

Attachment A

Board Contract Summary

BC 16 _110

For use with Expenditure Contracts submitted to the Board for approval. Complete information below, print, obtain signature of authorized departmental representative, and submit this form, along with attachments, to the appropriate departments for signature. See also: Auditor-Controller Intranet Policies->Contracts.

D1.	Fiscal Year	2015-2016
D2.	Department Name	Public Works
D3.	Contact Person	Martin Wilder
D4.	Telephone	x8755

K1.	Contract Type (check one): <input checked="" type="checkbox"/> Personal Service <input type="checkbox"/> Capital	
K2.	Brief Summary of Contract Description/Purpose	Design of Phase 1 plant upgrades.
K3.	Department Project Number	PLEXP1
K4.	Original Contract Amount	\$ 2,980,949
K5.	Contract Begin Date	09/22/2015
K6.	Original Contract End Date	12/31/2017
K7.	Amendment? (Yes or No)	Yes
K8.	- New Contract End Date	12/31/2022
K9.	- Total Number of Amendments	5
K10.	- This Amendment Amount	\$ 4,858,622
K11.	- Total Previous Amendment Amounts	\$ 319,690
K12.	- Revised Total Contract Amount	\$ 8,159,261

B1.	Intended Board Agenda Date	11/13/2018
B2.	Number of Workers Displaced (if any)	
B3.	Number of Competitive Bids (if any)	
B4.	Lowest Bid Amount (if bid)	
B5.	If Board waived bids, show Agenda Date	
	and Agenda Item Number	
B6.	Boilerplate Contract Text Changed? (If Yes, cite Paragraph)	

F1.	Fund Number	2870
F2.	Department Number	054
F3.	Line Item Account Number	8200
F4.	Project Number (if applicable)	
F5.	Program Number (if applicable)	
F6.	Org Unit Number (if applicable)	
F7.	Payment Terms	Net 30 days

V1.	Auditor-Controller Vendor Number	051723
V2.	Payee/Contractor Name	Carollo Engineers, Inc.
V3.	Mailing Address	3150 Bristol St., Suite 500
V4.	City State (two-letter) Zip (include +4 if known)	Costa Mesa, CA 92626
V5.	Telephone Number	(714) 593-5100
V6.	Vendor Contact Person	Graham Juby
V7.	Workers Comp Insurance Expiration Date	12/31/2018
V8.	Liability Insurance Expiration Date	07/04/2019
V9.	Professional License Number	67217
V10.	Verified by (print name of county staff)	Martin Wilder

V11 Company Type (Check one): Individual Sole Proprietorship Partnership Corporation

I certify information is complete and accurate; designated funds available; required concurrences evidenced on signature page.

Date: Oct 3, 2018 Authorized Signature: Martin Wilder

**AMENDMENT NO. 5
TO AGREEMENT FOR PROFESSIONAL SERVICES WITH CAROLLO ENGINEERS,
INCORPORATED FOR THE DESIGN OF LAGUNA COUNTY SANITATION DISTRICT
WASTEWATER RECLAMATION PLANT UPGRADES**

THIS AMENDMENT, effective as of the date last written below, is entered into between the Laguna County Sanitation District, a dependent special district of the County of Santa Barbara, a political subdivision of the state (hereinafter DISTRICT) and Carollo Engineers, Incorporated, having its place of business at 3150 Bristol Street, Suite 500, Costa Mesa, CA 92626 (hereinafter ENGINEER).

WHEREAS, the parties hereto, on September 22, 2015, entered into an agreement (BC16-110) for performance of professional services by ENGINEER in connection with the Laguna County Sanitation District Plant Upgrades Project; and

WHEREAS, the original agreement for said services was in the amount of \$2,980,949 ; and

WHEREAS, Amendment No. 1 in the amount of \$38,791 was executed by the Board of Directors on April 5, 2016, and provided for additional electrical related studies and design; and

WHEREAS, Amendment No. 2 in the amount of \$105,560 was executed by the Public Works Director on August 1, 2016, and provided for a revised flood protection design, the design of a storm water collection system, and design of an upgrade to the in-house recycled water system, ; and

WHEREAS, Amendment No. 3 in the amount of \$163,511 was executed by the Board of Directors on October 4, 2016, and provided for design of new laboratory and control center facilities that will consolidate existing laboratory, operations, locker room and control facilities.

WHEREAS, Amendment No. 4 in the amount of \$11,828 was executed by the Board of Directors on November 7, 2017, and provided for review and input of technical information used for the environmental analysis documentation in the mitigated negative declaration (MND) for CEQA compliance.

WHEREAS, the term of the agreement per Amendment No. 4 is through December 31, 2018;

WHEREAS, a proposal for additional work has been negotiated with ENGINEER and found to be appropriate; and

NOW THEREFORE, the parties hereto agree as follows:

A. The revised term of the agreement shall be through December 31, 2023.

- B. ENGINEER will provide optimization of electrical loads as they relate to the existing PV solar facility and updating drawings.
- C. ENGINEER will provide engineering services during construction related to project coordination, responding to requests for information, review of equipment and material submittals, attending meetings, assistance in reviewing construction contract change orders, startup assistance, facility training, preparation of record drawings.
- D. ENGINEER will provide integration and programming and computer integration design, as well as program and software implementation (building supervisory control and data acquisition (SCADA) screens) for existing plant systems and new plant facilities in addition to one-year warranty services.
- E. Because the scope of work will extend through multiple years, this amendment estimates an annual escalation to derive the total cost. District shall apply an actual escalation based on the Consumer Price Index (annual average U.S. Bureau of Labor Statistics for Los Angeles-Long Beach-Anaheim, all urban consumers, not seasonally adjusted, Series ID CUURS49ASA0). A negative CPI will mean no change. The CPI will be applied to labor costs in the following calendar year. Escalation that exceeds the actual CPI will be paid from a contingency of \$150,000 upon written authorization by the Public Works Director or designee.
- F. ENGINEER hereby agrees to accept the following as full and final compensation for the Scope of Work as amended herein:
 - 1. Compensation for additional services in the amount not to exceed \$4,858,622 for items B through D above as described in the Scope of Services to this Amendment No. 5 (Exhibit A hereto).
 - 2. ENGINEER shall be paid a total agreement amount of \$8,159,261 not including the contingency.
- G. In all other respects the agreement shall remain in full force and effect.

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IN WITNESS WHEREOF, the parties have executed this Amendment to be effective on the date executed by DISTRICT.

ATTEST:
Mona Miyasato
County Executive Officer
Ex-Officio Clerk of the Board

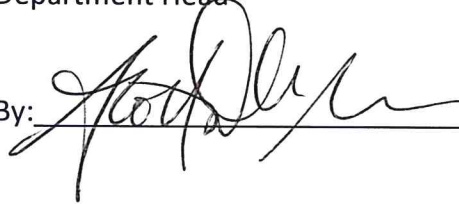
DISTRICT:
Laguna County Sanitation District
Das Williams
Chair, Board of Directors

By: _____

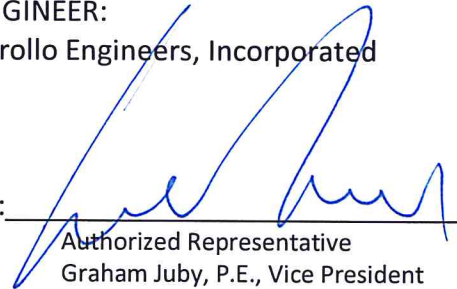
By: _____

Date: _____

RECOMMENDED FOR APPROVAL:
Scott D. McGolpin
Department Head

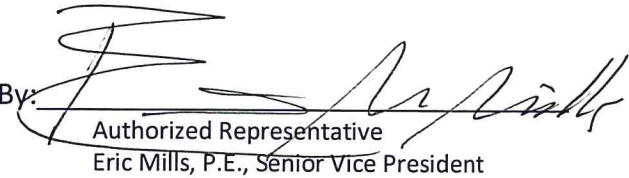
By:  _____

ENGINEER:
Carollo Engineers, Incorporated

By:  _____
Authorized Representative
Graham Juby, P.E., Vice President CGE217

APPROVED AS TO FORM:
Michael C. Ghizzoni
County Counsel

By:  _____
C. Aylin Bilir, Deputy

By:  _____
Authorized Representative
Eric Mills, P.E., Senior Vice President

APPROVED AS TO FORM:
Ray Aromatorio, ARM, AIC
Risk Manager

By:  _____

APPROVED AS TO ACCOUNTING FORM:
Theodore A. Fallati, CPA
Auditor-Controller

By:  _____

**Exhibit A
Scope of Services
Amendment No. 5**

Engineering Services During Construction & Integration/Programming Services

**Phase I Plant Upgrade Project
Wastewater Reclamation Plant
Laguna County Sanitation District
(October 3, 2018)**

1.0 INTRODUCTION

The purpose of this Exhibit is to provide details of the scope of services for an amendment to the Phase I Plant Upgrade Project for the Laguna County Sanitation District (the District) Wastewater Reclamation Plant (WWRP) to provide engineering services during the construction phase of the project, as well as integration and programming services.

2.0 BACKGROUND

The original scope of work for this project did not include construction management, engineering services during construction, or integration/programming of the new plant processes into the existing WWRP Process Control System. In order to successfully construct the project, these services are necessary. The construction cost of the project was estimated to be \$39.7 million with an anticipated construction duration of 33 months.

Since the District does not have the staff available to perform construction management services, they have hired Martin Northart & Spencer to perform construction management for the project.

Engineering services during construction should be completed by the design engineer so that the design intent is carried through to the construction of the new facilities. The scope of services that follows details the effort that is involved in order to maintain the design intent during the construction phase. Some of these tasks, like development of an Operations and Maintenance Manual or participation or help with process optimization after startup, are optional at the discretion of the District. However, most of the tasks, in particular, review of Submittals, Change Orders, and Requests for Information (RFI), should be completed by the design engineer.

Today's use of more complex control systems for wastewater treatment plants, requires the use of an integrator/programmer that has specific experience programming such systems for wastewater treatment plants. This is particularly true with energy intensive processes like aeration basin blower systems. Inefficient system integration of blower systems can result in wasted energy and higher operating costs for the District. As detailed in the Integration/Programming scope task below, hiring the design engineer's programming team has the double benefit of providing delivery of these services by a team that understands wastewater process systems and was involved with the design process, which leads to a system that optimizes energy efficiency.

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3.0 SCOPE OF SERVICES

The following Scope of Work describes the professional services to be provided by the engineer during the construction of the District's Phase 1 Plant Upgrade Project. Outlined below are the tasks that will be completed as part of this project.

- Task 1 – Project Management / Coordination
- Task 2 - Update Drawings and Prepare Bid Set
- Task 3 – Respond to RFIs
- Task 4 – Submittal Review
- Task 5 – Change Order Assistance
- Task 6 – Startup Assistance
- Task 7 – Facility Training
- Task 8 – Record Drawings Preparation
- Task 9 – Project Meetings
- Task 10 – Environmental Review
- Task 11 – Integration/Programming

The following optional tasks are also described in this Scope of Work:

- Task 12 – Operations and Maintenance Manual
- Task 13 – Operation Optimization

A detailed explanation of the Engineering support services during construction is described below:

Task 1: Project Management / Coordination

Consultant will be responsible for detailed management of the project, including managing its subconsultants and keeping the District apprised of the status of the project.

Consultant will prepare and submit a monthly progress report to the District. The monthly progress report will delineate the project progress in relation to scope, schedule, and budget for the past month and the plan for the next month.

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Task 2: Update Drawings and Prepare Bid Set

The 100-percent drawing set was prepared in May 2017, and it is expected that the bid set will be issued to pre-qualified contractors in May 2019. As a result of the two-year delay, the drawings, front end documents and technical specifications need to be updated to reflect the latest dates, and design code information. In addition, since May 2017, the design has been reviewed by the Construction Manager (CM) and certain drawings need to be updated to include the CM comments. At a minimum, each drawing in the 435 sheet set will need to be opened, the dates adjusted and the updated responsible engineer's stamp added. As part of this process the Front End documents will be finalized by incorporating comments from the District and the CM, all Technical Specifications sections will be updated, and a print-ready bid set will be prepared. This PDF version of the drawings and specifications will be delivered to the District ready for the District to print bidding sets, as needed. Both 11x17 and full-size print sets will be provided.

This task also includes an evaluation of the solar and PV systems at the plant in order to consider better distribution of solar power generation and load for the two PG&E meters. If this task results in modifications to the drawings and/or specifications then these will be made as part of this task.

Deliverable: Updated signed and sealed drawings and technical specifications packaged into a print-ready Bid Set in 11x17 and full-size format. Draft and final Technical Memorandum on the Solar/PV Study.

Task 3: Respond to Requests for Information (RFI)

Consultant will review and respond to all RFIs transmitted through Bentley's EADOC Software by the Construction Manager. Consultant will generate necessary sketches, figures, and modifications to the drawings for clarifications. Consultant will return written responses to the construction manager through EADOC within fourteen (14) calendar days of receipt of the RFI. When required to avoid schedule delay or additional construction-related costs, the Consultant shall expedite the review of time sensitive RFIs. For budgeting purposes, it is assumed that a total of 400 RFIs will be received for review/response, with 4 hours of review per RFI.

Task 4: Submittal Review

Consultant will review all submittals transmitted through EADOC by the Construction Manager. Submittals will be reviewed for conformance with the requirements of the Contract Documents and will be returned to the Construction Manager through EADOC within thirty (30) calendar days. When a submittal cannot be returned within the specified period, the Consultant will, within a reasonable time after receipt of the submittal, give notice of the date by which that submittal will be returned. When

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required to avoid schedule delay or additional construction-related costs, the Consultant shall expedite the review of time sensitive submittals. Based on the Technical Specifications, it is assumed for budgeting purposes that five hundred and fifty-two (552) unique submittals will be required for review.

A list of anticipated submittals is included in Appendix B.

