City of Fayetteville Staff Review Form

2020-0153

Legistar File ID

3/3/2020

City Council Meeting Date - Agenda Item Only
N/A for Non-Agenda Item

Tim Nyander	2/14/2020	WATER SEWER (720)
Submitted By	**Submitted Date**	**Division / Department**

Action Recommendation:

Staff recommends the approval an Out-of-Scope Letter Agreement with CH2M Hill Engineers, Inc. in an amount not to exceed $596,335.00 for Task 4 of the SCADA system upgrades for wastewater treatment facility operations, lift station operations, and water distribution system operations.

Budget Impact:

5400.720.XXXX-XXXX.00	Water and Sewer
Account Number	Fund
02017.1	Sanitary Sewer Rehabilitation
Project Number	Project Title

Budgeted Item?	Yes	Current Budget	$	4,185,548.00
		Funds Obligated	$	1,616,922.67
		Current Balance	$	2,568,625.33
Does item have a cost?	Yes	Item Cost	$	596,335.00
Budget Adjustment Attached?	No	Budget Adjustment	$	-
		Remaining Budget	$	1,972,290.33

V20180321

Purchase Order Number:

Previous Ordinance or Resolution # 226-19, 263-19

Change Order Number:

Approval Date:

Original Contract Number:

Comments:

CITY OF FAYETTEVILLE ARKANSAS

CITY COUNCIL MEMO

MEETING OF MARCH 3, 2020

TO: Mayor and City Council

THRU: Susan Norton, Chief of Staff

FROM: Tim Nyander, Utilities Director

DATE: February 14, 2020

SUBJECT: **CH2M Hill Engineers - SCADA Task 4**

RECOMMENDATION:
Staff recommends the approval an Out-of-Scope Letter Agreement with CH2M Hill Engineers, Inc. in an amount not to exceed $596,335.00 for Task 4 of the SCADA system upgrades for wastewater treatment facility operations, lift station operations, and water distribution system operations.

BACKGROUND:
City Information Technology (IT), Utilities, and CH2M/Jacobs staff have been working on the review and re-design of the City's water and wastewater SCADA system for the past 18 months. The City has placed a priority on the following areas:

- Reliability, decreased maintenance
- Resiliency in by design (power, equipment, configuration)
- Focus on change management and leverage current industry standards
- Plug and play replacements
- Focus on consistent hardware, software, and programming methodology
- Cybersecurity
- Increased mobile access for staff
- Improved reporting
- Improved automation
- Future integration with Automated Meter Infrastructure (AMI)

DISCUSSION:
City Council approved an agreement with CH2M Hill Engineers, Inc. on October 1, 2019 to develop a new SCADA design, assist with the selection of new SCADA software, and develop a comprehensive list of hardware to support the new design. The software and hardware items will be procured through various existing cooperative purchasing agreement already approved by the City Council, or through CH2M/Jacobs directly if they are able to provide the best price by leveraging their larger purchasing power. The SCADA specific software will be procured through CH2M/Jacobs due to their shared purchasing power and ability to obtain preferred pricing.

Jacobs maintains the Supervisory Control and Data Acquisition (SCADA) system for the Noland and West Side Wastewater Treatment Plants, the Biosolids Management System, Wastewater Lift Stations Water & Sewer Office, Water Pump Stations, and the Water Tanks.

The existing SCADA software and hardware presently in use is obsolete and has significant vulnerabilities, therefore a SCADA Master Plan was created to capture and order priority projects for a holistic approach to the modernization of the entire SCADA system.

In 2019, the City Council approved implementation of the following tasks for priority replacement and upgrades identified in the Master Plan:

- Task 1: SCADA System Access Point Hardening – COMPLETE – part of Jacobs O&M contract

- Task 2: SCADA Telemetry System and Plant Network Hardening –COMPLETE – part of Jacobs O&M contract

- Task 3: SCADA System Software and Hardware Upgrade Plan – COMPLETE – passed by City Council $396,718

The remaining Task 4 is for SCADA System Software and Hardware Upgrade Implementation, which includes in-lab configuration, application development and application and hardware deployment. These tasks can be completed with the following estimates for labor and expenses.

4.1: SCADA In-Lab Configuration	$110,640
4.2: SCADA Standards for Process Graphics and HMI Screens	$74,000
4.3: SCADA Application Development	$161,480
4.4: SCADA Hardware Deployment	$95,434
4.5: SCADA Application Deployment	$51,256
4.6: Project Management and Administration	$31,680
Task 4 Jacobs Labor and Expenses	$524,490
VTScada Software	$71,845
Total Task 4 Amount	**$596,335**

BUDGET/STAFF IMPACT:
Funds are available in the Sanitary Sewer Rehabilitation account within the Water and Sewer Fund.

Attachments:
Out-of-Scope Letter Agreement
Task 4 Scope of Work Details

JACOBS

9191 S. Jamaica Street
Englewood, CO 80211
ww.jacobs.com

February 13, 2020

Mr. Tim Nyander
City of Fayetteville
113 West Mountain Street
Fayetteville, AR 72701

Subject: Out-of-Scope Letter Agreement
SCADA Software Upgrade

Dear Mr. Nyander:

CH2M Hill Engineers, Inc. (CH2M HILL) will provide the following out-of-scope services/materials as an addendum to the previous out-of-scope agreement dated 9/12/2019:

What is being provided:	Refer to Exhibit A for the services to be provided in support of the SCADA Software Upgrade.
When it is being provided:	CH2M HILL will commence work within 10 working days of receiving a written notice to proceed with the project. The anticipated project duration is 8-10 months.
Price of services:	The fee is calculated based on the hourly rates, quoted equipment costs and the estimated Level of Effort (LOE) for this Scope of Services. Compensation will be on a not-to-exceed basis, and the project compensation will not exceed a value of **$596,335** without written authorization from the City of Fayetteville.
Payment terms:	Invoices shall be paid in accordance with D.2.4 of Amendment 11 to the Agreement dated December 5, 2009.

All other terms and conditions of the Agreement dated December 5, 2009 including all Amendments 1 through 11, between CH2M HILL and the City of Fayetteville remains in full force and effect.

If these terms are agreeable to you, please sign both copies of this letter. We will return one fully executed original for your files.

CH2M HILL appreciates the opportunity to provide these additional services to the City of Fayetteville.

Sincerely,

Greg Weeks

Both parties indicate their approval of the above described services by their signature below.

