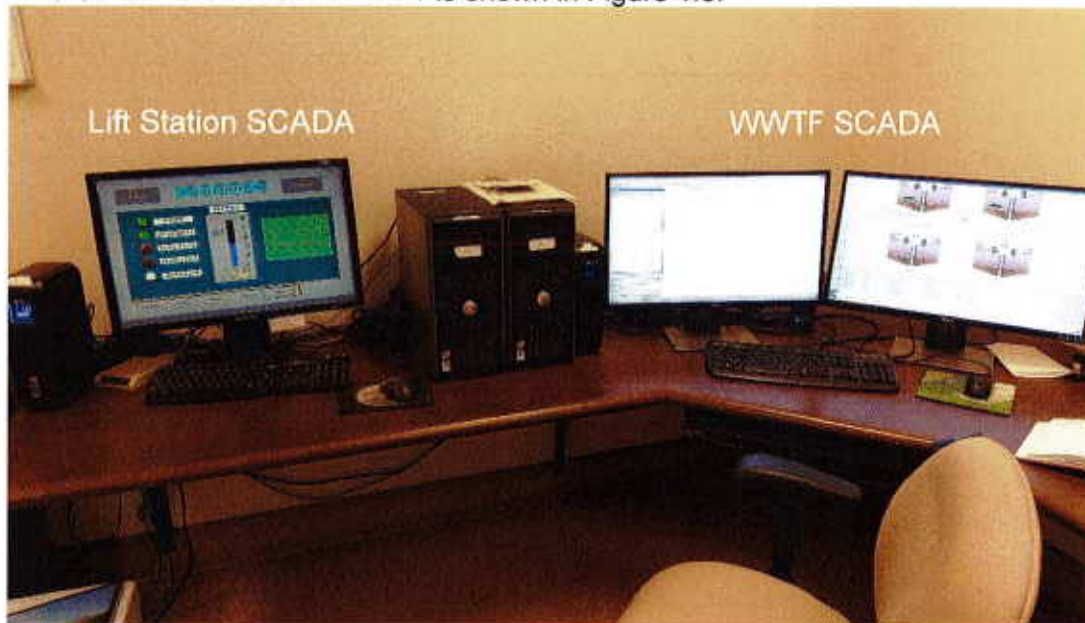
Current SCADA Control Console

PURPOSE

The purpose of this Task Order is to describe the project management, programming and control systems integration services provided by ENGINEER required to complete Phase II of the SCADA system upgrade.

NOTE: The term "PROGRAMMER" used herein is defined as the ENGINEER's programming services group, who will complete the services defined herein.

     a. Assumptions – PROGRAMMER

          i. PROGRAMMER's scope and fee estimate is based on the assumption that Wonderware Norcal under a separate contract with the OWNER will provide all of the new server and workstation setup for the new Wonderware software. PROGRAMMER will coordinate with their scope of work and provide the upgrade of the old application to the new servers and workstations.

<u>ENGINEER'S SCOPE OF SERVICES</u>

PROGRAMMER will provide programming and integration services associated with the Phase II SCADA system upgrade that will include software coordination, supervisory control and data acquisition (SCADA) hardware and software integration, field-testing, startup, training, and warranty period services.

TASK 1 PROJECT MANAGEMENT COORDINATION AND PLAN

1.1 Project Management Plan

PROGRAMMER will submit a Project Management Plan (PMP) including the following elements:
1. Scope
2. Budget
3. Team Structure
4. Team member contact information
5. Workshop/Meeting Plan
6. Schedule – tasks, meetings, milestones, delivery dates and regular monthly meetings
7. Monthly reporting, including:
    o Progress associated with each of the major tasks.
    o Schedule performance: Planned versus actual schedule.
    o Work completed performance: planned versus actual.
    o Cost performance: planned versus actual.
    o Summary overview of all activities scheduled for the upcoming month.
    o Outstanding project issues and identification of any items that will affect performance under this contract.

1.2 – Project Control Reporting/Invoicing

PROGRAMMER will submit monthly progress reports with each invoice to substantiate the progress of the work to date, including any potential out-of-scope items. This information will be utilized to determine if any changes are required in the management of the project.

PROGRAMMER will oversee project efforts, monitor progress and budgets expended, and ascertain proper execution of the project in accordance with the project scope, schedule, and budget.