Task 5: Change Order Assistance

When requested, Consultant shall assist with providing change documentation to the Construction Manager to aid the response to change order requests. Change documentation includes plan drawings, schematics, typical details, schedules, and specifications, as required. For budgeting purposes, it was assumed that twenty (20) change order requests would require assistance for review, with 24 hours of review per change order.

Task 6: Startup Assistance

An engineer with the Consultant will remain onsite for two (2) weeks prior to startup of the treatment system. The engineer will assist with the upcoming startup by confirming that all equipment and operational parameters are properly set and configured.

Task 7: Facility Training

To educate the Plant Operations staff on the basis of the design and the recommended modes of operation, the Consultant will develop and conduct a training program for the facilities constructed or modified as part of the project. The training outline and dates will be coordinated with the Construction Manager and the District's Project Manager.

Training will only be conducted on Wednesdays, in a three hour session. The same session will be offered in both the morning and afternoon, to allow for training of each of the District's operation shifts. Morning sessions will be scheduled between 8 AM and Noon. Afternoon sessions will be scheduled between 1 PM and 5 PM. A total of four training sessions have been proposed.

Task 8: Record Drawings Preparation

After completion of construction, the District will transmit the Contractor's as-built set to the Consultant. The Consultant will prepare a Draft Record Drawing set based on the Contractor's as-built drawings. Upon completion of the Draft Record Drawing Set, the Consultant will submit three (3) sets of bound 11x17 prints and one DVD containing the drawings in CAD and PDF format to the District for review.

Review comments of the Draft Record Drawing set will be transmitted to the Consultant. The Consultant will revise the Record Drawing Set based on comments from the District, and will submit the revised sheets in PDF format only, back to the District for review of the changes. When no additional comments

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are identified, the Consultant will prepare the Final Record Drawings and submit them, along with the Contractor's as-built set, to the District.

The Final Record Drawing set submittal will include one (1) set of bound 11x17 prints, one (1) set of unbound 22x34 drawings printed on paper, and one DVD containing the drawings in CAD and PDF format.

Task 9: Project Meetings

A representative of the Consultant will participate in the Pre-Construction Meeting and Weekly Progress Meetings held by the Contractor. The Consultant's representative will attend in person one (1) meeting per calendar month and will participate in the remaining meetings in a calendar month through a conference call. Depending on the topic of discussion, representatives from either or both Carollo and Cannon may be required to participate in the meetings. The scope includes time for meeting preparation, travel, follow-up, and review of meeting minutes. Progress meeting minutes will be prepared by the Construction Manager and published on EADOC for Consultant review. Attendance for the Weekly Progress Meetings may be removed from the Scope, if desired by the District.

Task 10: Environmental Review

Consultant will assist in the review of updated environmental data prior to the start of construction.

Task 11: Integration/Programming

Consultant will provide programming and SCADA integration services associated with the Phase I Upgrade. These services will include software coordination, supervisory control and data acquisition (SCADA) hardware and software integration, programmable logic controller (PLC) programming, SCADA configuration, Historian, Trending, Report configuration, testing, startup, training, and warranty period assistance for one year. Warranty period will begin the day after the substantial completion date.

TASK 11.1 – CONTROL SYSTEMS/CONTROL STRATEGIES REVIEW

1. Control Systems Review

Review the PLC and network architecture design for the specified PLC and SCADA architecture in order to optimize the logical paths for control communications and establish preliminary SCADA system security guidelines.

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2. Control Strategy Review

Review the final control descriptions and conduct the following meetings with the District and the Design Team to review, refine, and confirm control logic descriptions. This coordination with the designer, at this stage, will prevent startup surprises and optimize process control.

CONTROL STRATEGIES REVIEW MEETINGS				
Meeting Title	Duration (each)	Location	Designer's Programming Team	Other Attendees
Preliminary Control Logic Review	8 hours	District Office or Wastewater Reclamation Plant	Lead PLC Programmer, Lead HMI Programmer	District, Consultant
Final Control Logic Review	4 hours	District Office or Wastewater Reclamation Plant	Lead PLC Programmer, Lead HMI Programmer	District, Consultant

TASK 11.2 - CONSTRUCTION PHASE – PROGRAMMING PROJECT MANAGEMENT

1. Provide programming project management services that include:
 - a. Development of a Programming Services Project Plan
2. Monthly reporting, including:
 - a. Progress associated with each of the major tasks.
 - b. Schedule performance: Planned versus actual schedule.
 - c. Work completed performance: planned versus actual.
 - d. Cost performance: planned versus actual.
 - e. Summary overview of all activities scheduled for the upcoming month.
 - f. Outstanding project issues and identification of any items that will affect performance under this contract.

For the purposes of this project, it is assumed that the Project Manager will spend 4 hours per month preparing and reviewing the monthly Project Summary Reports. A construction project duration of 33

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months is assumed from notice to proceed through final completion and beginning of the warranty period. Programmer will also provide warranty period services for 12 months following final completion.

INTEGRATION AND COORDINATION MEETINGS				
Integration/Meeting Title	Duration (each)	Location	Designer's Programming Team	Other Attendees
Kickoff and Project Goal Meeting	2 hours	District Office	Programming Project Manager, Lead PLC Programmer, Lead HMI Programmer	District, Contractor
Programming Team Weekly Coordination Teleconference Calls	.5 hours	Teleconference	Programming Project Manager, Programming Team	

TASK 11.3 – PRELIMINARY PROGRAMMING STANDARDS DEVELOPMENT

Provide the following scope prior to the start of the construction phase:

1. Review existing Software & Integration Standards
2. Software Standards Workshop NO. 1 – Draft PLC and HMI Standards Outline
3. Software Standards Workshop NO. 2 – 50% PLC and HMI Standards

TASK 11.4 – CONSTRUCTION PHASE – GENERAL PROGRAMMING & CONTROL SYSTEM SOFTWARE INTEGRATION

Provide the following scope during the Project's construction phase:

1. Coordinate programming work with the Designer, District, Contractor, and Electrical, Instrumentation & Controls (E&IC) Subcontractor(s).
2. Coordinate programming work with:
 - a. PLC-VCP-12.2001 – Grit Washer, Stirrer and Grit Screw

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- b. PLC-VCP-11-2001 – Step Screen #2
 - c. PLC-VCP-11.1001 – Step Screen #1
 - d. SWGR-22 – Switchgear 22
 - e. PLC-VCP-22.1001 –Aeration Blower #1
 - f. PLC-VCP-22.1002 – Aeration Blower #2
 - g. PLC-VCP-22.1003 – Aeration blower #3
 - h. Motor Control Centers/VFD's
3. Furnish SCADA hardware and software (including submittals) for items furnished by programmer detailed under the Hardware and Software Bill of Materials section (10.13).
 4. Integrate new tag database development with existing equipment tagging
 5. Construction phase coordination (refer to Table below), including:
 - o One (1) SCADA system configuration meeting for network and PLC communications.
 - o Three Vendor programming coordination meetings with Headworks, Switchgear and Blower packages as specified. Vendor programmers must be present.
 - o Four (4) software coordination meetings with the District.
 - o Construction period coordination with the District, Contractor, (and key subcontractors including electrical, Instrumentation & Controls Subcontractor (ICSC, Vendors).

PROGRAMMING/INTEGRATION AND COORDINATION MEETINGS				
Integration/Meeting Title	Duration (each)	Location	Designer's Programming Team	Other Attendees
One (1) SCADA and PLC Network Configuration Meeting	2 hours	Teleconference	Programming Team PM, Lead PLC Programmer and Lead HMI Programmer	
Three (3) Vendor Programming Coordination Meetings	2 hours	Onsite	Programming Team PM, Lead PLC Programmer and Lead HMI Programmer	Vendor's Programmer
Four (4) Software Coordination Meetings	4 hours	District Office/Teleconference	Programming Team PM, Lead PLC Programmer and Lead HMI Programmer	District

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CONSTRUCTION COORDINATION MEETINGS				
Integration/Meeting Title	Duration (each)	Location	Designer's Programming Team	Other Attendees
Construction Period Coordination (may include Progress, Schedule update, pre-Shutdown, pre-Process startup, EI&C Coordination and Closeout meetings)	1 hour	Teleconferences /Construction Trailer	Programming Team PM and/or Lead PLC Programmer/Lead HMI Programmer	District, Contractor
O&M Documentation Usage Meeting	2 hours	Onsite	Lead PLC Programmer and Lead HMI Programmer	District, Contractor

TASK 11.5 – EXISTING SYSTEM PROGRAMMING & CONTROL SYSTEM SOFTWARE INTEGRATION

The programming team will gather all current hardware and software files and configurations for the existing systems which they will interface with, integrate into the new systems and/or replace. They will do the necessary reverse engineering of the following existing software:

1. Mobilization
2. PLC Code
3. HMI Application
4. Reports Configuration
5. Database Configuration
6. Equipment Tagging
7. Remote Site HMI Application

TASK 11.6 – PLC SYSTEM PROGRAMMING

1. Program all PLCs to implement the Control Strategies and logic required for the Project. Provide testing, start-up, and documentation. Programming excludes PLCs provided by packaged equipment suppliers, however, interface and "handshaking" with such supplier's logic may be required.
2. PLC programming strategy:
 - a. Existing PLCs: Follow existing PLC programming standard if possible. The PLC programs will be written in annotated Ladder logic including rung comments.
 - b. New PLCs: Program using Studio5000 in IEC61131 standard. The PLC programs will be written in annotated Ladder logic (LD) or Function Block Diagram (FBD). Add-On

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Instruction (AOI) will be used for object oriented programming. These AOIs will be re-usable for future projects. All AOI's logic (LD or FBD) will be annotated.

TASK 11.7 – HMI SYSTEM PROGRAMMING

1. Configure the SCADA and Human Machine Interface (HMI) systems for all modified and new processes provided under the Phase I Plant Upgrade project. The approach will be to perform a complete HMI software application upgrade to ensure that all existing application functions are upgraded to match the new application. This will migrate the District from Wonderware InTouch to Wonderware System Platform 2017. As a result, the system will look and function consistently for existing and new plant processes. The color schemes, the control interfaces, and the process graphics will look and function in a cohesive and standardized manner. Additionally, SCADA communication and diagnostic information will be available for the existing processes, where none existed before.
 - a. System overview will be designed to capture main wastewater liquids and solids process flow.
 - b. Establish a single, intuitive navigation scheme, create new dynamic objects more efficiently and user friendly integration between the old and new applications.
 - c. Provide a more robust application with redundancy on the major data servers. Server roles will be configured for quick fail-over and disaster recovery, in the event of a failure.
 - d. Redundant alarm notification system will provide alarms to operator phones via voice, text message or e-mail. Advanced Alarm analysis will allow operators to focus on process improvement and optimization.
 - e. Graphics will be standardized, built on Wonderware standard object templates and take full advantage of situational awareness graphics.
 - f. The new application will include a single data base which includes all operational data, alarms and events and historical archived data around a common information model that is relevant to all functional teams utility wide. . Reporting software tools will pull process performance data from the database to create periodic operations reports.
 - g. Standards will includes colors, control pop ups and user-defined interactive trends.
 - h. New Plant Communications status including the PLCs and network health of communications

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TASK 11.8 – MISCELLANEOUS SYSTEMS PROGRAMMING

1. SCADA Network/Computer Control System (CCS)
2. Historian Assistance and Trend Development
3. Compliance and operational Report Configuration
4. Alarm Management Software Configuration

TASK 11.9 – PROCESS CONTROL SYSTEMS ACCEPTANCE TESTING (FAT AND SAT)

1. Attend Headworks, Switchgear and Blower Vendor Systems FAT SCADA Network/Computer Control System (CCS)
2. Attend PCM-BLWR FAT
3. Witnessed Software Acceptance Testing (SAT)
4. Software demonstration test in Roseville Cyber Lab – estimate 1 week.
5. Configure communications and test connection between SCADA and Vendor PLC's.
 - a) Test SCADA interface and screen functionality with all Vendors during factory test.
 - b) The vendor's will be responsible for configuring communication in their PLC's.
 - c) Test critical software cutover migrations

TASK 11.10 – PROGRAMMING - O&M DOCUMENTATION (DRAFT)

1. Provide draft copies of the following for the O&M Manuals:
 - a) CEET* and SFT* test results
 - b) SCADA and PLC systems O&M
 - c) Final PLC programs, including final flow charts, documented function blocks and annotated ladder logic with rung and address comments.
 - d) Final control sequencing describing startup, operation, shutdown, and safety procedures.

2. TASK 11.11 – TRAINING SERVICES

- a. Operator training services provided by the Programmer

The Programmer will provide training on the operation of the system and the use of the operator displays. The Programmer will provide training to District operations staff for software packages that are developed by the Programmer. Training sessions will be conducted at the project site utilizing the equipment and software applications that are being supplied for this Project.

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OPERATOR TRAINING SERVICES			
Course Title	Minimum Course Length (hours per session)	Personnel (Estimated Number of Students)	Minimum Number of Sessions
HMI Hardware and Software	8	5	2
Historian System Training	4	5	1* one shift only
Reports Training	16	5	1* one shift only
Network Equipment	4	5	1* one shift only
Refresher Training	8	5	2
<ul style="list-style-type: none"> Programmer is not responsible for training described in Section 17050-34, Table 1. Where 2 training sessions are noted, it is assumed that they will take place on Wednesdays, with one morning session for one part of the staff and one afternoon session for the rest of the staff. Where 1 training session is noted, it is assumed that only a small subset of the staff will be trained in this topic. 			

The Programmer will provide a two-day refresher course training session for operators not less than sixty (60) days after completion of system startup. The intent of the refresher training session will be to answer questions that may arise during the initial 60-day operational period.