Authorized CH2M HILL:	Authorized City of Fayetteville:
Name: Steve Carpenter	Name:
Title: Manager of Projects	Title:
Date: 2/14/20	Date:

Exhibit A

City of Fayetteville SCADA Software Upgrade Project Plan

City of Fayetteville SCADA Software Upgrade Project Plan

1 | 3

February 12, 2020

City of Fayetteville

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
0	1/15/2020	Draft for Review	J. Atkins	E. Campos	K. Tymrak	K. Tymrak
1	1/24/2020	Draft for Review	J. Atkins	E. Campos	K. Tymrak	K. Tymrak
2	2/7/2020	Final for Approval	J. Atkins	D. Espy	K. Tymrak	K. Tymrak
3	2/12/2020	Final for Approval		J. Atkins	K. Tymrak	K. Tymrak

Distribution of copies

Revision	Issue approve	Date issued	Issued to	Comments
0		1/15/2020	K. Macedo, City of Fayetteville, AR	
1		1/24/2020	K. Macedo, City of Fayetteville, AR	Draft cost estimate included
2		2/7/2020	K. Macedo, City of Fayetteville, AR	Final for approval
3		2/12/2020	K. Macedo, City of Fayetteville, AR	Final for approval

City of Fayetteville SCADA Software Upgrade Project Plan

Project No:	659031CH
Document Title:	City of Fayetteville SCADA Software Upgrade Project Plan
Document No.:	1
Revision:	3
Date:	February 11, 2020
Client Name:	City of Fayetteville
Project Manager:	Kaitlin Tymrak
Author:	Jerry Atkins, Jr.
File Name:	FAY SCADA Software Upgrade Plan v4

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1. Executive Summary

1.1 Introduction

CH2M HILL Engineers Inc. (a wholly owned subsidiary of Jacobs) operates and maintains the wastewater treatment facilities for the City of Fayetteville, Arkansas (CITY), including the Paul R. Noland Wastewater Treatment Plant (Noland WWTP), West Side Wastewater Treatment Plant (West Side WWTP), Biosolids Management System (BMS), and Wastewater Lift Stations. Additionally, the CH2M maintains the Supervisory Control and Data Acquisition (SCADA) system for the aforementioned facilities in addition to the City Water & Sewer Office (W&S Office) and Water Pump Stations, and Water Tanks. The existing SCADA software and hardware presently in use is obsolete and has significant vulnerabilities, which could lead to extended downtimes in the event of a catastrophic failure. An evaluation of the control systems for these facilities was completed in 2019 at the request of the CITY and CH2M Fayetteville management (FAY). The evaluation was a partnership effort between the CITY and O&M staff, and included an assessment of the overall SCADA system, the interconnecting control and communication networks, the Programmable Logic Controllers (PLCs), and the Remote Terminal Units (RTUs). Instrumentation and process control were not evaluated. As a result of this evaluation, a SCADA Master Plan was created to capture and order priority projects for a holistic approach to the modernization of the entire SCADA system and related subsystems, including mitigation of cybersecurity vulnerabilities found in the control and communication networks, as well as in the SCADA software.

In 2019, a plan was presented to the City of Fayetteville that outlined the following tasks to implement the priority replacement and upgrades identified in the Master Plan:

- Task 1: SCADA System Access Point Hardening – COMPLETE
    - Work was done as a partnership between CITY and CH2M, utilizing CH2M O&M contract. The CITY purchased equipment and assisted CH2M with initial configuration. CH2M engaged subject matter experts on network security to train local CH2M O&M staff and complete network configuration
- Task 2: SCADA Telemetry System and Plant Network Hardening – In Progress – part of CH2M O&M contract
    - Work to complete hardness of wireless network is in progress, utilizing CH2M O&M contract.
- Task 3: SCADA System Software and Hardware Upgrade Plan – COMPLETE
    - Outcome of work discussed herein. This work was authorized by Resolutions 226-19 and 263-19
- Task 4: SCADA System Software and Hardware Upgrade Implementation – To be completed

This memorandum summarizes the work completed in Task 3, and outlines the work to be undertaken in Task 4.

1.2 Task 3 Outcomes

On October 17th, 2019, CH2M conducted a half-day workshop with key CITY and CH2M Fayetteville Operations Team (FAY) managers and staff to understand the needs and requirements of the SCADA system. CH2M also aimed to assist with refining the CITY's vision for the future state of the SCADA system.

Overall, the CITY requests a modernized system that is secure, user friendly, supports future expansions, and evolves to meet all current and future needs. Requirements for the immediate and future states are summarized in the following table.

Immediate Improvements	Future State
Standardized Process Graphics	Mobile Operator/Operations
Improved Process Data, Runtimes, Timestamping	More Robust Data for Advanced Analytics
Improved Historian capabilities and data tracking	Integration with third-party systems such as GIS, CMMS
Monitoring of processes currently not seen	Scheduled Task Reminders
Mobile Acknowledgement of Alarms	Note taking ability for Corrective Actions
Role-based and Priority-based Alarming	
System Redundancy	

Selecting the right software package to implement can be an arduous and extensive process. Recognizing that the selection will impact the current system, determine flexibility for future expansion, and require capital expenditure and on-going maintenance costs makes the selection an important decision. Considerations began with evaluating industry trends and comparing product features and costs between many of the major software packages. CH2M was also able to shorten the selection process by leveraging previous work done for a client with a similar size system.

As discussed in the October 17 workshop, the evaluation process included a general features questionnaire, sample system pricing, vendor demonstrations, and site visits. From the analysis, the VTScada software package performed well in each category. Coupled the results from the analysis with the requirements and vision the CITY has for the future state, CH2M recommended designing the new SCADA system around the VTScada software package. VTScada is an intuitive HMI software package that is highly scalable to a user's need, multifaceted with robust features, and is a cost-effective solution with support options ideal for a growing system. The VTScada HMI software and Nutanix HCI hardware were determined to have the functionality to meet the CITY's need for its future state SCADA system. The CITY's understanding of the software package was also benefitted by targeted visits to installation sites at Broken Arrow, OK and Wichita Falls, TX.

As part of this Task, a hardware and software purchase list was finalized (included at Attachment B). A combination of CH2M resale agreements with vendors and City contracts will be utilized to purchase the equipment, as summarized below. In December 2019, a PO was issued to CH2M to purchase the agreed-upon items (Resolution 263-19).

Equipment Item	Total	City Purchase Value	CH2M Purchase Value
Software	$145,850	$0	$145,850
Hardware – Fixed Assets	$155,834	$71,501	$84,334
Hardware – Minor Equipment	$95,034	$37,495	$57,539
Total	$396,718	$108,996	$287,722

1.3 Task 4 Scope of Work

The plan presented herein will implement VTScada HMI software on Nutanix HCI hardware in a virtualized environment. The new system will monitor and control the Paul R. Noland Wastewater Treatment Plant (Noland WWTP), West Side Wastewater Treatment Plant (West Side WWTP), Biosolids Management System (BMS), City Water & Sewer Office (W&S Office), Wastewater Lift Stations, Water Pump Stations, and Water Tanks. The remaining tasks and estimated costs are defined in the following sections.

1.3.1 Tasks Details

The following tasks have been identified to upgrade the SCADA system.

1. **Task 4.1: SCADA In-Lab Configuration:** CH2M will procure and prepare the SCADA software and hardware for use. In the CH2M Denver lab environment, CH2M will configure and test the components for base functionality.