NOTE: It is assumed that the PROGRAMMER will spend 24 hours preparing the PMP and 4 hours per month preparing and reviewing the monthly Project Summary Reports and invoices.

1.3 – Project Meetings

- 1.3.1 Kickoff/Goal Setting - PROGRAMMER will conduct one (1) Project Kickoff and Goal Setting Meeting (4-hr duration) at the OWNER's facility. The meeting will include up to two (2) representatives from the PROGRAMMER. The purpose of the Project Kickoff and Goal Setting Meeting will be to review the overall project goals, critical success factors, scope of work, schedule, lines of communication, and individual expectations. PROGRAMMER will prepare an agenda and distribute draft and final meeting minutes.

- 1.3.2 – Programming Team Bi-Weekly Coordination Calls – Programming Project Manager will host bi-weekly coordination calls with the programming team as necessary.

Meeting Title	Duration	PROGRAMMER's Team	Other Attendees
Kickoff/Goal Setting	4 hours	Lead PLC Programmer & Project Manager	OWNER SCADA and IT Staff, Wonderware Norcal
Programming Team Internal Bi-Weekly Coordination Calls	.5 hour	Programming Team & Project Manager	TBD

TASK 2 – ENGINEERING

PROGRAMMER will provide the following WWTF SCADA system drawing updates and new lift station RTU drawings.

2.01 – Design Deliverables

1. Generate the following drawings:
   i. Planned SCADA Block diagram in AutoCAD.
   ii. Revisions to Server Rack drawings as needed.
   iii. Revisions to Point to point network cabling drawing as needed.

TASK 3 – PRELIMINARY DEVELOPMENT/PROGRAMMING COORDINATION

PROGRAMMER will incorporate project-specific programming details to meet the OWNER's developed software and programming standards.

3.01 – Develop Migration Plan. Programmer will develop a migration plan from the existing Wonderware application to the new software levels on the new hardware provided by Wonderware NORCAL. The City of Reedley has pre-purchased SCADA software and the new Computer Control System (CCS) from Wonderware Norcal. Wonderware NorCal's Bill of Materials and scope of work are attached as Appendix A.

Draft Migration Plan Outline (not included in scope):

While the Server Upgrade work is in progress by others, a SCADA migration plan will be developed for review by the City of Reedley. Meetings will be held to accumulate input from Reedley Staff. These meetings will cover such topics as what to expect from the migration effort including proposed activities and schedule. Once this input is documented, a copy for review by Plant Staff would be provided to assure all input was correctly transcribed.

Upon completion, the SCADA graphics would be modified/converted as needed and testing performed to verify connectivity between the SCADA application and the PLCs. Once this portion is complete, a witnessed test (either remotely or in person per the City's discretion) would be scheduled to review and approve the newly created application.

After a test period and confirmation that the WWTF process control system is functioning properly on the new SCADA hardware and upgraded software, the old WWTF SCADA system will be shut down and removed from the WWTF.

The old lift station SCADA system will be shut down and removed from the WWTF. Carollo will provide operator training on all of the new hardware and software systems. All of the new and upgraded equipment and software will be fully documented in an operations and maintenance manual.

3.02 – Migration of existing Lift Station monitoring and control application and existing WWTF SCADA application.

3.03 – Upgrade existing developed Wonderware applications noted above from existing software levels to current license revision levels as installed by Wonderware NORCAL.

3.04 – Migrate existing WIN911 configuration software to TopView software for emergency alarm call out functionality. TopView software and installation provided by Wonderware NORCAL.

TASK 4 – PROGRAMMING/INTEGRATION SERVICES

PROGRAMMER will provide programming services during the HMI software upgrade.

4.1 – Software Coordination Meetings

PROGRAMMER will conduct implementation phase software coordination meetings. The anticipated meetings are listed below and in the following table:

8. 4.1.1 One (1) SCADA system configuration meeting for SCADA and PLC network communications coordination with the OWNER.
9. 4.1.2 One (1) software coordination meetings with OWNER

Meeting Title	Duration (Each)	Location	PROGRAMMER	Other Attendees
SCADA & PLC Network Communications Meeting	2 hours	Conference Call and/or TBD	Supervising Programmer & Project Manager	Owners staff
Software Coordination Meetings (1 total)	2 hours	Onsite/Teleconference	Lead PLC/HMI Programmers & Project Manager	Owners Staff

4.2 – Implementation Coordination Meetings

PROGRAMMER will attend coordination calls and progress meetings. The anticipated meetings are listed below and in the following table:

Bi-weekly coordination calls with OWNER and Wonderware NORCAL.