TASK 11.12 – PCS CONTROL SYSTEM ONSITE TESTING, STARTUP AND COMMISSIONING

1. Provide Startup/Commissioning services in conjunction with Contractor after loop validation testing is completed by Contractor:
 - o Complete End to End Testing (CEET*) - 5 weeks of on-site services by Programmer
 - CEET: After the network acceptance testing (NAT) and panel acceptance loop (PAL) testing for a PLC are completed successfully, the Programmer will go to the field and load the PLC program for testing. In addition, the PLC is connected to the network at this time. The CEET is similar to the partial end-to-end testing performed during the PAL Test, except now signals are tested through the PLC program, the network, and all the way to the operator’s SCADA graphic screens

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- *Manual Equipment Startup Test (MST)** - Provided by the contractor and Packaged System Vendors*
 - *MST: Manual Equipment Startup Tests (MST) are tests of mechanical equipment and instruments with equipment operating in Local Manual control. After the PAL, and either before or after CEET testing, the Contractor shall perform startup and commissioning tests of all mechanical equipment. These tests are performed with equipment in local, manual control, without reliance on PLC program logic, unless the PLC logic is provided by the Contractor (packaged systems). The Programmer staff will not be present during the MST.*
- Strategy Field Testing (SFT*) – 6.5 weeks of on-site services by Programmer.
 - SFT: After CEET and MST, Strategy Field Testing (SFT) will be performed by the Programmer with assistance (full-time) from the Contractor. Some District assistance is also generally required. The Designer will witness the tests. The purpose of the SFT is to verify the proper operation of all PLC control logic and its interaction with field equipment and devices. Feedback control loops are also tuned at this time.
The Programmer will exercise programs, conduct tests, tune process control system feedback loops and record results. The Contractor staff shall be responsible for equipment operation and verification of correct field operation results.
- Process Startup & Commissioning –
 - The Startup and Commissioning period will verify that the performance meets the contract document requirements. The process startup includes control loop tuning, individual process area startups followed by facility-wide process startup.

Once the performance tests have been verified, the Process Operational period begins. The Process Operational Period is a 30-day performance test to prove the facility conforms to the contract document requirements. PROGRAMMER may or may not be onsite for the entire duration of the Startup and Commissioning.

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- 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 two (2) weeks

Note: Programmer will use their standard testing forms for functional testing. Sample forms will be included with the SCADA screen submittals.

TASK 11.13 – HARDWARE AND SOFTWARE

PROGRAMMER will purchase, setup and configure the network hardware, computerized Control System (CCS) and software provided by the PROGRAMMER listed in the Bill of Materials. PROGRAMMER will configure the network area racks as well as the network server racks. PROGRAMMER will perform setup and configuration of the SCADA clients, Network Attached Storage, Thin Client node, and SCADA workstations. Appendix C includes a list of materials to be provided as part of the Agreement.

TASK 11.14 – PROGRAMMING FINAL DOCUMENTATION AND FOLLOW UP SERVICES

Provide the following:

1. Programming - Operations and Maintenance Manuals (Final)
2. Warranty period services
 - On-call, dial-in adjustments during the 1 year warranty period following final completion of the construction contract.
 - On-site visits and follow-up training with the District's staff at 2 months, 6 months, and 12 months following final completion of the construction contract.
 - Programmer will attempt to troubleshoot the problem over the telephone to determine the cause and whether or not the reported problem is covered under warranty services.
 - If the problem is covered under warranty services, the Programmer will determine the cause, determine what repairs or corrections are necessary, and perform necessary work.
 - When needed, the Programmer will provide on-site staff to perform software repairs. The Programmer will generally require one to two (1-2) working days' notice to perform on-site repairs. However, for serious problems that disrupt treatment operations, the Programmer will make every reasonable effort to arrive on site as soon as possible after notification of the problem.

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- If the Programmer believes a reported problem is not covered under Warranty Services, the Programmer will promptly notify the District. The District will then either obtain repairs through other means or direct the Programmer to proceed with repairs.
- The District and Programmer will attempt to mutually determine and agree if a reported problem is covered by Warranty Services

Note: Warranty Services do not cover equipment, materials, services, or software provided by others. Warranty Services do not include equipment damage caused by misuse, accidental damage, electrical surges, or other events outside the control of the Programmer. Warranty Services do not include work performed by the District or by the Contractor and others hired by the District. The reloading of programs, software files and configuration parameters that becomes necessary due to the failure of equipment provided by others or the negligent acts of the District or others is not covered by the warranty.

ASSUMPTIONS FOR INTEGRATOR/PROGRAMMING TASK

Major Requirements:

1. Approximately 894 I/O.

PLC	Analog Input (AI)	Analog Output (AO)	Digital Input (DI)	Digital Output (DO)	Ethernet (ETH)*	Comments
Blower (BLWR)	67	25	236	57	300	ETH: Bar Screen 1 & 2, Grit Stirrer, Aeration Blowers 1,2,3 (This is the calculated soft I/O from the VCP's)
CLW (Clearwell)	6		30	3		
RDS (Rotary Drum Screen)	8	5	44	12		
Ultraviolet Break Tank (UVBT)	6	3	37	5	50	Power Quality Meter
						*Fire Alarm & Main HVAC monitoring and control are not included. ETH is calculated soft I/O.

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2. Approximately 130+ SCADA Screens (1) Plant Overview (15) Process overviews, (100+) Equipment Popups, (2)Set points, (2) Alarms and (4) Infrastructure - power, HVAC, network, etc. including:
 - a. Overview Screen – Build new screen to follow current Industry Standards, including existing process modifications and all new processes
 - b. Influent Flowmeter - Flow monitoring, software selected set points, totalization, alarming, and trending.
 - c. Headworks – (2) screening channels, fan, influent and effluent Gates, step screens, washer/compactors, level monitors and solenoid valves. Status monitoring, software selector switches, software pushbutton, speed controls, automatic mode set points, level monitoring alarming and trending. Monitoring of Vendor supplied systems
 - d. Influent Pumping – (4) VFD Driven Influent Pumps in a dual chambered wet well with influent gates, level monitor and HI-HI float switch. Status monitoring and control, software selector switches, software pushbuttons, speed controls, automatic mode set points, and influent level measurements, alarming and trending. (5) Pumping control options.
 - e. Grit Handling – grit chamber, (2) grit pumps w/seal water system, grit washer, grit flow, wash water valves. Status monitoring, software selector switches, software pushbuttons, automatic mode set points, low-pressure monitoring, grit flow measurement, alarming and trending. Monitoring of Vendor supplied systems
 - f. Low/High TDS Bypass – Grit chamber splitter box, bypass valves, flowmeters, and conductivity. Status monitoring and control, software selector switches, software pushbuttons, automatic mode set points, conductivity, flow monitoring, alarming and trending.
 - g. Storm Water Station- Duplex pump system, float switches and flowmeter. Status monitoring, software selector switches, software pushbuttons, flow readings and alarming.
 - h. Aeration Basins – Air Flow Control Valves, Surface Mixers, VFD Driven Mixed Liquor Return Pumps, and air operated mixers, zone air flowmeters and DO probes. Status monitoring and control, software selector switches, software pushbuttons, flow readings and alarming. Monitoring of Vendor supplied systems.
 - i. Aeration Blowers – (2) VFD Driven Blowers, Discharge and Main Header Blow-off valves and pressure transmitters. Status monitoring, software selector switches, software pushbuttons, speed controls, automatic mode set points, pressure reading, alarming and trending. Monitoring of Vendor supplied systems.

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- j. Blower Building HVAC- Supply and Exhaust Fans, Smoke Detection and Air Conditioning units. Monitoring and alarming.
 - k. Secondary Clarifiers – (2) clarifiers. Equipment status.
 - l. Scum Pump Station - one duty secondary scum pump, one standby secondary scum pump, a common recirculation assembly, a common motorized three-way control valve, and a spray water system. Equipment status, software selector switches, scum level monitoring, and automatic mode set points. Scum Pit Level monitor.
 - m. Return Activated Sludge Pumps – (3) VFD Driven RAS Pumps w/seal water systems, Flowmeter. Status monitoring, software selector switches, software pushbuttons, speed controls, automatic mode set points, and RAS flow readings.
 - n. Waste Activated Sludge Pumps - (3) VFD Driven RAS Pumps w/seal water systems, Flowmeters and Valves... Status monitoring, software selector switches, speed controls, automatic mode set points, and WAS flow readings.
 - o. UV Break Tank & Pump Station – (3) VFD Driven UV Break Pumps, Ammeter, MOV Control Valve. Status monitoring, software selector switches, software pushbuttons, speed controls, automatic mode set points, level monitoring, flow monitoring, alarming and trending.
 - p. Recycle Pump Station – Triplex pumping system. Status monitoring, software selector switches, software pushbuttons, and flow readings. Monitoring of Vendor supplied system.
 - q. Electrical distribution gear and Motor Control Center (MCC) – Emergency Management Control System (EMCS) monitoring and power metering
 - r. Process Control Module (PCM) and Uninterruptible Power Supply (UPS) – power status, temperature monitoring and alarms.
-
- 3. Approximately 300 + data points to configure in historian
 - 4. Historize all Analog I/O
 - 5. Configuration of (1) Regulatory Compliance and (5) Operational Reports
 - 6. Furnish SCADA screens for all Vendor supplied equipment

Startup Sequence:

Based on Section 01140, Article 1.10, the programming team is planning for 3 major testing and startup milestones:

- 1. New Administration Building –
 - a. New Networks in place
 - b. New Servers, Workstations in place

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- c. Establish communications with the process control and SCADA networks
- d. Software upgrades to existing Wonderware application completed
- 2. RDS/Low TDS/High TDS
 - a. Critical cutovers involved in these process startups requiring cutover plans
 - b. Simulated software testing of all modified and new software involved
 - c. Staged PLC conversions to minimize the process disruption and abbreviated CEET and SFT testing during the short cutover periods.
 - d. Awareness that these migrations are interlocked with other existing processes that must remain in operation at all time
- 3. Main Upgrade (Headworks, Aeration and Secondary's
 - a. These processes will be tested independently while the plant is running and then go live after cut over to new raw sewer line to the headworks facility.
 - b. CEET and SFT will take place with each process after Loop testing is complete and certified by the contractor.
 - c. Performance testing will come after the cut over is complete.
 - d. UV Break Tank
 - i. This process upgrade will be tested and started up after the main upgrades are online.
 - ii. The moving of the Lab is critical and must come before to MCC/PLC additions can occur.

Work to be performed on PLC's Supplied by Others:

- 1. Coordinate all PLC-to-PLC communication and interlocks with vendor packages.
- 2. Develop PLC Code for required interlocks between plant PLCs and Vendor PLCs.
- 3. Coordinate Global Tag integration with Vendors.

The following items shall be provided to the Programmer no later than 90 days before the start date of the Software Demonstration Test:

- o All "Final" Vendor PLC programs, completely tested, with full annotation and documentation.
- o All final Vendor OIT applications completely tested with full documentation.
- o A complete and final Vendor I/O list provided in Excel format, with additional columns denoting all "send" and "receive" global data and PLC-PLC Interlocks (each interlock explained in a word document and/or flow chart).

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- A complete list of tags, which the Vendor requires, displayed on the plant-wide SCADA system matching the SCADA system format for tag naming and description (both tag naming conventions and descriptions will be discussed in the first mandatory programmer meeting).
- All operating parameters, set points, alarm levels, historical data, and trending which the Vendors systems require being functions of the plant-wide SCADA system.

Other Project Assumptions:

1. All Vendor PLC and OIT programming will be tested for I/O verification by the vendor, also all send/receive data and interlocks.
2. Contractor will provide all hardware and integration services specified in the Phase 1 Upgrade Construction Bid Documents. This includes complete loop drawings and loop checkout forms delivered to Programmers five days prior to our on-site field CEET and SFT testing procedures.
3. The electrical contractor shall perform complete testing of all Ethernet cabling (Fiber and/or Copper) per the specifications. Testing must certify all paths to CAT 6 specifications and provide a formal written report to Programmer.
4. Programmer will use standard Rockwell PLC programming function blocks and add-on instructions as much as possible to develop the PLC code for this project.
5. Programmer's services exclude final loop testing of I/O, cable, and fiber optic networks.

4.0 OPTIONAL SCOPE OF SERVICES

If desired by the District, the following optional professional services may be provided by the consultant:

Task 12: Operations and Maintenance (O&M) Manual

Consultant will develop a paper O&M Manual with operations and maintenance (O&M) content for the Facility. Engineer will develop a narrative to explain the start-up and operating and maintenance procedures for the treatment plant. The document will reference the equipment O&M manuals to be provided by the Contractor. The O&M Manual will be organized by process area chapters that are anticipated to include the following:

1. Introduction
2. Screening
3. Influent Pumping
4. Grit Removal
5. Low TDS Pond and Pump Station
6. Aeration Basins
7. Aeration Air Supply
8. Secondary Clarification

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9. Ultraviolet Break Tank and Pump Station
10. Storm Water Pond and Pump Station
11. Recycled Water Pump Station
12. Standby Generator
13. Electrical and Plant PLC

Within each process area chapter, the Consultant will develop O&M content according to a standard template of sections that include: process overview, design criteria, theory of operation, equipment/instrument descriptions, process control strategies, standard operating procedures (SOPs), safety systems, alarms and alarm responses, reference to design drawings and specifications, digital photographs, vendor O&M manuals, and notes to where training videos can be located. SCADA screens and control panels will be included under the appropriate process area sections. Using available information, chapters will also be developed to include electrical, yard piping, building support, and safety systems.

Upon completion of the O&M Manual, the Consultant will print and bind the manual and transmit to the District as hardcopies. Three (3) hardcopies will be provided.

Task 13: Operation Optimization

An Engineer with the Consultant will perform analysis and onsite evaluation for three (3) weeks after startup of the treatment system. This will include assisting the operators with optimizing the system by using the process model in combination with onsite evaluation to fine tune the secondary treatment system.

5.0 Engineering Effort and Cost

The fee estimate is shown in Appendix A - page 1 (2018 costs), page 2 (escalated totals).

6.0 Schedule

It is anticipated that bidding for the project will occur around May 2019 and that construction will last until approximately December 2022. The one-year warranty period for the programming services is expected to start upon substantial completion of the project, in or around December 2022, and all services are expected to be complete by the end of December 2023.