2. **Task 4.2: SCADA Standards for Process Graphics and HMI Screens:** CH2M will develop SCADA Standards for Process Graphics and HMI screens for review and approval by CITY. Process layout will be based on the existing SCADA software while operational control will be based on functional requirements. The SCADA software will also be prepared for future enhancements.

3. **Task 4.3: SCADA Application Development:** CH2M will develop and lab-test the new SCADA application, which conform to functional requirements of CITY and the approved SCADA Standards. CH2M will develop the Process Operator-Use Training Manual upon completion of application development, for City review and acceptance.

4. **Task 4.4: SCADA Hardware Deployment:** CH2M will deploy the new hardware in the field, maintaining the current SCADA system along with the new SCADA system. This task includes field testing and acceptance.

5. **Task 4.5: SCADA Application Deployment:** CH2M will perform the installation and startup of the new SCADA application. The installation and startup at each facility will be performed sequentially, and the application will be installed in parallel to the existing system until field testing and training has completed. This task includes field testing and acceptance. After a reasonable period of time and proven confidence in the system is realized, the legacy environment will be turned off and decommissioned.

These tasks can be completed with the following estimates for labor and expenses. It should be noted that some of these tasks can be done concurrently, while others require the completion of other activities before beginning. Additional details regarding these limitations can be found later in this document.

Task 4: Cost Estimate	Hours	Cost
4.1: SCADA In-Lab Configuration	680	$ 110,640
4.2: SCADA Standards for Process Graphics and HMI Screens	480	$ 74,000
4.3: SCADA Application Development	1088	$ 161,480
4.4: SCADA Hardware Deployment	540	$ 95,434
4.5: SCADA Application Deployment	290	$ 51,256
4.6: Project Management and Administration	152	$ 31,680
Task 4 CH2M Labor and Expenses	**3230**	**$ 524,490**
VTScada Software		$ 71,845.00
Total Task 4 CH2M Value		**$ 596,335**

1.3.2 Task 3 and Task 4 Project Cost

The total upgrade/modernization costs for Task 3 and 4 projects are presented in the table below.

Tasks 3 and 4 Cost Summary	Item Cost	Notes
Task 3 (Funding Authorized)	**$ 435,578**	
CH2M Labor and Expenses (226-19)	$38,860	
Computing Hardware (263-19)	$250,868	Purchase split between CH2M and City vendor contracts (PO has been issued and equipment is being ordered)
Computing Software (263-19)	$145,850	Purchase via CH2M vendor contracts (PO has been issued and equipment is being ordered)
Task 4 (To be Authorized)	**$ 604,505**	
CH2M Labor and Expenses	$524,490	
SCADA Software	$71,845	Purchase via CH2M vendor contracts; estimated based on current proposed software architecture
SCADA Software Yearly Support Costs	$8,170	Purchase via City
Total	**$1,040,083**	
Tasks 4 CH2M Proposal Value	**$596,335**	
Task 4 City Purchased Software Support*	**$8,170**	

*Yearly support costs include technical support and software upgrades, based on 15% of the combined license components. Pricing shown above is for standard support and does not include 24/7 emergency support.

1.4 Conclusion

The Task 4 scope of work presented herein is a continuation of work already completed, as the City continues to invest in modernization of its facilities. These tasks intend to upgrade the existing SCADA software for the Paul R. Noland Wastewater Treatment Plant (Noland WWTP), West Side Wastewater Treatment Plant (West Side WWTP), Biosolids Management System (BMS), City Water & Sewer Office (W&S Office), Wastewater Lift Stations, Water Pump Stations, and Water Tanks to a new VTScada HMI system. The work specified in this plan is to be executed with minimal interruption to existing operating facilities and remote sites. The resulting new infrastructure is expected to be utilized concurrently with ongoing integration projects throughout the operating facilities and remotes sites. The new SCADA software will run in parallel to the existing software during the testing and training phases. At the conclusion of the training phase, the existing software will be removed. Upon completion of this plan, the CITY will have implemented a new SCADA software package that will fulfill immediate SCADA system needs and prepare for the future state.

2. Background

CH2M, operates and maintains the Paul R. Noland Wastewater Treatment Plant (Noland WWTP), West Side Wastewater Treatment Plant (West Side WWTP), Biosolids Management System (BMS), City Water & Sewer Office (W&S Office), Wastewater Lift Stations, Water Pump Stations, and Water Tanks for the City of Fayetteville. The existing SCADA software and hardware presently in use is obsolete and has significant vulnerabilities, which could lead to extended downtimes in the event of a catastrophic failure. An evaluation of the control systems for these facilities was completed in 2019 at the request of the CITY and CH2M Fayetteville management (FAY). The evaluation was a partnership effort between the CITY and O&M staff, and included an assessment of the overall SCADA system, the interconnecting control and communication networks, the Programmable Logic Controllers (PLCs), and the Remote Terminal Units (RTUs). Instrumentation and process control were not evaluated. As a result of this evaluation, a SCADA Master Plan was created to capture and order priority projects for a holistic approach to the modernization of the entire SCADA system and related subsystems, including mitigation of cybersecurity vulnerabilities found in the control and communication networks, as well as in the SCADA software.

The existing SCADA system utilizes an HMI software package, computing hardware, and Microsoft operating systems that are no longer commercially available nor supported. Replacing these components are an immediate need of the existing SCADA system as a catastrophic failure has the potential to adversely impact operations for an extended period. For reference, the existing SCADA software is National Instruments Lookout HMI software. The plan is to replace it with VTScada HMI software on Nutanix HCI hardware. The VTScada HMI software and Nutanix HCI hardware were selected through collaboration with the CITY. The software package was determined to have the functionality to meet the CITY's need for its future state SCADA system. The CITY's understanding of the software package was also benefitted by targeted visits to installation sites at Broken Arrow, OK and Wichita Falls, TX.

The implementation of the new software and hardware is intended to fulfill immediate, and prepare for future, SCADA system needs. The new core infrastructure will be designed to be utilized concurrently with ongoing integration projects throughout the operating facilities and remote sites. Additionally, the work specified in this plan is to be executed with minimal interruption to existing operating facilities and remote sites. The new SCADA software will run in parallel to the existing Lookout system during the testing and training phases. At the conclusion of the training phase, the existing Lookout system will be removed.

It should be noted that a preliminary review of the PLCs and RTUs was performed during the Master Plan development phase, but a comprehensive evaluation is has not yet been completed. It is anticipated that these devices, and any desired process enhancements, will be upgraded under a future project. The focus of Task 4 is to replace the existing Lookout system with a new, supportable system having the capabilities to leverage technological advancements. This plan will not address PLC or RTU concerns identified at the operating facilities and remote sites; however, through careful planning in this phase, new installations of PLCs and RTUs may only require minimal adjustment to software.