Meeting Title	Duration (Each)	Location	Programmer	Other Attendees
6 Bi-Weekly Coordination Calls as Required	.5 hours	Phone	TBD	Programmer, Vendors and Owner Staff

4.3 –Historian Assistance and Custom Trend Screen Development

PROGRAMMER will provide data tags for inclusion the existing Historian. PROGRAMMER shall perform all configuration and testing of the new historical data added to the existing historian.

4.4 –Installation & Removal of Hardware

PROGRAMMER will install at the City of Reedley plant new hardware as noted in Wonderware NORCAL's proposal. This includes the following equipment:
1. Primary Host
2. Secondary Host
3. Operator Workstation 1
4. Operator Workstation 2
5. Administrator Workstation

After successful installation, PROGRAMMER will remove existing SCADA computer hardware and turn over to City of Reedley.

TASK 5 – TRAINING SERVICES

5.1 – Training Preparation

PROGRAMMER will prepare training materials and handouts prior to conducting the on-site training. Training material will be delivered to the OWNER no less than one (1) week in advance of the date of the training.

5.2 –Training Courses

PROGRAMMER will conduct the training courses detailed in the following table:

Course Title	Minimum Course Length (hours per session)	Personnel (Estimated No. of Students)	Minimum No. of Sessions
Operator Training - Basic	4	6	1
Operator Training - Advanced	8	2	1
Follow-up Training	8	4	2

TASK 6 – PCS CONTROL SYSTEMS ONSITE TESTING, STARTUP AND COMMISSIONING

PROGRAMMER will be coordinate with Owner's staff, with development testing plans, specifically as they relate to installation and commissioning of the SCADA System.

6.1 – Conduct Functional Testing

PROGRAMMER will provide Functional Testing (FT). The FT will be performed by PROGRAMMER with assistance from the OWNER or the inspection staff, as needed.

The purpose of the FT is to verify the proper operation of the recently migrated Wonderware applications. PROGRAMMER will verify SCADA system operation with plant operational staff.

6.2 – Close-Out Services

PROGRAMMER will provide closeout services in order to finalize outstanding issues on the Contractor's programming punch list. It has been assumed that the closeout services will last one (1) week.

TASK 7 - FINAL DOCUMENTATION AND FOLLOW-UP SERVICES

7.1 – Post Technical Services

PROGRAMMER will provide post technical services for 1-year following final completion of the construction contract. Post technical services will include on-call, dial-in adjustments in addition to two (2) three-day on-site visits following final completion of the construction contract.

7.2 - Allowance

A list of software application enhancements was accumulated during the Phase 1 control strategy workshop. Upon review of each of these items it was determined that an in depth review of the existing code and issue for each item would need to be performed before an accurate labor cost could be determined. As part of this task order the PROGRAMMER has included an "Allowance" for these software enhancements based on our experience and knowledge of the existing systems.

Each of the items below will be analyzed, a cost per item will be determined and PROGRAMMER and staff will prioritize which items shall be completed under the "Allowance"

Reports – Weekly gas emissions, Martha prepares yearly report for the Air quality control board. 5/2/2017 HMI items –Add a tag for influent pumps go to auto on power outage.

Home screen – operator set points to be made adjustable.

HMI - Add a tag or button to reset influent pumps after over temp is recorded, Local reset button is not read in the HMI.

IPS Pump No. 3, with power loss goes to over temp and there is no real over temp.

Can't adjust each RAS pump individually. The hydraulics are different because the distance is different, and wasting process has been changed from original process control strategy.

Bypass centrifuge SCADA for emergency, when both centrifuges are out can we change the process control to accommodate.

Hydro ranger went out, false reading to HMI, PLC did not take over the float control, and only the backup float took over control. 5/2/2017 –Add a tag for influent pumps go to auto on power outage.

Effluent PS – power outage – pump 3 turns off, pump 2 stays in manual until pump 3 is running again. Pump 2 will not receive the AUTO command until pump 3 is back up and running in auto.

Alarm identification improvements. Define individual alarms better.

The "allowance" amount is shown as Task 7.2 in the cost breakdown.