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Appendix A (page 2) - Fee Estimate Including Escalation

Escalated at 2018 CPI of 2.7% pa

Tasks	Total 2019	Total 2020	Total 2021	Total 2022	Total 2023	Project Total
Task 1: Project Management / Coordination	\$37,386	\$76,792	\$78,865	\$22,498	\$0	\$215,541
Task 2: Update Drawings and Prepare Bid Set	\$221,599	\$0	\$0	\$0	\$0	\$221,599
Task 3: Respond to Requests for Information	\$69,451	\$178,315	\$109,878	\$0	\$0	\$357,644
Task 4: Submittal Review	\$170,853	\$614,131	\$90,102	\$0	\$0	\$875,085
Task 5: Change Order Assistance	\$18,663	\$38,333	\$39,368	\$11,231	\$0	\$107,595
Task 6: Startup Assistance	\$0	\$0	\$24,747	\$25,416	\$0	\$50,163
Task 7: Facility Training	\$0	\$0	\$4,521	\$41,791	\$0	\$46,312
Task 8: Record Drawings Preparation	\$0	\$0	\$23,983	\$221,677	\$0	\$245,660
Task 9: Project Meetings	\$42,904	\$88,124	\$90,503	\$25,819	\$0	\$247,349
Task 10: Environmental Review	\$12,147	\$0	\$0	\$0	\$0	\$12,147
Task 11: HMI & PCL Programming/Integration Services	\$419,740	\$538,841	\$664,067	\$454,665	\$116,735	\$2,194,048
Total	\$992,743	\$1,534,535	\$1,126,035	\$803,096	\$116,735	\$4,573,144
Optional Tasks						
Task 12: Operations and Maintenance Manual				\$239,732		
Task 13: Operation Optimization				\$45,746		
<i>Optional Tasks Escalated</i>				\$285,478		\$285,478
						\$4,858,622

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Appendix B - Submittal Review Estimate

Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
00100	ADVERTISEMENT FOR BIDS	NO	Carollo	General	0
00200	INSTRUCTIONS TO BIDDERS	NO	Carollo	General	0
00410	BID FORM	NO	Carollo	General	0
00432	BID BOND	NO	Carollo	General	0
00434	PROPOSED SUBCONTRACTORS FORM	NO	Carollo	General	0
00436	LIST OF EQUIPMENT MANUFACTURERS	NO	Carollo	General	0
00451A	CONSTRUCTION CONTRACTOR'S QUALIFICATION STATEMENT FOR ENGINEERED CONSTRUCTION	NO	Carollo	General	0
00452	AFFIRMATIVE ACTION PROGRAM CERTIFICATE	NO	Carollo	General	0
00454	BID CERTIFICATION FOR THE PAYMENT OF STATE AND LOCAL TAXES	NO	Carollo	General	0
00456	NON-COLLUSION AFFIDAVIT	NO	Carollo	General	0
00458	CERTIFICATION OF DRUG-FREE WORKPLACE REQUIREMENTS	NO	Carollo	General	0
00510	NOTICE OF AWARD	NO	Carollo	General	0
00520	AGREEMENT	NO	Carollo	General	0
00550	NOTICE TO PROCEED	NO	Carollo	General	0
00602A	ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION - CALIFORNIA, PUBLIC CONTRACT CODE §10263	NO	Carollo	General	0
00612	PERFORMANCE BOND	NO	Carollo	General	0
00614	PAYMENT BOND	NO	Carollo	General	0
00620	CONTRACTOR'S APPLICATION FOR PAYMENT	NO	Carollo	General	0
00632	REQUEST FOR INFORMATION OR INTERPRETATION (RFI)	NO	Carollo	General	0
00633	FIELD ORDER	NO	Carollo	General	0
00634	WORK CHANGE DIRECTIVE	NO	Carollo	General	0
00636	CHANGE ORDER	NO	Carollo	General	0
00700	STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT	NO	Carollo	General	0
00800	SUPPLEMENTARY CONDITIONS	NO	Carollo	General	0
00850	OWNER CONTROLLED INSURANCE PROGRAM CONTRACTORS INSURANCE PROCEDURES MANUAL	NO	Carollo	General	0
00851	INDEMNIFICATION AND INSURANCE REQUIREMENTS	NO	Carollo	General	0
01110	SUMMARY OF WORK	NO	Carollo	General	0

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
01116	CONTRACT DOCUMENT LANGUAGE	NO	Carollo	General	0
01140	WORK RESTRICTIONS	YES	Carollo	General	4
01201	PAYMENT PROCEDURES	NO	Carollo	General	0
01210	ALLOWANCES	NO	Carollo	General	0
01260	CONTRACT MODIFICATION PROCEDURES	NO	Carollo	General	0
01292	SCHEDULE OF VALUES	YES	Carollo	General	2
01294	APPLICATIONS FOR PAYMENT	NO	Carollo	General	0
01312	PROJECT MEETINGS	NO	Carollo	General	0
01322	WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT	YES	Carollo	General	1
01324A	PROGRESS SCHEDULES AND REPORTS	YES	Carollo	General	1
01329	SAFETY PLAN	YES	Carollo	General	1
01330	SUBMITTAL PROCEDURES	NO	Carollo	General	0
01340	PHOTOGRAPHIC AND VIDEOGRAPHIC DOCUMENTATION	YES	Carollo	General	2
01350	SPECIAL PROCEDURES	NO	Carollo	General	0
01351	ENVIRONMENTAL PROCEDURES	YES	Carollo	General	1
01352	ALTERATION PROJECT PROCEDURES	YES	Carollo	General	4
01354	HAZARDOUS MATERIAL PROCEDURES	YES	Carollo	General	2
01355A	STORMWATER POLLUTION PREVENTION CONSTRUCTION ACTIVITIES: BEST MANAGEMENT PRACTICES	YES	Cannon	Civil	1
01410	REGULATORY REQUIREMENTS	NO	Carollo	General	0
01424	ABBREVIATIONS AND ACRONYMS	NO	Carollo	General	0
01450	QUALITY CONTROL	NO	Carollo	General	0
01455	SPECIAL TESTS AND INSPECTIONS	NO	Carollo	General	0
01460	CONTRACTOR QUALITY CONTROL PLAN	YES	Cannon	General	1
01500	TEMPORARY FACILITIES AND CONTROLS	YES	Carollo	General	3
01600	PRODUCT REQUIREMENTS	NO	Carollo	General	0
01610	PROJECT DESIGN CRITERIA	NO	Carollo	General	0
01612	SEISMIC DESIGN CRITERIA	YES	Carollo	Structural	10
01614	WIND DESIGN CRITERIA	YES	Carollo	Structural	2
01722	FIELD ENGINEERING	NO	Carollo	General	0
01732	CUTTING AND PATCHING	YES	Carollo	General	3
01734	WORK WITHIN PUBLIC RIGHT-OF-WAY	NO	Cannon	General	0

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
01738	SELECTIVE SITE DEMOLITION	YES	Cannon	General	2
01756	COMMISSIONING	YES	Carollo	General	2
01759	WATER LEAKAGE TEST FOR CONCRETE STRUCTURES	YES	Carollo	General	7
01770	CLOSEOUT PROCEDURES	YES	Carollo	General	3
01782	OPERATION AND MAINTENANCE DATA	NO	Carollo	Process	0
01783	WARRANTIES AND BONDS	NO	Carollo	General	0
02050	SOILS AND AGGREGATES FOR EARTHWORK	YES	Cannon	Civil	3
02084	PRECAST DRAINAGE STRUCTURES	YES	Cannon	Civil	3
02090	PRECAST REINFORCED POLYMER CONCRETE SANITARY SEWER MANHOLES	YES	Cannon	Civil	3
02200	SITE CLEARING	NO	Cannon	Civil	0
02222	BUILDING DEMOLITION	YES	Cannon	Civil	1
02240	DEWATERING	YES	Cannon	Civil	3
02260	EXCAVATION SUPPORT AND PROTECTION	YES	Cannon	Civil	5
02280	SUBSURFACE UTILITY ENGINEERING	YES	Cannon	Civil	3
02300	EARTHWORK	YES	Cannon	Civil	4
02312	CONTROLLED LOW STRENGTH MATERIAL (CLSM)	YES	Cannon	Civil	2
02318	TRENCHING	NO	Cannon	Civil	0
02370	RIPRAP AND GABIONS EROSION AND SEDIMENTATION CONTROL	YES	Cannon	Civil	2
02581	PRECAST ELECTRICAL HANDHOLES AND ELECTRICAL MANHOLES	YES	Carollo	Electrical	3
02621	STABILIZATION FABRIC	YES	Cannon	Civil	3
02742A	ASPHALTIC CONCRETE PAVING	YES	Cannon	Civil	3
02762	PAVEMENT MARKINGS	YES	Cannon	Civil	2
02772	CONCRETE CURBS, GUTTERS, AND SIDEWALKS	YES	Cannon	Civil	1
02952	PAVEMENT RESTORATION AND REHABILITATION	NO	Cannon	Civil	0
03055	ADHESIVE-BONDED REINFORCING BARS AND ALL THREAD RODS IN CONCRETE	YES	Carollo	Structural	1
03071	EPOXIES	YES	Carollo	Structural	1
03072	EPOXY RESIN/PORTLAND CEMENT BONDING AGENT	YES	Carollo	Structural	1
03102	CONCRETE FORMWORK	YES	Carollo	Structural	1

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
03103	CONCRETE VOID FILLERS (GEOFOAM)	YES	Carollo	Structural	1
03150	CONCRETE ACCESSORIES	YES	Carollo	Structural	2
03154	HYDROPHILIC RUBBER WATERSTOP	YES	Carollo	Structural	1
03200	CONCRETE REINFORCING	YES	Carollo	Structural	10
03300	CAST-IN-PLACE CONCRETE	YES	Carollo	Structural	4
03366	TOOLED CONCRETE FINISHING	NO	Carollo	Structural	0
03565	BASIN BOTTOM GROUT	YES	Carollo	Structural	1
03600	GROUTING	YES	Carollo	Structural	1
03931	EPOXY INJECTION SYSTEM	YES	Carollo	Structural	1
03933	HYDROPHILIC FOAM POLYURETHANE RESIN INJECTION SYSTEM	YES	Carollo	Structural	1
04055	ADHESIVE BONDING REINFORCING BARS AND ALL THREAD RODS IN MASONRY	YES	Carollo	Structural	1
04090	MASONRY ACCESSORIES	YES	Carollo	Structural	1
04100	MORTAR AND MASONRY GROUT	YES	Carollo	Structural	1
04220	CONCRETE UNIT MASONRY	YES	Carollo	Structural	3
05120	STRUCTURAL STEEL	YES	Carollo	Structural	4
05140	STRUCTURAL ALUMINUM	YES	Carollo	Structural	2
05190	MECHANICAL ANCHORING AND FASTENING TO CONCRETE AND MASONRY	YES	Carollo	Structural	3
05310	STEEL DECKING	YES	Carollo	Structural	2
05500	METAL FABRICATIONS	YES	Carollo	Structural	10
05820	JOINT SLIDE BEARINGS	YES	Carollo	Structural	1
06072	PRESERVATIVE PRESSURE TREATED WOOD	YES	Carollo	Structural	1
06100	ROUGH CARPENTRY	YES	Carollo	Structural	3
06174	SHOP-FABRICATED WOOD TRUSSES	YES	Carollo	Structural	3
06608	FIBERGLASS REINFORCED PLASTIC	YES	Cannon	Structural	1
06611	FIBERGLASS REINFORCED PLASTIC FABRICATIONS	NO	Cannon	Structural	0
07212	WALL INSULATION SYSTEM	YES	Carollo	Architectural	1
07220	ROOF AND DECK INSULATION	YES	Carollo	Architectural	1
07530	ELASTOMERIC MEMBRANE ROOFING	YES	Carollo	Architectural	2
07600	FLASHING AND SHEET METAL	YES	Carollo	Architectural	2

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Appendix B - Submittal Review Estimate

Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
07700	ROOF SPECIALTIES AND ACCESSORIES	YES	Carollo	Architectural	3
07900	JOINT SEALANTS	YES	Carollo	Structural	1
08110	HOLLOW METAL DOORS AND FRAMES	YES	Carollo	Architectural	2
08320	FLOOR ACCESS DOORS	YES	Carollo	Process & Structural	2
08332	OVERHEAD COILING DOORS	YES	Carollo	Architectural	1
08412	ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS	YES	Pults ⁽²⁾	Architectural	-
08710	DOOR HARDWARE	YES	Carollo	Architectural	1
08800	GLAZING	YES	Carollo	Architectural	2
08952	TRANSLUCENT SKYLIGHT SYSTEM	YES	Carollo	Architectural	2
09250	GYPSUM BOARD	YES	Carollo	Architectural	2
09310	CERAMIC TILING	YES	Pults ⁽²⁾	Architectural	-
09652	RESILIENT BASE AND ACCESSORIES	YES	Carollo	Architectural	1
09910	PAINTING	YES	Carollo	Architectural	1
09960	HIGH-PERFORMANCE COATINGS	YES	Carollo	Process	1
09968	CONCRETE REPAIR AND COATING	YES	Cannon	Structural	3
10400	SIGNAGE	YES	Carollo	Process	2
10520	FIRE PROTECTION SPECIALTIES	YES	Carollo	Architectural	1
10650	OPERABLE PARTITIONS ACOUSTI-SEAL®	YES	Pults ⁽²⁾	Architectural	-
10810	TOILET ACCESSORIES	YES	Pults ⁽²⁾	Architectural	-
11224	AIRLIFT PEDESTAL MIXERS	YES	Carollo	Process	2
11233	FLOATING MIXERS	YES	Carollo	Process	4
11291	CANAL GATES	YES	Cannon	Process	1
11294B	HEAVY-DUTY FABRICATED STAINLESS STEEL SLIDE GATES	YES	Carollo	Process	3
11298B	STOP PLATES	YES	Cannon	Process	1
11312B	HORIZONTAL NON-CLOG CENTRIFUGAL PUMPS	YES	Carollo	Process & Electrical	4
11312C	HORIZONTAL RECESS IMPELLER CENTRIFUGAL PUMPS	YES	Cannon	Process & Electrical	4
11312D	VERTICAL TURBINE SHORT SETTING CENTRIFUGAL PUMPS	YES	Cannon	Process & Electrical	4