3. Task 3 Outcomes

3.1 Key Objectives Workshop and Functional Requirements

On October 17th, 2019, CH2M conducted a one half-day workshop with key CITY and FAY managers and staff to understand the needs and requirements the new SCADA software should meet for the system. During the workshop, CH2M also aimed to assist with refining the CITY's vision for the future state of the SCADA system. Overall, the workshop objectives were:

- Create Communication Cadence

- Acquire Functional Requirements
- Present Preliminary Design
- Develop Work Schedule
- Discuss Existing Concerns

The full workshop presentation and meeting notes can be found in **Appendix A. SCADA Key Objectives Workshop Presentation and Meeting Notes**.

The workshop included documenting key business objectives that were then used to provide guidance towards achieving the future state. Commonly accepted business objectives include efficiency and effectiveness of operations, product quality, service quality, risk management, regulatory /non-regulatory compliance, safeguarding assets, and reliable financial reporting. Over 100+ objectives and topics were discussed with CITY and FAY management and operations. An extended list of objectives and topics can be found in **Appendix B. SCADA Key Objectives List and Topics**. The extended list contains objectives and topics that were not discussed in detail, such as instrumentation and control improvements. Such improvements will need to be covered in a future project. The workshop focused on the topics which had immediate impact to the existing system and would prepare for the future state. During the discussion, there were recurring concerns with the existing system and visions for the future state that were conveyed. CH2M captured and categorized those concerns and visions, then separated them into requirements for immediate improvements and future state. The following table reflects those requirements.

Immediate Improvements	Future State
Standardized Process Graphics	Mobile Operator/Operations
Improved Process Data, Runtimes, Timestamping	More Robust Data for Advanced Analytics
Improved Historian capabilities and data tracking	Integration with third-party systems such as GIS, CMMS
Monitoring of processes currently not seen	Scheduled Task Reminders
Mobile Acknowledgement of Alarms	Note taking ability for Corrective Actions
Role-based and Priority-based Alarming	
System Redundancy	

The development and deployment of the new SCADA software and subsequent SCADA application will be directed to meet these requirements.

Selecting the right software package to implement can be an arduous and extensive process. Recognizing that the selection will impact the current system, determine flexibility for future expansion, and require capital expenditure and on-going maintenance costs makes the selection an important decision. Considerations began with evaluating industry trends and comparing product features and costs between many of the major software packages. CH2M was also able to shorten the selection process by leveraging previous work done for a client with a similar size system.

As discussed in the October 17 workshop, the evaluation process included a general features questionnaire, sample system pricing, vendor demonstrations, and site visits. From the analysis, the VTScada software package performed well in each category. Coupled the results from the analysis with the requirements and vision the CITY has for the future state, CH2M recommended designing the new SCADA system around the VTScada software package. VTScada is an intuitive HMI software package that is highly scalable to a user's need, multifaceted with robust features, and is a cost-effective solution with support options ideal for a growing system. The VTScada HMI software and Nutanix HCI hardware were determined to have the functionality to meet the CITY's need for its future state SCADA system. The CITY's understanding of the software package was also benefitted by targeted visits to installation sites at Broken Arrow, OK and Wichita Falls, TX.

3.2 Proposed Software Architecture

The following graphics depict the proposed architecture for the future state. In this architecture, the environment is simplified in several ways. One of those ways is by utilizing hyper-converged technology that virtualizes and consolidates hardware, software, storage and networking. This is accomplished in part by Nutanix server technology. The Nutanix server block contains 3 high performance servers inside the hardware chassis along with the necessary storage to run all the Virtual Machines or VMs that make up the SCADA stack.

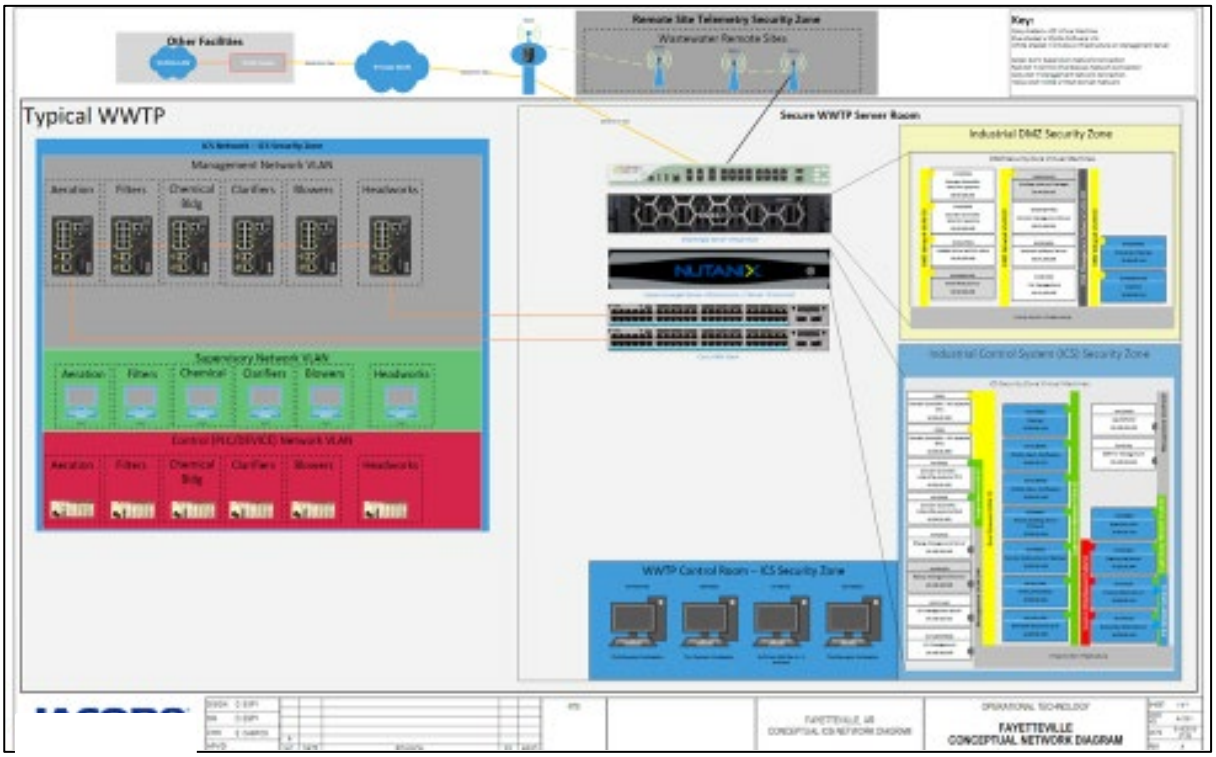
Networking between the Nutanix hyper-converged block and all other components is facilitated via a redundant 10Gbps Cisco 9300 switch stack, providing a high-speed backplane for quick IO connectivity between VMs and the rest of the SCADA network and endpoints.