PAYMENT

PROGRAMMER will prepare and submit invoices and progress reports on a monthly basis based upon the cost estimate presented in (Attachment A). The total value of the services outlined in this Task Order is $ 286,898.00 (including the programming allowance)

TIME OF PERFORMANCE
This scope of services and fee are based on attached Programming Baseline Schedule (Attachment B) with the following primary milestones:

- Project is required to meet Substantial Completion by December 1, 2019.
- Project is required to meet Final Completion by January 15, 2020.
    - Assumes NTP on/or before February 15, 2019.

EFFECTIVE DATE

This Task Order No. 2 is effective as of the ___7___ day of ___March___, 2019.

IN WITNESS WHEREOF, duly authorized representatives of the City of Reedley and of the ENGINEER have executed this Task Order No. 2 evidencing its issuance by City of Reedley and acceptance by ENGINEER.

CAROLLO ENGINEERS, INC.

City of Reedley

Accepted this _26_ day of ___February___, 2019

By: _____
          Sr. Vice President

By: _____
          Sr. Vice President

By: _____
          Nicole Ziebe, City Manager

REEDLEY CITY COUNCIL

DATE: February 12, 2019

TITLE: APPROVE AND AUTHORIZE THE CITY MANAGER TO EXECUTE A PROFESSIONAL SERVICES AGREEMENT WITH CAROLLO ENGINEERS, INC. FOR THE PROJECT MANAGEMENT, PROGRAMMING, AND CONTROL SYSTEMS INTEGRATION SERVICES AS PART OF PHASE II OF THE SCADA SYSTEM UPGRADE AT THE WASTEWATER TREATMENT PLANT

BY: Martha S. Cardoso, Wastewater Systems Supervisor
Public Works Department

SUBMITTED: Russ Robertson, Public Works Director
Public Works Department

APPROVED: Nicole R. Zieba
City Manager

RECOMMENDATION

Authorize the City Manager to execute a professional service agreement with Carollo Engineers, Inc. (Carollo) for the project management, programming and control systems integration services for the amount of $296,807 as part of Phase II of the Supervisor Control and Data Acquisition (SCADA) System Upgrade at the Wastewater Treatment Plant (WWTP).

BACKGROUND

As part of the WWTP expansion in 2009 a new SCADA system was installed and implemented. It was based on the Wonderware Intouch 10.0 software platform, which has served the City well for almost 10 years. However, it has come time to replace the system with current technologies; not only to replace hardware well past its life expectancy, but also to replace dated operating systems and applications with current state of the art technologies. Much of the City's current software is no longer supported and has become obsolete.

During the 2017-2018 fiscal year the City contracted with Carollo to evaluate the current WWTP and Sewer Collection Lift Station (Lift Station) Conveyance SCADA system as

part of Phase I of the SCADA System Upgrade Functionality Analysis. The evaluation consisted of a SCADA software comparison between the existing Wonderware platform by Schneider Electric and the Ignition platform by Inductive Automation, a preliminary recommendation for the integration of the lift stations to the existing SCADA system, an architecture and functional specification for the existing SCADA information network hardware and software, a migration plan, a project schedule and the scope of work and estimated costs for Phase II and Phase III implementation of both the WWTP and Lift Station SCADA upgrades. The Technical Memorandum with Carollo's findings was delivered in August of 2017 with their recommendations. The City procured the software and hardware along with the license upgrades with funding available during the same fiscal year.

The City is ready to move forward with the implementation of Phase II of the SCADA System Upgrade, which will consist of the migration of the old SCADA system with the new system upgrade, programming and integration services that will include software coordination, field testing, startup, training and post technical services. Carollo has been an integral part in all aspects of the design and implementation process of the SCADA system from inception. Carollo has in-depth knowledge and expertise with the City's current SCADA system and as such, it would be in the City's best interest to continue using their expertise and technical services during the next phase of this project. They have provided the City with a scope of work and a cost proposal in the amount of $296,807.

FISCAL IMPACT

Funds were budgeted for the SCADA system upgrade in the 2018-19 fiscal year budget. An internal budget amendment shall be performed to appropriate additional necessary funds from a Capital Improvement Project that will be postponed to a later date to fully fund this project from the existing Sewer Enterprise Fund appropriations.

ATTACHMENTS

1. Exhibit "A", Professional Services Agreement with Carollo Engineers, Inc.

Motion: _____
Second: _____