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In association with



Appendix B - Submittal Review Estimate

Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
11312E	SCREW CENTRIFUGAL PUMPS	YES	Cannon	Process & Electrical	4
11312J	SUBMERSIBLE PROCESS LIQUID SUMP PUMPS	YES	Carollo	Process & Electrical	4
11312K	SUBMERSIBLE MEDIUM CAPACITY CENTRIFUGAL PUMPS	YES	Cannon	Process & Electrical	6
11312O	HORIZONTAL ANSI CENTRIFUGAL PUMPS	YES	Cannon	Process & Electrical	4
11313F	SUBMERSIBLE CHOPPER CENTRIFUGAL PUMPS	YES	Carollo	Process & Electrical	4
11313M	VERTICAL MULTISTAGE CENTRIFUGAL PUMP	YES	Cannon	Process & Electrical	4
11315	MIXED LIQUOR RECYCLE PUMPS	YES	Carollo	Process & Electrical	4
11322D	VORTEX GRIT BASIN EQUIPMENT - GENERAL	YES	Cannon	Process & Electrical	4
11324	GRIT WASHER/DEWATERING UNITS	YES	Cannon	Process & Electrical	4
11332B	STEP-SCREENS AND WASHER-COMPACTOR SYSTEM	YES	Cannon	Process & Electrical	4
11353B	CIRCULAR SECONDARY CLARIFIER EQUIPMENT	YES	Carollo	Process & Electrical	4
11376B.	DIRECT DRIVE HIGH-SPEED TURBO BLOWER SYSTEM	YES	Carollo	Process & Electrical	6
11377A	COARSE BUBBLE AERATION SYSTEM	YES	Carollo	Process	2
11378A	MEMBRANE TUBE FINE BUBBLE DIFFUSED AERATION SYSTEM	YES	Carollo	Process	3
11510	SAFETY EQUIPMENT	YES	Carollo	Process	1
11620.3	LABORATORY FUME HOODS GEN5 SERIES	YES	Pults ⁽²⁾	Architectural	-
12346	LABORATORY WORK SURFACES	YES	Pults ⁽²⁾	Architectural	-
13115	YARD PIPING CATHODIC PROTECTION	YES	Cannon	Process	4
13212A	ABOVEGROUND FUEL-STORAGE TANK AND APPURTENANCES – STEEL OR CONCRETE VAULTED TANK	YES	Carollo	Mechanical & Electrical	2

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
13214	FUEL SYSTEM ACCESSORIES	YES	Carollo	Mechanical & Electrical	1
13238A	ALUMINUM COVERS	YES	Cannon	Process	3
13446	MANUAL ACTUATORS	YES	Carollo	Process	1
13447	ELECTRIC ACTUATORS	YES	Cannon	Process & Electrical	8
13449	PORTABLE OPERATORS	YES	Carollo	Process	1
15050	COMMON WORK RESULTS FOR MECHANICAL EQUIPMENT	NO	Carollo	Mechanical & Process	0
15052	COMMON WORK RESULTS FOR GENERAL PIPING	NO	Cannon	Process	0
15061	PIPE SUPPORTS	YES	Carollo	Process & Structural	10
15062	PREFORMED CHANNEL PIPE SUPPORT SYSTEM	YES	Carollo	Process & Structural	8
15063	NON-METALLIC PIPE SUPPORT SYSTEM	YES	Carollo	Process & Structural	4
15075	EQUIPMENT IDENTIFICATION	YES	Carollo	Process	1
15076	PIPE IDENTIFICATION	YES	Cannon	Process	4
15082	PIPING INSULATION	YES	Carollo	Process	1
15084	DUCTWORK INSULATION	YES	Carollo	Mechanical	1
15110	COMMON WORK RESULTS FOR VALVES	NO	Cannon	Process	0
15111	BALL VALVES	YES	Carollo	Process	2
15112	BUTTERFLY VALVES	YES	Carollo	Process	2
15114	CHECK VALVES	YES	Cannon	Process	4
15115	GATE, GLOBE, AND ANGLE VALVES	YES	Cannon	Process	4
15116	PLUG VALVES	YES	Carollo	Process	3
15117	SPECIALTY VALVES	YES	Carollo	Process	2
15118	PRESSURE REDUCING AND PRESSURE RELIEF VALVES	YES	Carollo	Process	2
15119	AIR AND VACUUM RELIEF VALVES	YES	Cannon	Process	4
15120	PIPING SPECIALTIES	YES	Cannon	Process	4
15121	PIPE COUPLINGS	YES	Cannon	Process	12
15122	FIRE HYDRANTS	NO	Cannon	Process	0

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
15211	DUCTILE IRON PIPE: AWWA C151	YES	Cannon	Process	3
15230	PLASTIC PIPING AND TUBING	YES	Cannon	Process	3
15244	POLYVINYL CHLORIDE (PVC) PIPE: AWWA C900 AND AWWA C905	YES	Cannon	Process	3
15245	DRAIN, WASTE, AND VENT PIPING	YES	Carollo	Architectural	2
15249	POLYVINYL CHLORIDE (PVC) PIPE: SCHEDULE TYPE	YES	Cannon	Process	3
15270	STEEL PIPE: GALVANIZED AND BLACK, ASTM A53	YES	Cannon	Process	3
15274	PLASTIC TAPE WRAP FOR PIPE	YES	Cannon	Process	3
15286	STAINLESS STEEL PIPE AND TUBING	YES	Carollo	Process	3
15294	RUBBER HOSE	YES	Carollo	Mechanical & Process	2
15732	AIR CONDITIONING UNITS	YES	Carollo	Mechanical	4
15812	METAL DUCTS	YES	Carollo	Mechanical	1
15820	DUCTWORK ACCESSORIES	YES	Carollo	Mechanical	3
15830	FANS	YES	Carollo	Mechanical	4
15954	TESTING, ADJUSTING, AND BALANCING FOR HVAC	YES	Carollo	Mechanical	2
15956	PIPING SYSTEMS TESTING	NO	Cannon	Process	0
15958	MECHANICAL EQUIPMENT TESTING	NO	Carollo	Mechanical & Process	0
16050	COMMON WORK RESULTS FOR ELECTRICAL	NO	Carollo	Electrical	0
16052	HAZARDOUS CLASSIFIED AREA CONSTRUCTION	NO	Carollo	Electrical	0
16060	GROUNDING AND BONDING	YES	Carollo	Electrical	1
16070	HANGERS AND SUPPORTS	YES	Carollo	Electrical	1
16075	IDENTIFICATION FOR ELECTRICAL SYSTEMS	YES	Carollo	Electrical	1
16123	600-VOLT OR LESS WIRES AND CABLES	YES	Carollo	Electrical	2
16125	FIBER OPTIC CABLE AND APPURTENANCES	YES	Carollo	Electrical	5
16130	CONDUITS	YES	Carollo	Electrical	10
16133	DUCT BANKS	YES	Carollo	Electrical	4
16134	BOXES	YES	Carollo	Electrical	1
16136	WIREWAY	YES	Carollo	Electrical	2
16140	WIRING DEVICES	YES	Carollo	Electrical	2
16150	LOW VOLTAGE WIRE CONNECTIONS	YES	Carollo	Electrical	1

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
16210	UTILITY COORDINATION	YES	Carollo	Electrical	1
16222	LOW VOLTAGE MOTORS UP TO 500 HORSEPOWER	NO	Carollo	Electrical	0
16232	SINGLE DIESEL FUELED ENGINE GENERATOR ABOVE 200 KW	YES	Carollo	Electrical	5
16262	VARIABLE FREQUENCY DRIVES 0.50 – 50 HORSEPOWER	YES	Carollo	Electrical	4
16272	DRY-TYPE TRANSFORMERS	YES	Carollo	Electrical	5
16281	HARMONIC FILTER	YES	Carollo	Electrical	5
16285	SURGE PROTECTIVE DEVICES	YES	Carollo	Electrical	2
16290	ELECTRICAL POWER MONITORING	YES	Carollo	Electrical	2
16305	ELECTRICAL SYSTEM STUDIES	YES	Carollo	Electrical	3
16411	DISCONNECT SWITCHES	YES	Carollo	Electrical	3
16412	LOW VOLTAGE MOLDED CASE CIRCUIT BREAKERS	YES	Carollo	Electrical	2
16414	LOW VOLTAGE POWER CIRCUIT BREAKERS	YES	Carollo	Electrical	2
16422	MOTOR STARTERS	YES	Carollo	Electrical	4
16430	LOW VOLTAGE SWITCHGEAR	YES	Carollo	Electrical	4
16433	SERVICE ENTRANCE AUTOMATIC TRANSFER SWITCHGEAR	YES	Carollo	Electrical	3
16444	LOW VOLTAGE MOTOR CONTROL CENTERS	YES	Carollo	Electrical	5
16445	PANELBOARDS	YES	Carollo	Electrical	2
16452	BUSWAY	YES	Carollo	Electrical	4
16472	PACKAGED POWER SUPPLY CENTER	YES	Carollo	Electrical	3
16494	LOW VOLTAGE FUSES	YES	Carollo	Electrical	1
16500	LIGHTING	YES	Carollo	Electrical	2
16510	LIGHTING: LED LUMINAIRES	YES	Carollo	Electrical	2
16907	NETWORK LIGHTING CONTROLS	YES	Carollo	Electrical	3
16950	FIELD ELECTRICAL ACCEPTANCE TESTS	YES	Carollo	Electrical	3
16990	CONDUIT SCHEDULE	NO	Carollo	Electrical	0
17050	COMMON WORK RESULTS FOR PROCESS CONTROL AND INSTRUMENTATION SYSTEMS	NO	Carollo	Programming	0
17101	SPECIFIC CONTROL STRATEGIES	NO	Carollo	Programming	0
17101-11A	PROCESS CONTROL STRATEGY PLANT INFLUENT FLOW	NO	Cannon	Programming	0
17101-11B	PROCESS CONTROL STRATEGY STEP SCREENS/SCREENINGS WASHER COMPACTORS	NO	Cannon	Programming	0
17101-11C	PROCESS CONTROL STRATEGY INFLUENT PUMPING	NO	Cannon	Programming	0

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
17101-12A	PROCESS CONTROL STRATEGY GRIT HANDLING	NO	Cannon	Programming	0
17101-12B	PROCESS CONTROL STRATEGY LOW/HIGH-TDS BYPASS	NO	Cannon	Programming	0
17101-21	PROCESS CONTROL STRATEGY AERATION BASINS	NO	Carollo	Programming	0
17101-22A	PROCESS CONTROL STRATEGY AERATION BLOWERS	NO	Carollo	Programming	0
17101-22B	PROCESS CONTROL STRATEGY BLOWER BUILDING HVAC	NO	Carollo	Programming	0
17101-24A	PROCESS CONTROL STRATEGY SECONDARY CLARIFIERS	NO	Carollo	Programming	0
17101-24B	PROCESS CONTROL STRATEGY SECONDARY SCUM PUMP STATION	NO	Carollo	Programming	0
17101-24C	PROCESS CONTROL STRATEGY RETURN ACTIVATED SLUDGE PUMPS	NO	Carollo	Programming	0
17101-24D	PROCESS CONTROL STRATEGY WASTE ACTIVATED SLUDGE PUMPS	NO	Carollo	Programming	0
17101-26A	PROCESS CONTROL STRATEGY UV BREAK TANK AND PUMP STATION	NO	Cannon	Programming	0
17101-XX	PROCESS CONTROL STRATEGY STORM WATER PUMP STATION	NO	Cannon	Programming	0
17201	LEVEL MEASUREMENT: SWITCHES	YES	Carollo	Instrumentation	2
17206	LEVEL MEASUREMENT: ULTRASONIC	YES	Carollo	Instrumentation	2
17301	FLOW MEASUREMENT: SWITCHES	YES	Carollo	Instrumentation	2
17302	FLOW MEASUREMENT: MAGNETIC FLOWMETERS	YES	Carollo	Instrumentation	2
17305	FLOW MEASUREMENT: THERMAL MASS	YES	Carollo	Instrumentation	2
17307	FLOW MEASUREMENT: ULTRASONIC TRANSIT TIME	YES	Cannon	Instrumentation	2
17316	FLOW MEASUREMENT: ROTAMETERS (VARIABLE AREA FLOWMETERS)	YES	Carollo	Instrumentation	2
17317	FLOW MEASUREMENT: OPEN CHANNEL	YES	Carollo	Instrumentation	2
17401	PRESSURE/VACUUM MEASUREMENT: DIAPHRAGM SEALS	YES	Carollo	Instrumentation	2
17402	PRESSURE/VACUUM MEASUREMENT: INSTRUMENT VALVES	YES	Carollo	Instrumentation	1
17403	PRESSURE/VACUUM MEASUREMENT: SWITCHES	YES	Carollo	Instrumentation	2
17404	PRESSURE/VACUUM MEASUREMENT: GAUGES	YES	Carollo	Instrumentation	2
17405	PRESSURE/VACUUM MEASUREMENT: DIRECT	YES	Carollo	Instrumentation	2
17406	PRESSURE/VACUUM MEASUREMENT: DIFFERENTIAL	YES	Carollo	Instrumentation	2
17407	PRESSURE MEASUREMENT: SUBMERSIBLE	YES	Carollo	Instrumentation	2

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Section No.	Title	Submittal Required?	Reviewer	Discipline	Anticipated No. of Submittals ⁽¹⁾
17504	ANALYZERS: GAS MONITORS	YES	Cannon	Instrumentation	2
17506	ANALYZERS: DISSOLVED OXYGEN (DO)	YES	Carollo	Instrumentation	2
17511	ANALYZERS: CONDUCTIVITY	YES	Cannon	Instrumentation	2
17710	CONTROL SYSTEMS: PANELS, ENCLOSURES, AND PANEL COMPONENTS	YES	Carollo	Instrumentation	8
17712	CONTROL SYSTEMS: UNINTERRUPTIBLE POWER SUPPLIES 10 KVA AND BELOW	YES	Carollo	Instrumentation	3
17720	CONTROL SYSTEMS: PROGRAMMABLE LOGIC CONTROLLERS	YES	Carollo	Electrical & Instrumentation	4
17721	CONTROL SYSTEMS: LOCAL OPERATOR INTERFACE (LOI)	YES	Carollo	Electrical & Instrumentation	4
17733	CONTROL SYSTEMS: NETWORK MATERIALS AND EQUIPMENT	YES	Carollo	Electrical & Instrumentation	4
17901	SCHEDULES: FIELD INSTRUMENTS	NO	Carollo	Electrical & Instrumentation	0
17902	SCHEDULES: CONTROL PANELS	NO	Carollo	Electrical & Instrumentation	0
17903	SCHEDULES: I/O LIST	NO	Carollo	Electrical & Instrumentation	0
17950	TESTING, CALIBRATION, AND COMMISSIONING	YES	Carollo	Electrical & Instrumentation	0

TOTAL UNIQUE SUBMITTALS: 552

Notes:

- (1) Anticipated number of submittals includes unique submittals only; number of resubmittals were not included.
- (2) Submittals were not estimated for Pults.