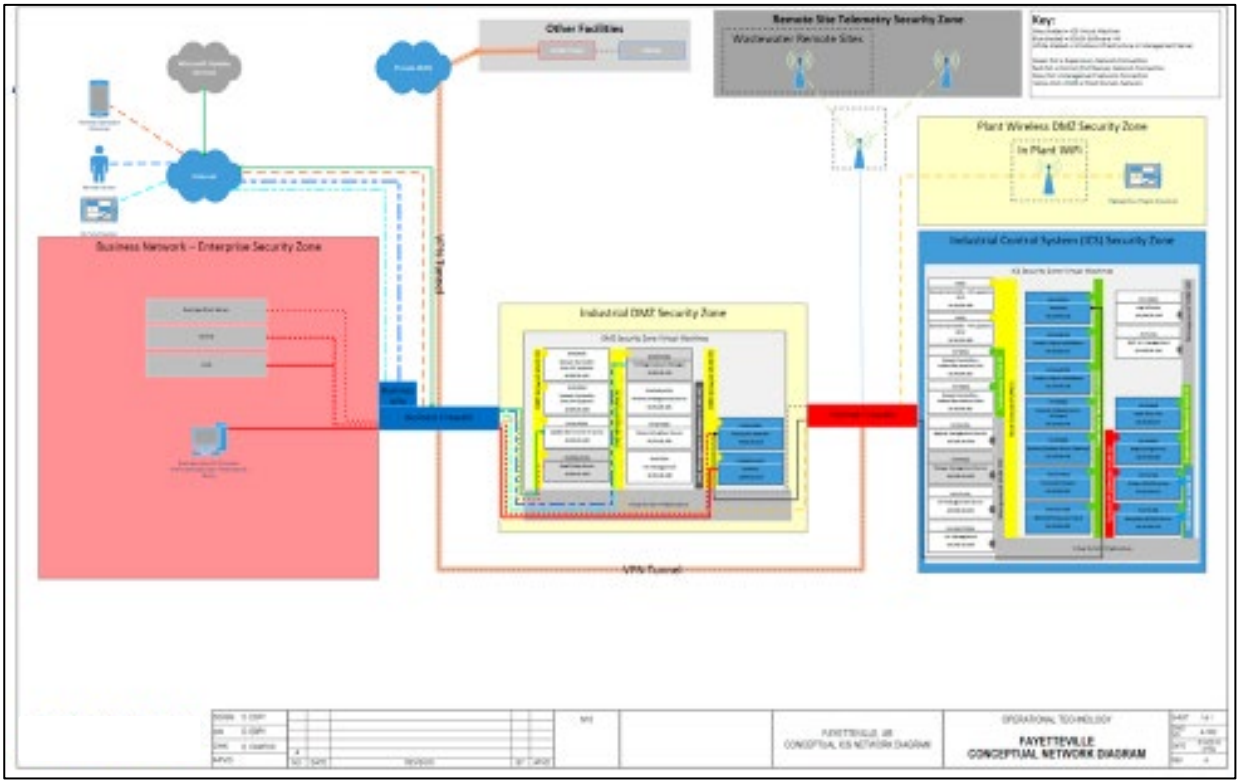
The SCADA, Business, PLC, HMI and DMZ networks are further secured using Fortinet firewalls. The firewalls inspect all traffic and through the use of policies along with IDS and IPS technology, the SCADA network is isolated and segregated from the rest of the other networks, while ensuring that any threats are automatically mitigated and handled. Based on NIST 800-82 standards, the implementation of a DMZ Security Zone, essential services that are typically accessed directly from the Internet such as Windows OS updates and patches, software antivirus definition updates, email relay services, Privilege Account Management (PAM), Enterprise Historian etc. are accessed through this zone, mitigating direct connectivity to the Internet while providing these much-needed services and functions.

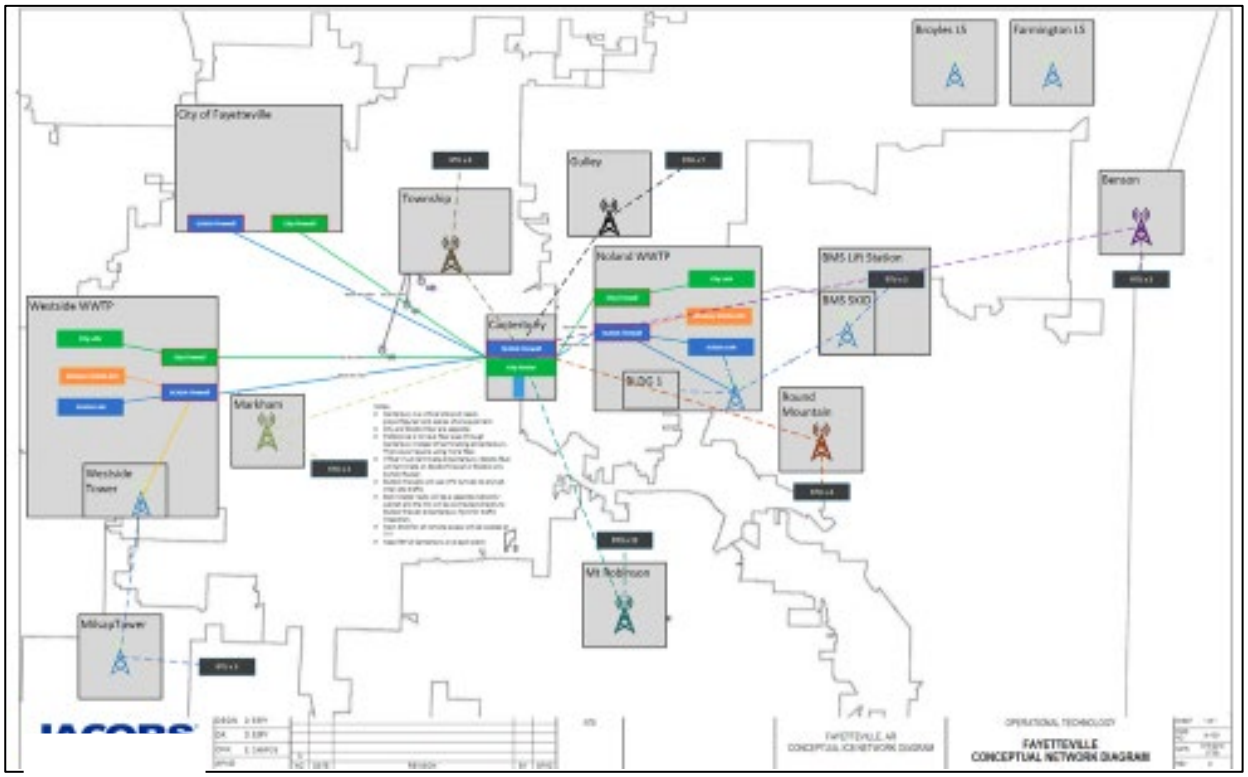
Also, radio telemetry traffic is also brought into the firewalls for full inspection. In doing so, we create a communications baseline of normal traffic and in the event of a possible attack vector through the radio infrastructure, the system would automatically handle and provide the necessary alerting.

We will also implement fiber optic connectivity to several of the sites that are currently dependent on the city-provided connectivity. Some of the sites such as Canterbury Tank are critical ones, providing communications to other sub-dependent sites and therefore requiring reliable means of communications such as what fiber optic provides.

The images below show all the components discussed above.

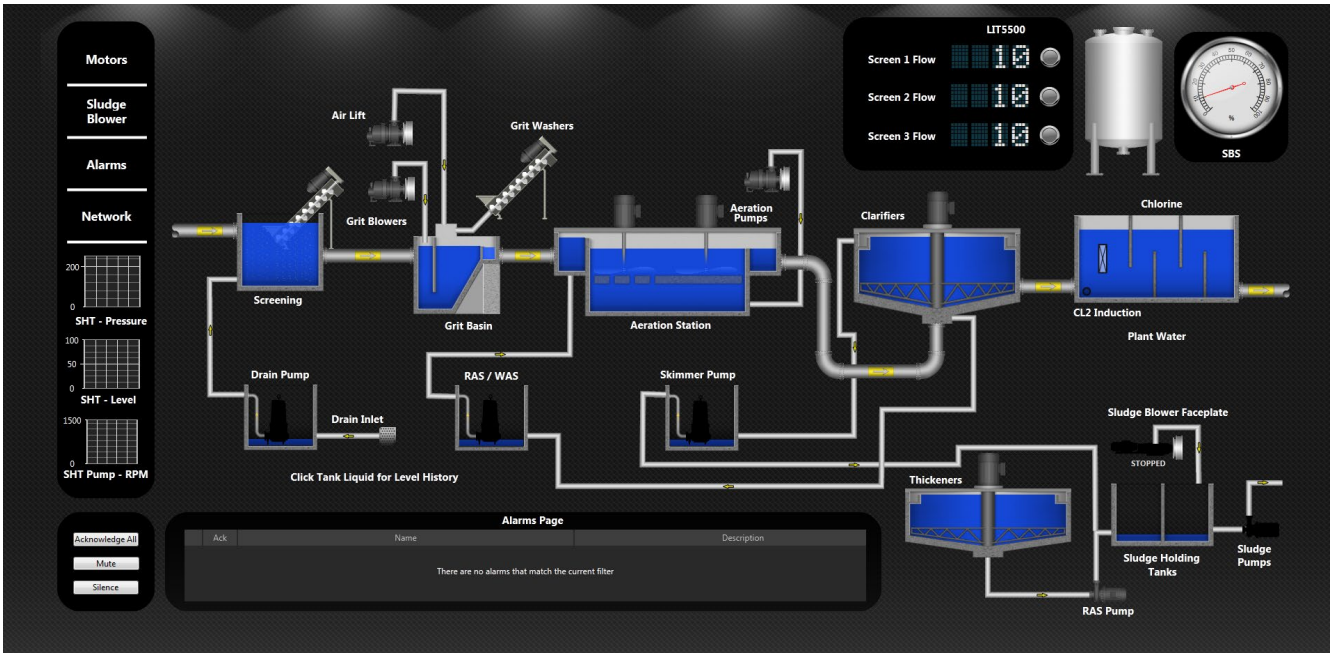

Other Facilities
Remote Site Telemetry Security Zone
Wastewater Remote Sites
Key:
Typical WWTP
Secure WWTP Server Room
Industrial DMZ Security Zone
Management Network VLAN
Aeration
Filters
Chemical Bldg
Clarifiers
Blowers
Headworks
Supervisory Network VLAN
Control (PLC/DEVICE) Network VLAN
Industrial Control System (ICS) Security Zone
WWTP Control Room – ICS Security Zone
FAYETTEVILLE, AR
CONCEPTUAL ICS NETWORK DIAGRAM
OPERATIONAL TECHNOLOGY
FAYETTEVILLE
CONCEPTUAL NETWORK DIAGRAM

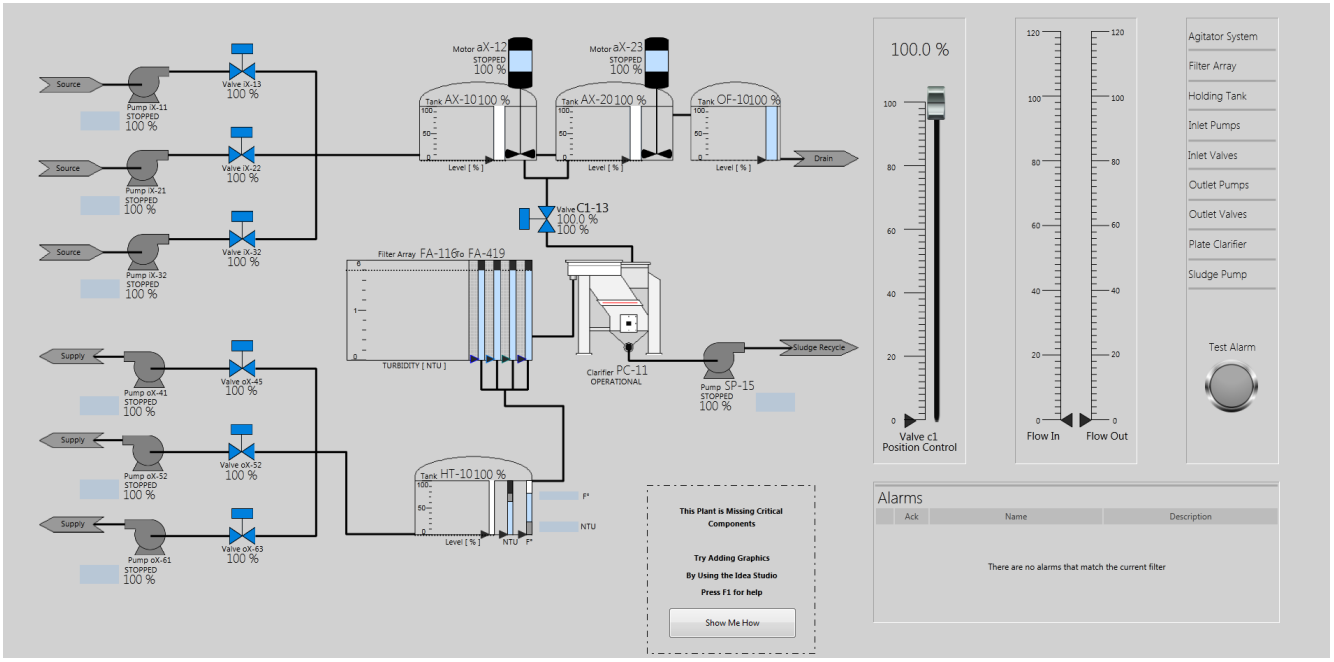

Other Facilities
Remote Site Telemetry Security Zone
Wastewater Remote Sites
Key:
Plant Wireless DMZ Security Zone
In Plant WiFi
Business Network – Enterprise Security Zone
Industrial DMZ Security Zone
Industrial Control Systems (ICS) Security Zone
VPN Tunnel
FAYETTEVILLE, AR
CONCEPTUAL ICS NETWORK DIAGRAM
OPERATIONAL TECHNOLOGY
FAYETTEVILLE
CONCEPTUAL NETWORK DIAGRAM