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Appendix C - SCADA Hardware & Software Bill of Material

Category	Location	Service	Description	Part Number	Qty	Line Item Total
Network Panel	NP-SCADA	SCADA Network Rack	72U SmartRack Seismic-Certified Standard-Depth Rack Enclosure Cabinet with Doors & Side Panels	TrippLite SR42UB24	1	\$ 2,524.78
Network Panel	NP-SCADA	SCADA Network Rack PDU	1.4kW Single-Phase Metered PDU, 120V Outlets (13 5-15R), 5-15P, 100-127V Input, 15ft Cord, 1U Rack-Mount	TrippLite PDUHM15	1	\$ 116.67
Network Panel	NP-SCADA	SCADA Network Rack UPS	UPS 3kVa	Eaton 9PX3000 RTN	1	\$ 3,196.68
Network Panel	NP-SCADA	SCADA Network Rack Batt	Extended Battery	Eaton 9PXEBM72RT	1	\$ 706.07
Network Panel	NP-SCADA	SCADA Network Rack in the Admin Bldg.	Bypass Switch	Eaton EHBPL3000R-PDU1U	1	\$ 418.31
Network Panel	NP-SCADA	Primary and Secondary SCADA Servers	SCADA Server HP ProLiant DL380 G9 2U Rack Server - Intel Xeon ES-2620 v4 Octa-core (8 Core) 2.10 GHz - 64 GB Installed DDR4 SDRAM - Serial ATA/600, 12Gb/s SAS Controller - 0, 1, 5, 10 RAID Levels - 2 Processor Support - Gigabit Ethernet - Matrox G200eK2 Graphic Card SVR SMART BUY	HP ProLiant DL380 G9 2U Rack Server	2	\$ 9,407.99
Network Panel	NP-SCADA	Primary and Secondary SCADA Servers	1TB Internal Hard Drives HP 1 TB 2.5" Internal Hard Drive - SAS - 7200rpm - 1 Pack HDD	HP 1 TB 2.5" Internal Hard Drive	4	\$ 2,005.23
Network Panel	NP-SCADA	Primary and Secondary SCADA Servers	1TB Internal Hard Drives HP 1 TB 2.5" Internal Hard Drive - SAS - 7200rpm - 1 Pack HDD	HP 1 TB 2.5" Internal Hard Drive	4	\$ 2,005.23
Network Panel	NP-SCADA	Primary and Secondary SCADA Servers	Server Accessories HP Internal DVD-Reader - Jack Black - DVD-ROM Support - 24x CD Read - 8x DVD Read - Double-layer Media Supported SATA/150	HP Internal DVD-Reader	2	\$ 203.70
Network Panel	NP-SCADA	Primary and Secondary SCADA Servers	Server Support HP Integrated Lights-Out Advanced Pack - License - 1 Server	HP Integrated Lights-Out Advanced Pack	2	\$ 784.51
Network Panel	NP-SCADA	SCADA Server Software Operating System Licenses	Server Licenses OLP GOVT WIN SVR STD CORE 2016 2UCS NL CORE LICs	OLP GOVT WIN SVR STD CORE 2016 2UCS NL CORE LICs	1	\$ 5,142.84
Network Panel	NP-SCADA	Time Server	Network Time Server: T550 NTP Server, Antenna, Mount	T550-00	1	\$ 1,936.76
Network Panel	NP-SCADA	Time Server	GPS Surge Suppressor		1	\$ 222.05
Network Panel	NP-SCADA	Time Server	50m GPS Antenna extension cable		1	\$ 101.16
Network Panel	NP-SCADA	NAS	QNAP 12-bay High Performance Unified Storage: Network Attached Storage QNAP 12-bay High Performance Unified Storage - Intel Core i3 i3-4150 Dual-core (2 Core) 3.50 GHz - 12 x Total Bays - 8 GB RAM DDR3 SDRAM - Serial ATA/600 - RAID Supported 0, 1, 5, 6, 10, Hot Spare, JBOD - 12 x 2.5"/3.5" Bay - 2 x Total Slot(s) - Gigabit Ethernet - HDMI - Network (RJ-45) - 8 x USB Ports - 4 - 4 USB 3.0 Port(s) - QTS 4.1 - TCP/IP, IPv6, IPV4, NTP, DHCP, CIFS/SMB, AFP 3.3, NFSv3, SFTP, FTPS, ... - 2U - Rack-mountable DUAL CORE 8GB RAM 4LAN 10GREADY	TVS-1271U-RP-i3-8G	1	\$ 3,920.16
Network Panel	NP-SCADA	NAS Mounting Kit	NAS Mounting Rail Kit QNAP RAIL-801 Mounting Rail Kit for Server TS-1253U TS-1253U-RP TS-1269U-RP	QNAP RAIL-801 Mounting Rail Kit	1	\$ 122.88
Network Panel	NP-SCADA	NAS Hard drives	Seagate IronWolf ST10000VN0004 10 TB 3.5" Internal Hard Drive - SATA - 7200rpm - 256 MB Buffer 3.5IN 256MB	ST10000VN0004	2	\$ 1,674.92
Network Panel	NP-SCADA	Network Rack Components	Allen-Bradley - Circuit Breaker - 30amp single pole	1489-M1C300	1	\$ 57.05
Network Panel	NP-SCADA	Network Rack Components	Allen-Bradley - Terminal Blocks	1492-14	16	\$ 19.27
Network Panel	NP-SCADA	Network Rack Components	Allen-Bradley - Terminal Blocks - Ground	1492-JG4	8	\$ 28.91
Network Panel	NP-SCADA	Network Rack Components	Allen-Bradley - End Anchors and Retainers: DIN Rail - Normal Duty	1492-EA135	4	\$ 8.71
Network Panel	NP-SCADA	Network Rack Components	Allen-Bradley - Jumpers: Screw Center Jumper - 10-pole	1492-CJ6-10	2	\$ 12.60
Network Panel	NP-SCADA	Network Rack Components	Allen-Bradley - Partition Plate	1492-EBJ3	4	\$ 4.18
Network Panel	NP-SCADA	Network Rack Components	Hubbell - Duplex Receptacle - DIN rail mountable	DRUB15	1	\$ 46.05
Network Panel	NP-SCADA	Network Rack Components	Hubbell-Kellems HBL2610 Twist-Lock, Single Flush Receptacle, 30A	HBL2610	1	\$ 43.02
Network Panel	NP-SCADA	Network Rack Components	Hubbell - 1.60 in. opening plate only	KP720GY	1	\$ 2.73
Network Panel	NP-SCADA	Network Rack Components	Phoenix Contact Type 3 surge protection device - PLT-SEC-T3-120-FM	2905228	1	\$ 253.79
Network Panel	NP-SCADA	Network Rack Components	6U DIN Rail Rack Mount Panel	RCB1122BK15	1	\$ 274.30
Network Panel	NP-SCADA	Network Rack Components	Allen-Bradley - Partition Plate	1492-EBJ3	8	\$ 8.59
Network Panel	NP-SCADA	Network Rack Components	Fuse Terminal blocks (to match the 1492-J4 style)	1492-H4	16	\$ 454.43
Network Panel	NP-SCADA	Network Rack Components	Samp fuses for the above fuse blocks	MF2 GGCS	20	\$ 31.35
Network Panel	NP-SCADA	Network Rack Components	Terminal block markers for the J4 terminal blocks	1492-MR6X12	1	\$ 12.95
Network Panel	NP-SCADA	Network Rack Components	THRN Wire		1	\$ 17.20
Network Panel	NP-SCADA	KVM	Keyboard, Video Monitor and Mouse for Server Access	AP1579	1	\$ 2,104.39
Network Panel	NP-OPS (Network)	SCADA Network Rack	72U SmartRack Seismic-Certified Standard-Depth Rack Enclosure Cabinet with Doors & Side Panels	TrippLite SR42UB24	1	\$ 2,614.39
Network Panel	NP-OPS (Network)	SCADA Network Rack PDU	1.4kW Single-Phase Metered PDU, 120V Outlets (13 5-15R), 5-15P, 100-127V Input, 15ft Cord, 1U Rack-Mount	TrippLite PDUHM15	1	\$ 112.74
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP 2920-24G Switch - 20 Ports - Manageable - 6 x Expansion Slots - 10/100/1000Base-T - Modular - 24 x Network, 4 x Expansion Slot, 2 x Expansion Slot - Twisted Pair - Gigabit Ethernet - Shared SFP Slot - 4 x SFP Slots - 3 Layer Supported - 1U High - Rack-mountable Lifetime Limited Warranty	J9726ARABA	1	\$ 1,813.52
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP 640 Redundant/External Power Supply Shelf - Modular - 1.44 kW	J8805A	1	\$ 1,729.41
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP X331 Proprietary Power Supply - 110 V AC, 220 V AC Input Voltage - Internal - Modular - 165 W PS	J9739ARABA	1	\$ 311.13
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP 640 EPS/RPS 1m Cable - For Power Supply, Switch Fabric Module	J8806A	1	\$ 142.47
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP Mini-GBIC Transceiver Module - 1 x 1000Base-SX GBIC	J485BC	2	\$ 578.75
Network Panel	NP-OPS (Network)	I/O Server to PLC network interface	NTRON 7012FX2-SC Multimode, SC Style Managed industrial Ethernet Switch, 2KM	7010TX	2	\$ 4,584.66
Network Panel	NP-OPS (Network)	I/O Server to PLC network interface accessories	NTRON URMK Universal Rack Mount Kit	URMK	2	\$ 304.40
Network Panel	NP-OPS (Network)	I/O Server to PLC network interface accessories	NTRON NTPS-24-1.3 Power Supply	NTPS-24-1.3	2	\$ 386.05
Network Panel	NP-OPS (Network)	I/O Server to PLC network interface accessories	NTRON SFP Transceiver - Multimode Gigabit Fiber - 550m	N1SFP-SX	2	\$ 525.75
Network Panel	NP-OPS (Network)	Copper Patch Panel	Tripp Lite 24-Port Cat6 Cat5 Patch Panel Rackmount 110 Punch Down RJ45 Ethernet 1URM - 568B RACKMOUNT 110 IDC RJ45 ETHERNET	N252-024	2	\$ 132.36
Network Panel	NP-OPS (Network)	Copper Patch Panel	Tripp Lite 24-Port Cat6 Cat5 Patch Panel Rackmount 110 Punch Down RJ45 Ethernet 1URM - 568B RACKMOUNT 110 IDC RJ45 ETHERNET	N252-024	2	\$ 132.36
Network Panel	NP-OPS (Network)	OPS Firewall	Cisco ASA 5506-X, Threat-focused NGFW, provides ASA firewall functionality, advanced threat protection, and advanced breach detection and remediation combined in a single device	ASA5506-K9	1	\$ 869.89
Network Panel	NP-OPS (Network)	Network Rack Components	StarTech.com 2U 16in Universal Vented Rack Mount Candler Shelf - Fixed Server Rack Cabinet Shelf - 50lbs / 22kg - 19" 2U SHELF		2	\$ 94.33
Network Panel	NP-OPS (Network)	Fiber Patch Panels	Closet Connector Housing (CCH), 4 rack units, accepts up to 12 CCH panels, cassettes or modules	CCH-04U	1	\$ 1,667.99
Network Panel	NP-OPS (Network)	Fiber Patch Panels	Closet Connector Housing (CCH) Panel, SC adapters, duplex, 12 F, 50 µm multimode (OM3/OM4)	CCH-CP12-E7	12	\$ 1,252.01
Network Panel	NP-OPS (Network)	DH+ to Ethernet Transceiver	bridge between an Ethernet/IP and a Data Highway Plus network	AN-X2-AB-DHRIO	2	\$ 7,256.50
Network Panel	NP-OPS (Network)	Business Network Firewall	Cisco 5506X, Threat-focused NGFW, provides ASA firewall functionality, advanced threat protection, and advanced breach detection and remediation combined in a single device	Cisco 5506X	1	\$ -
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP 2920-24G Switch - 20 Ports - Manageable - 6 x Expansion Slots - 10/100/1000Base-T - Modular - 24 x Network, 4 x Expansion Slot, 2 x Expansion Slot - Twisted Pair - Gigabit Ethernet - Shared SFP Slot - 4 x SFP Slots - 3 Layer Supported - 1U High - Rack-mountable Lifetime Limited Warranty	J9726ARABA	1	\$ 1,813.52
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP 640 Redundant/External Power Supply Shelf - Modular - 1.44 kW	J8805A	1	\$ 1,729.41
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP X331 Proprietary Power Supply - 110 V AC, 220 V AC Input Voltage - Internal - Modular - 165 W PS	J9739ARABA	1	\$ 311.13

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Appendix C - SCADA Hardware & Software Bill of Material