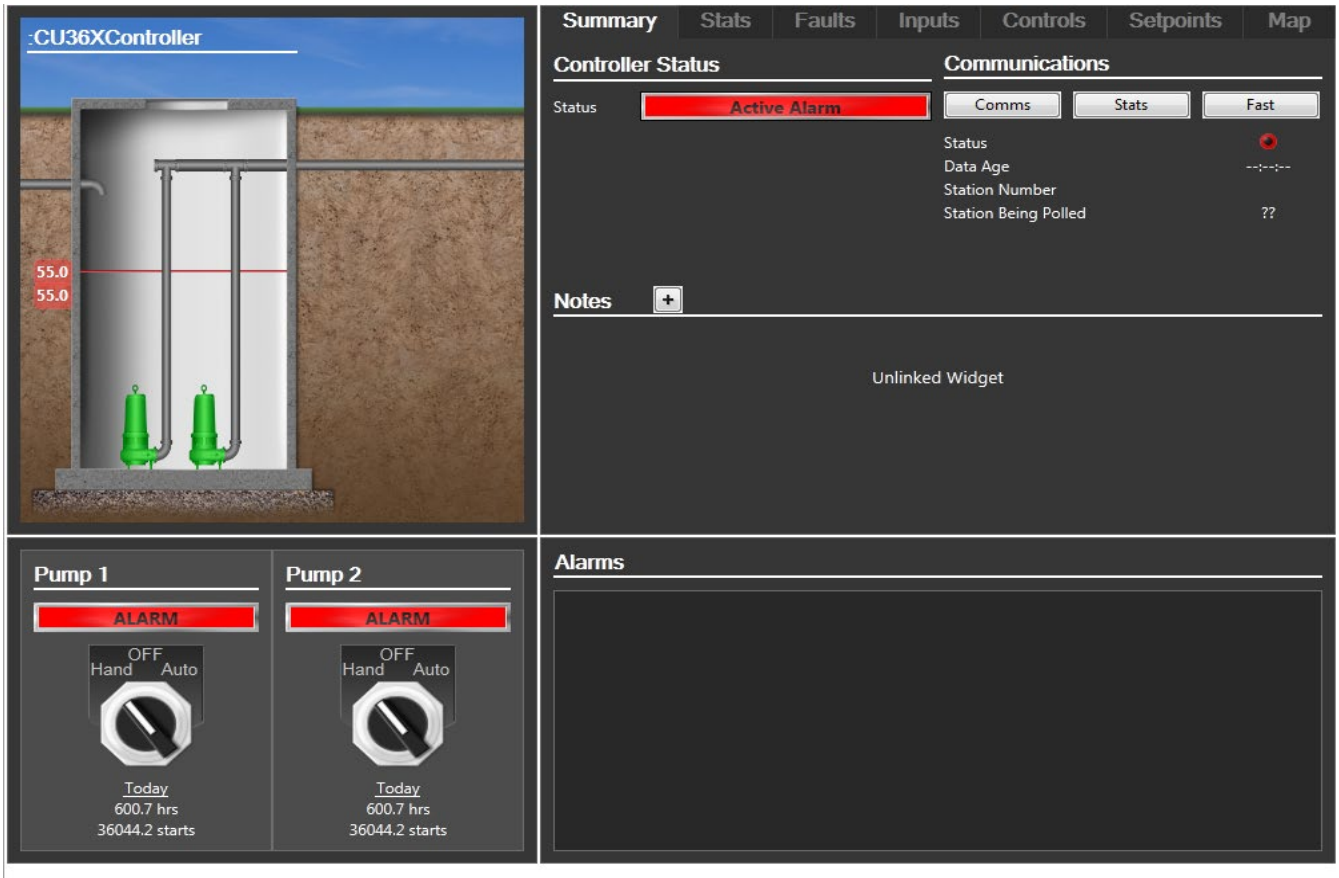


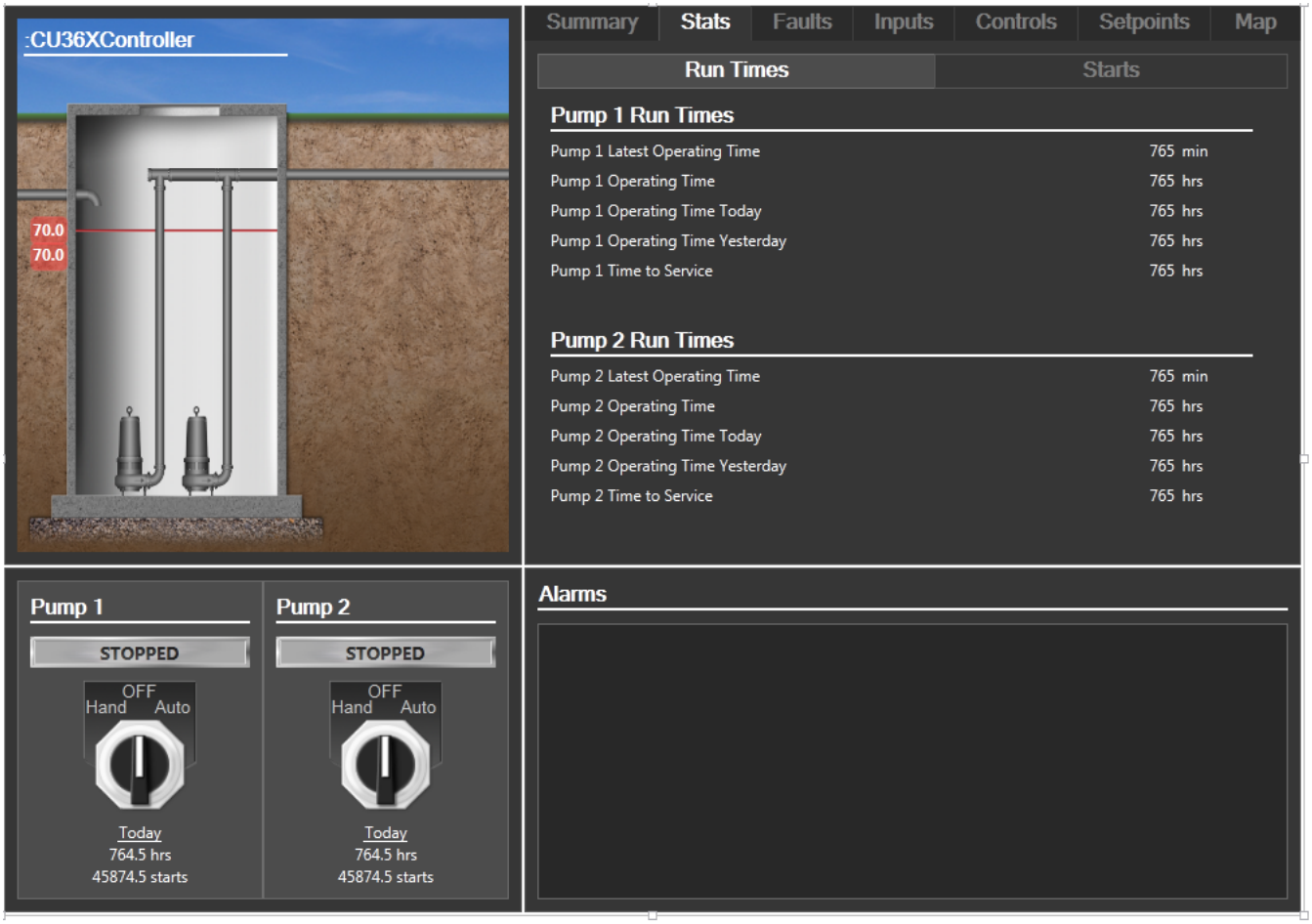
3.3 Sample HMI Screens

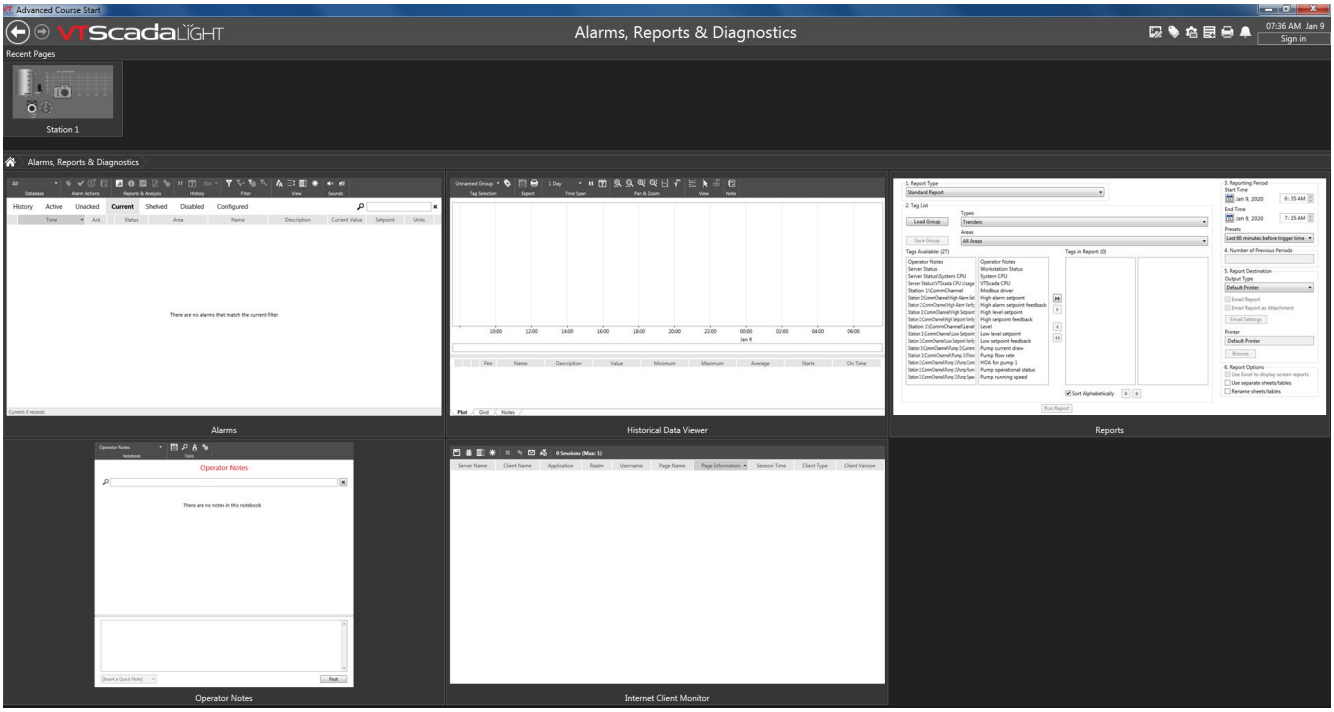
The following graphics depict typical HMI screen configurations that are available in the VTScada library. These sample screens intend to give the reader a glimpse of the available capabilities (i.e. monitoring, control, alarming, etc.) and type of information that can be displayed for a treatment process.




Source
Pump IX-11
STOPPED
100 %
Valve IX-13
100 %
Pump IX-21
STOPPED
Valve IX-22
Pump IX-32
Valve IX-32
Supply
Pump oX-41
Valve oX-45
Pump oX-52
Valve oX-52
Pump oX-61
Valve oX-63
Motor aX-12
Motor aX-23
Tank AX-10100 %
Tank AX-20100 %
Tank OF-10100 %
Level [%]
Drain
Valve C1-13
Filter Array FA-116ro FA-419
TURBIDITY [NTU]
Clarifier PC-11
OPERATIONAL
Pump SP-15
Sludge Recycle
Tank HT-10100 %
NTU
100.0 %
Valve c1
Position Control
Flow In
Flow Out
Agitator System
Filter Array
Holding Tank
Inlet Pumps
Inlet Valves
Outlet Pumps
Outlet Valves
Plate Clarifier
Sludge Pump
Test Alarm