Category	Location	Service	Description	Part Number	Qty	Line Item Total
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP 640 EP5/RP5 1m Cable - For Power Supply, Switch Fabric Module	19806A	1	\$ 142.47
Network Panel	NP-OPS (Network)	SCADA Enterprise Switches	HP Mini-GBIC Transceiver Module - 1 x 1000Base-SX GBIC	J485BC	2	\$ 578.75
Control Room Equipment	Control Room	SCADA Operations - Admin	Xerox Color Printer	Phaser 7100/DN	1	\$ 2,227.41
Control Room Equipment	Control Room	SCADA Operations - Admin	Xerox Black & White Printer	5550/DN	1	\$ 3,736.20
Control Room Equipment	Control Room	SCADA Operator Workstations	HP EliteDesk 800 G3	1F84UT#ABA	2	\$ 2,211.75
Control Room Equipment	Control Room	SCADA Operator Workstations Monitors	HP EliteDisplay E232 23-inch Monitor	M1N98A8#ABA	4	\$ 929.47
Control Room Equipment	Control Room	SCADA Operator Workstations Bracket	HP PC Mounting Bracket for Monitors	NEN00AT	2	\$ 81.97
Control Room Equipment	Control Room	SCADA Operator Workstations Mouse	Wireless Mouse M325	Red: PH 910-002651Blue: PH 910-002650	2	\$ 43.54
Control Room Equipment	Control Room	SCADA Operator Workstations Keyboard	Wireless Solar Keyboard K750	PH 920-002912	2	\$ 130.62
Plant Floor & Remote Client HMI	N/A	PCM SCADA clients	Arista - 21.5" 5-Wire Resistive Touch or Tempered Glass, NEMA 4/4X, PCIe Expansion Slot	ARP-2221AP-G00	1	\$ 4,604.97
Plant Floor & Remote Client HMI	N/A	Programming Laptop	Windows 10 Pro 64 16 GB DDR4-1866 SDRAM (2 x 8 GB) 17.3" diagonal FHD 120 Hz IPS anti-glare WLED-backlit (1920 x 1080) 1 TB 5400 rpm SATA	HP Pavilion 17z	1	\$ 1,146.51
Network Panel	NP-RDS	SCADA Network Rack in the Secondary Treatment Area	42U SmartRack Seismic-Certified Standard-Depth Rack Enclosure Cabinet with Doors & Side Panels	TrippLite SR42UB24	1	\$ 2,609.48
Network Panel	NP-RDS	SCADA Network Rack PDU	1.4kW Single-Phase Metered PDU, 120V Outlets (13 5-15R), 5-15P, 100-127V Input, 15ft Cord, 1U Rack-Mount	TrippLite PDUHM15	1	\$ 112.74
Network Panel	NP-RDS	Secondary Treatment Area - Network Rack - UPS	UPS 3kVa	Eaton 9PK3000 RTN	1	\$ 3,241.71
Network Panel	NP-RDS	Secondary Treatment Area - Network Rack - Relay	UPS Management card contact & RS232 / Serial	Eaton Relay-MS Card	1	\$ 106.18
Network Panel	NP-RDS	Secondary Treatment Area - Network Rack - Batt	Extended Battery	Eaton 9PKEBM72RT	1	\$ 706.07
Network Panel	NP-RDS	Secondary Treatment Area - Network Rack - Bypass	Bypass Switch	Eaton EHBPL3000R-PDU1U	1	\$ 432.07
Network Panel	NP-RDS	I/O Server to PLC network Interface	NTRON 7012FX2-SC Multimode, SC Style Managed Industrial Ethernet Switch, 2KM	7010TX	2	\$ 4,584.66
Network Panel	NP-RDS	I/O Server to PLC network Interface accessories	NTRON URMK Universal Rack Mount Kit	URMK	2	\$ 304.40
Network Panel	NP-RDS	I/O Server to PLC network Interface accessories	NTRON NTPS-24-1.3 Power Supply	NTPS-24-1.3	2	\$ 386.05
Network Panel	NP-RDS	I/O Server to PLC network Interface accessories	NTRON SFP Transceiver - Multimode Gigabit Fiber - 550m	N7SFP-SX	2	\$ 525.75
Network Panel	NP-RDS	Fiber Patch Panels	Closet Connector Housing (CCH), 4 rack units, accepts up to 12 CCH panels, cassettes or modules	CCH-04U	1	\$ 1,667.99
Network Panel	NP-RDS	Fiber Patch Panels	Closet Connector Housing (CCH) Panel, SC adapters, duplex, 12 F, 50 µm multimode (OM3/OM4)	CCH-CP12-E7	9	\$ 939.01
Network Panel	NP-RDS	Copper Patch Panel	Tripp Lite 24-Port Cat6 Cat5 Patch Panel Rackmount 110 Punch Down RJ45 Ethernet 1URM - 568B RACKMOUNT 110 IDC RJ45 ETHERNET	N252-024	1	\$ 66.18
Network Panel	NP-RDS	Network Rack Components	Allen-Bradley - Circuit Breaker - 30amp single pole	1489-M1C300	1	\$ 57.05
Network Panel	NP-RDS	Network Rack Components	Allen-Bradley - Terminal Blocks	1492-J4	16	\$ 19.27
Network Panel	NP-RDS	Network Rack Components	Allen-Bradley - Terminal Blocks - Ground	1492-JG4	8	\$ 28.91
Network Panel	NP-RDS	Network Rack Components	Allen-Bradley - End Anchors and Retainers: DIN Rail - Normal Duty	1492-EA135	4	\$ 8.71
Network Panel	NP-RDS	Network Rack Components	Allen-Bradley - Jumpers: Screw Center Jumper - 10-pole	1492-CJ6-10	2	\$ 12.60
Network Panel	NP-RDS	Network Rack Components	Allen-Bradley - Partition Plate	1492-EB13	4	\$ 4.18
Network Panel	NP-RDS	Network Rack Components	Hubbell - Duplex Receptacle - DIN rail mountable	DRU815	1	\$ 46.05
Network Panel	NP-RDS	Network Rack Components	Hubbell-Kellems HBL2610 Twist-Lock, Single Flush Receptacle, 30A	HBL2610	1	\$ 43.02
Network Panel	NP-RDS	Network Rack Components	Hubbell - 1.60 in. opening plate only	KP720GY	1	\$ 2.73
Network Panel	NP-RDS	Network Rack Components	Phoenix Contact Type 3 surge protection device - PLT-SEC-T3-120-FM	2905228	1	\$ 253.79
Network Panel	NP-RDS	Network Rack Components	6U DIN Rail Rack Mount Panel	RCB1122BK15	1	\$ 274.30
Network Panel	NP-RDS	Network Rack Components	THHN Wire		1	\$ 17.20
Network Panel	NP-LVBT	SCADA Network Rack in the Secondary Treatment Area	42U SmartRack Seismic-Certified Standard-Depth Rack Enclosure Cabinet with Doors & Side Panels	TrippLite SR42UB24	1	\$ 2,609.48
Network Panel	NP-LVBT	SCADA Network Rack PDU	1.4kW Single-Phase Metered PDU, 120V Outlets (13 5-15R), 5-15P, 100-127V Input, 15ft Cord, 1U Rack-Mount	TrippLite PDUHM15	1	\$ 112.74
Network Panel	NP-LVBT	Secondary Treatment Area - Network Rack - UPS	UPS 3kVa	Eaton 9PK3000 RTN	1	\$ 3,241.71
Network Panel	NP-LVBT	Secondary Treatment Area - Network Rack - Relay	UPS Management card contact & RS232 / Serial	Eaton Relay-MS Card	1	\$ 106.18
Network Panel	NP-LVBT	Secondary Treatment Area - Network Rack - Batt	Extended Battery	Eaton 9PKEBM72RT	1	\$ 706.07
Network Panel	NP-LVBT	Secondary Treatment Area - Network Rack - Bypass	Bypass Switch	Eaton EHBPL3000R-PDU1U	1	\$ 432.07
Network Panel	NP-LVBT	I/O Server to PLC network Interface	NTRON 7012FX2-SC Multimode, SC Style Managed Industrial Ethernet Switch, 2KM	7010TX	2	\$ 4,584.66
Network Panel	NP-LVBT	I/O Server to PLC network Interface accessories	NTRON URMK Universal Rack Mount Kit	URMK	2	\$ 304.40
Network Panel	NP-LVBT	I/O Server to PLC network Interface accessories	NTRON NTPS-24-1.3 Power Supply	NTPS-24-1.3	2	\$ 386.05
Network Panel	NP-LVBT	I/O Server to PLC network Interface accessories	NTRON SFP Transceiver - Multimode Gigabit Fiber - 550m	N7SFP-SX	2	\$ 525.75
Network Panel	NP-LVBT	Fiber Patch Panels	Closet Connector Housing (CCH), 4 rack units, accepts up to 12 CCH panels, cassettes or modules	CCH-04U	1	\$ 1,667.99
Network Panel	NP-LVBT	Fiber Patch Panels	Closet Connector Housing (CCH) Panel, SC adapters, duplex, 12 F, 50 µm multimode (OM3/OM4)	CCH-CP12-E7	9	\$ 939.01
Network Panel	NP-LVBT	Copper Patch Panel	Tripp Lite 24-Port Cat6 Cat5 Patch Panel Rackmount 110 Punch Down RJ45 Ethernet 1URM - 568B RACKMOUNT 110 IDC RJ45 ETHERNET	N252-024	1	\$ 66.18
Network Panel	NP-LVBT	Network Rack Components	Allen-Bradley - Circuit Breaker - 30amp single pole	1489-M1C300	1	\$ 57.05
Network Panel	NP-LVBT	Network Rack Components	Allen-Bradley - Terminal Blocks	1492-J4	16	\$ 19.27
Network Panel	NP-LVBT	Network Rack Components	Allen-Bradley - Terminal Blocks - Ground	1492-JG4	8	\$ 28.91
Network Panel	NP-LVBT	Network Rack Components	Allen-Bradley - End Anchors and Retainers: DIN Rail - Normal Duty	1492-EA135	4	\$ 8.71
Network Panel	NP-LVBT	Network Rack Components	Allen-Bradley - Jumpers: Screw Center Jumper - 10-pole	1492-CJ6-10	2	\$ 12.60
Network Panel	NP-LVBT	Network Rack Components	Allen-Bradley - Partition Plate	1492-EB13	4	\$ 4.18
Network Panel	NP-LVBT	Network Rack Components	Hubbell - Duplex Receptacle - DIN rail mountable	DRU815	1	\$ 46.05
Network Panel	NP-LVBT	Network Rack Components	Hubbell-Kellems HBL2610 Twist-Lock, Single Flush Receptacle, 30A	HBL2610	1	\$ 43.02
Network Panel	NP-LVBT	Network Rack Components	Hubbell - 1.60 in. opening plate only	KP720GY	1	\$ 2.73
Network Panel	NP-LVBT	Network Rack Components	Phoenix Contact Type 3 surge protection device - PLT-SEC-T3-120-FM	2905228	1	\$ 253.79
Network Panel	NP-LVBT	Network Rack Components	6U DIN Rail Rack Mount Panel	RCB1122BK15	1	\$ 274.30

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Appendix C - SCADA Hardware & Software Bill of Material

Category	Location	Service	Description	Part Number	Qty	Line Item Total
Network Panel	NP-LVBT	Network Rack Components	THHN Wire		1	\$ 17.20
Network Panel	NP-RW	SCADA Network Rack in the Secondary Treatment Area	42U SmartRack Seismic-Certified Standard-Depth Rack Enclosure Cabinet with Doors & Side Panels	TrippLite SR42UB24	1	\$ 2,609.48
Network Panel	NP-RW	SCADA Network Rack PDU	1.4kW Single-Phase Metered PDU, 120V Outlets (13 5-15R), 5-15P, 100-127V Input, 15ft Cord, 1U Rack-Mount	TrippLite PDU MH15	1	\$ 112.74
Network Panel	NP-RW	Secondary Treatment Area - Network Rack - UPS	UPS 3kVa	Eaton 9PX3000 RTN	1	\$ 3,241.71
Network Panel	NP-RW	Secondary Treatment Area - Network Rack - Relay	UPS Management card contact & RS232 / Serial	Eaton Relay-MS Card	1	\$ 106.18
Network Panel	NP-RW	Secondary Treatment Area - Network Rack - Batt	Extended Battery	Eaton 9PXEBM72RT	1	\$ 706.07
Network Panel	NP-RW	Secondary Treatment Area - Network Rack - Bypass	Bypass Switch	Eaton EHBPL3000R-PDU1U	1	\$ 432.07
Network Panel	NP-RW	I/O Server to PLC network interface	NTRON 7012FX2-SC Multimode, SC Style Managed Industrial Ethernet Switch, 2KM	7010TX	2	\$ 4,584.66
Network Panel	NP-RW	I/O Server to PLC network interface accessories	NTRON URMK Universal Rack Mount Kit	URMK	2	\$ 304.40
Network Panel	NP-RW	I/O Server to PLC network interface accessories	NTRON NTPS-24-1.3 Power Supply	NTPS-24-1.3	2	\$ 386.05
Network Panel	NP-RW	I/O Server to PLC network interface accessories	NTRON SFP Transceiver - Multimode Gigabit Fiber - 550m	NTSFP-SX	3	\$ 788.62
Network Panel	NP-RW	Fiber Patch Panels	Closet Connector Housing (CCH), 4 rack units, accepts up to 12 CCH panels, cassettes or modules	CCH-OAU	1	\$ 1,667.99
Network Panel	NP-RW	Fiber Patch Panels	Closet Connector Housing (CCH) Panel, SC adapters, duplex, 12 F, 50 µm multimode (OM3/OM4)	CCH-CP12-E7	9	\$ 939.01
Network Panel	NP-RW	Copper Patch Panel	Tripp Lite 24-Port Cat5 Cat5 Patch Panel Rackmount 110 Punch Down RJ45 Ethernet 1URM - 568B RACKMOUNT 110 IDC RJ45 ETHERNET	N252-024	1	\$ 66.18
Network Panel	NP-RW	Network Rack Components	Allen-Bradley - Circuit Breaker - 30amp single pole	1489-M1C300	1	\$ 57.05
Network Panel	NP-RW	Network Rack Components	Allen-Bradley - Terminal Blocks	1492-J4	16	\$ 19.27
Network Panel	NP-RW	Network Rack Components	Allen-Bradley - Terminal Blocks - Ground	1492-JG4	8	\$ 28.91
Network Panel	NP-RW	Network Rack Components	Allen-Bradley - End Anchors and Retainers: DIN Rail - Normal Duty	1492-EA135	4	\$ 8.71
Network Panel	NP-RW	Network Rack Components	Allen-Bradley - Jumpers: Screw Center Jumper - 10-pole	1492-CJ6-10	2	\$ 12.60
Network Panel	NP-RW	Network Rack Components	Allen-Bradley - Partition Plate	1492-EB13	4	\$ 4.18
Network Panel	NP-RW	Network Rack Components	Hubbell - Duplex Receptacle - DIN rail mountable	DRUB15	1	\$ 46.05
Network Panel	NP-RW	Network Rack Components	Hubbell-Kellems HBL2610 Twist-Lock, Single Flush Receptacle, 30A	HBL2610	1	\$ 43.02
Network Panel	NP-RW	Network Rack Components	Hubbell - 1.60 in. opening plate only	KP720GY	1	\$ 2.73
Network Panel	NP-RW	Network Rack Components	Phoenix Contact Type 3 surge protection device - PLT-SEC-T3-120-FM	2905228	1	\$ 253.79
Network Panel	NP-RW	Network Rack Components	6U DIN Rail Rack Mount Panel	RCB1122BK15	1	\$ 274.30
Network Panel	NP-RW	Network Rack Components	THHN Wire		1	\$ 17.20
Network Panel	NP-HW	SCADA Network Rack in the Secondary Treatment Area	42U SmartRack Seismic-Certified Standard-Depth Rack Enclosure Cabinet with Doors & Side Panels	TrippLite SR42UB24	1	\$ 2,609.48
Network Panel	NP-HW	SCADA Network Rack PDU	1.4kW Single-Phase Metered PDU, 120V Outlets (13 5-15R), 5-15P, 100-127V Input, 15ft Cord, 1U Rack-Mount	TrippLite PDU MH15	1	\$ 112.74
Network Panel	NP-HW	Secondary Treatment Area - Network Rack - UPS	UPS 3kVa	Eaton 9PX3000 RTN	1	\$ 3,241.71
Network Panel	NP-HW	Secondary Treatment Area - Network Rack - Relay	UPS Management card contact & RS232 / Serial	Eaton Relay-MS Card	1	\$ 106.18
Network Panel	NP-HW	Secondary Treatment Area - Network Rack - Batt	Extended Battery	Eaton 9PXEBM72RT	1	\$ 706.07
Network Panel	NP-HW	Secondary Treatment Area - Network Rack - Bypass	Bypass Switch	Eaton EHBPL3000R-PDU1U	1	\$ 432.07
Network Panel	NP-HW	I/O Server to PLC network interface	NTRON 7012FX2-SC Multimode, SC Style Managed Industrial Ethernet Switch, 2KM	7010TX	2	\$ 2,292.33
Network Panel	NP-HW	I/O Server to PLC network interface accessories	NTRON URMK Universal Rack Mount Kit	URMK	1	\$ 152.20
Network Panel	NP-HW	I/O Server to PLC network interface accessories	NTRON NTPS-24-1.3 Power Supply	NTPS-24-1.3	1	\$ 193.02
Network Panel	NP-HW	I/O Server to PLC network interface accessories	NTRON SFP Transceiver - Multimode Gigabit Fiber - 550m	NTSFP-SX	2	\$ 525.75
Network Panel	NP-HW	Fiber Patch Panels	Closet Connector Housing (CCH), 4 rack units, accepts up to 12 CCH panels, cassettes or modules	CCH-OAU	1	\$ 1,667.99
Network Panel	NP-HW	Fiber Patch Panels	Closet Connector Housing (CCH) Panel, SC adapters, duplex, 12 F, 50 µm multimode (OM3/OM4)	CCH-CP12-E7	5	\$ 521.67
Network Panel	NP-HW	Copper Patch Panel	Tripp Lite 24-Port Cat5 Cat5 Patch Panel Rackmount 110 Punch Down RJ45 Ethernet 1URM - 568B RACKMOUNT 110 IDC RJ45 ETHERNET	N252-024	1	\$ 66.18
Network Panel	NP-HW	Network Rack Components	Allen-Bradley - Circuit Breaker - 30amp single pole	1489-M1C300	1	\$ 57.05
Network Panel	NP-HW	Network Rack Components	Allen-Bradley - Terminal Blocks	1492-J4	16	\$ 19.27
Network Panel	NP-HW	Network Rack Components	Allen-Bradley - Terminal Blocks - Ground	1492-JG4	8	\$ 28.91
Network Panel	NP-HW	Network Rack Components	Allen-Bradley - End Anchors and Retainers: DIN Rail - Normal Duty	1492-EA135	4	\$ 8.71
Network Panel	NP-HW	Network Rack Components	Allen-Bradley - Jumpers: Screw Center Jumper - 10-pole	1492-CJ6-10	2	\$ 12.60
Network Panel	NP-HW	Network Rack Components	Allen-Bradley - Partition Plate	1492-EB13	4	\$ 4.18
Network Panel	NP-HW	Network Rack Components	Hubbell - Duplex Receptacle - DIN rail mountable	DRUB15	1	\$ 46.05
Network Panel	NP-HW	Network Rack Components	Hubbell-Kellems HBL2610 Twist-Lock, Single Flush Receptacle, 30A	HBL2610	1	\$ 43.02
Network Panel	NP-HW	Network Rack Components	Hubbell - 1.60 in. opening plate only	KP720GY	1	\$ 2.73
Network Panel	NP-HW	Network Rack Components	Phoenix Contact Type 3 surge protection device - PLT-SEC-T3-120-FM	2905228	1	\$ 253.79
Network Panel	NP-HW	Network Rack Components	6U DIN Rail Rack Mount Panel	RCB1122BK15	1	\$ 274.30
Network Panel	NP-HW	Network Rack Components	THHN Wire		1	\$ 17.20
Network Panel	NP-BLWR	SCADA Network Rack in the Secondary Treatment Area	42U SmartRack Seismic-Certified Standard-Depth Rack Enclosure Cabinet with Doors & Side Panels	TrippLite SR42UB24	1	\$ 2,609.48
Network Panel	NP-BLWR	SCADA Network Rack PDU	1.4kW Single-Phase Metered PDU, 120V Outlets (13 5-15R), 5-15P, 100-127V Input, 15ft Cord, 1U Rack-Mount	TrippLite PDU MH15	1	\$ 112.74
Network Panel	NP-BLWR	Secondary Treatment Area - Network Rack - UPS	UPS 3kVa	Eaton 9PX3000 RTN	1	\$ 3,241.71
Network Panel	NP-BLWR	Secondary Treatment Area - Network Rack - Relay	UPS Management card contact & RS232 / Serial	Eaton Relay-MS Card	1	\$ 106.18
Network Panel	NP-BLWR	Secondary Treatment Area - Network Rack - Batt	Extended Battery	Eaton 9PXEBM72RT	1	\$ 706.07
Network Panel	NP-BLWR	Secondary Treatment Area - Network Rack - Bypass	Bypass Switch	Eaton EHBPL3000R-PDU1U	1	\$ 432.07
Network Panel	NP-BLWR	I/O Server to PLC network interface	NTRON 7012FX2-SC Multimode, SC Style Managed Industrial Ethernet Switch, 2KM	7010TX	2	\$ 4,584.66
Network Panel	NP-BLWR	I/O Server to PLC network interface accessories	NTRON URMK Universal Rack Mount Kit	URMK	2	\$ 304.40
Network Panel	NP-BLWR	I/O Server to PLC network interface accessories	NTRON NTPS-24-1.3 Power Supply	NTPS-24-1.3	2	\$ 386.05
Network Panel	NP-BLWR	I/O Server to PLC network interface accessories	NTRON SFP Transceiver - Multimode Gigabit Fiber - 550m	NTSFP-SX	4	\$ 1,051.50

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Category	Location	Service	Description	Part Number	Qty	Line Item Total
Network Panel	NP-BLWR	Fiber Patch Panels	Closet Connector Housing (CCH), 4 rack units, accepts up to 12 CCH panels, cassettes or modules	CCH-04U	1	\$ 1,667.99
Network Panel	NP-BLWR	Fiber Patch Panels	Closet Connector Housing (CCH) Panel, SC adapters, duplex, 12 F, 50 µm multimode (OM3/OM4)	CCH-CP12-E7	9	\$ 939.01
Network Panel	NP-BLWR	Copper Patch Panel	Tripp Lite 24-Port Cat6 Cat5 Patch Panel Rackmount 110 Punch Down RJ45 Ethernet 1URM - 568B RACKMOUNT 110 IDC RJ45 ETHERNET	N252-024	1	\$ 66.18
Network Panel	NP-BLWR	Network Rack Components	Allen-Bradley - Circuit Breaker - 30amp single pole	1489-M1C300	1	\$ 57.05
Network Panel	NP-BLWR	Network Rack Components	Allen-Bradley - Terminal Blocks	1492-J4	16	\$ 19.27
Network Panel	NP-BLWR	Network Rack Components	Allen-Bradley - Terminal Blocks - Ground	1492-JG4	8	\$ 28.91
Network Panel	NP-BLWR	Network Rack Components	Allen-Bradley - End Anchors and Retainers: DIN Rail — Normal Duty	1492-EAJ35	4	\$ 8.71
Network Panel	NP-BLWR	Network Rack Components	Allen-Bradley - Jumpers: Screw Center Jumper — 10-pole	1492-CJ6-10	2	\$ 12.60
Network Panel	NP-BLWR	Network Rack Components	Allen-Bradley - Partition Plate	1492-EBJ3	4	\$ 4.18
Network Panel	NP-BLWR	Network Rack Components	Hubbell - Duplex Receptacle - DIN rail mountable	DRUB15	1	\$ 46.05
Network Panel	NP-BLWR	Network Rack Components	Hubbell-Kellems HBL2610 Twist-Lock, Single Flush Receptacle, 30A	HBL2610	1	\$ 43.02
Network Panel	NP-BLWR	Network Rack Components	Hubbell - 1.60 in. opening plate only	KP720GY	1	\$ 2.73
Network Panel	NP-BLWR	Network Rack Components	Phoenix Contact Type 3 surge protection device - PLT-SEC-T3-120-FM	2905228	1	\$ 253.79
Network Panel	NP-BLWR	Network Rack Components	6U DIN Rail Rack Mount Panel	RCB1122BK15	1	\$ 274.30
Network Panel	NP-BLWR	Network Rack Components	THHN Wire		1	\$ 17.20
Software	N/A	License Upgrade	SN#666775 - Dev. Studio 2014R2 (unlim/60K/500) to Dev. Studio 2017 (unlim/60K/500)	DEVSTD-04-U-17	1	\$ -
Software	N/A	License Upgrade	SN#1581316 - WW Historian Client 2014R2 per device to WW Historian Client 2017 Concurrent, single	HSTCLT-01-U-17	1	\$ -
Software	N/A	New Application Software License	SN#1624316 - System Platform 2017, 25K IO/SK History - Application Server 25K IO, Historian Server Standard 5Ktag, 2 OI Server Standard, 1 (License Credit of \$3810.00)	SYSPLT-07-N-17	1	\$ 38,720.68
Software	N/A	New Client Licenses	Supervisory Client w/Hist Client 2017, no MSCAL	SUPCLT-03-N-17	4	\$ 21,305.08
Software	N/A	New Client Licenses	Supervisory Client w/Hist Client 2017, no MSCAL, FLB	SUPCLF-03-N-17	4	\$ 4,324.87
Software	N/A	Additional Customer First Support for New Licenses	Add to existing CFP #100-307, Exp 9/27/2019	10-7050	1	\$ 13,250.37
Software	N/A	Redundant Top View	TV-WW-RESTR-UNL-B	TV-WW-RESTR-UNL-B	1	\$ 7,974.89
Software	N/A	TV-Extended Support	Additional 1 month support	Additional 1 month support	1	\$ 100.14
Software	N/A	Modem	Grandstream UCM6202 IP PBXC-2 port	4815456	1	\$ 928.83
Software	N/A	Tier Two Historian	Historian 2017 Enterprise 5,000 Tag	HSTENT-01-N-17	1	\$ 33,242.03
Software	N/A	Tier Two Historian Client	WW Historian Client 2017 Concurrent, Single	HSTCLT-01-N-17	1	\$ 2,307.57
Software	N/A	Additional Customer First Support for New Licenses	Add to existing CFP #100-307, Exp 9/27/2019	10-7050	1	\$ 7,321.81
Software	N/A	N/A	MS Office for Client Workstations		4	\$ 2,322.08
Software	N/A	N/A	MS RDP CALs for Remote Access		4	\$ 1,161.04
Software	N/A	Report SW	Sytech XLReporter from Rexell, Call Mana Lo		1	\$ 2,314.82
Miscellaneous Parts & Equipment	multiple	NP (All)	Electrical power cords (6' 14/3 SJT B N 5-15P TO ROI)	5160.072	15	\$ 173.50
Miscellaneous Parts & Equipment	multiple	Admin Area - Network Rack - Relay	UPS Management card contact & RS232 / Serial	Eaton Relay-MS Card	1	\$ 99.60
Miscellaneous Parts & Equipment	multiple	Network Rack Components	4U DIN Rail Rack Mount Panel	RCB1122BK15	4	\$ 864.97
Miscellaneous Parts & Equipment	multiple	Server Power Cables	TRIPP LITE 3FT COMPUTER POWER CORD 14AWG 15A 125V 5-15P TO C13 HEAVY DUTY		4	\$ 21.54
GRAND TOTAL						\$ 298,483.78