This Plant is Missing Critical Components
Try Adding Graphics
By Using the Idea Studio
Press F1 for help
Show Me How
Alarms
Ack
Name
Description
There are no alarms that match the current filter


:CU36XController
55.0
55.0
Summary
Stats
Faults
Inputs
Controls
Setpoints
Map
Controller Status
Status
Active Alarm
Communications
Comms
Stats
Fast
Status
Data Age
Station Number
Station Being Polled
??
Notes
Unlinked Widget
Pump 1
ALARM
OFF
Hand
Auto
Today
600.7 hrs
36044.2 starts
Pump 2
ALARM
OFF
Hand
Auto
Today
600.7 hrs
36044.2 starts
Alarms


:CU36XController
70.0
70.0
Summary
Stats
Faults
Inputs
Controls
Setpoints
Map
Run Times
Starts
Pump 1 Run Times
Pump 1 Latest Operating Time 765 min
Pump 1 Operating Time 765 hrs
Pump 1 Operating Time Today 765 hrs
Pump 1 Operating Time Yesterday 765 hrs
Pump 1 Time to Service 765 hrs
Pump 2 Run Times
Pump 2 Latest Operating Time 765 min
Pump 2 Operating Time 765 hrs
Pump 2 Operating Time Today 765 hrs
Pump 2 Operating Time Yesterday 765 hrs
Pump 2 Time to Service 765 hrs
Pump 1
STOPPED
OFF
Hand
Auto
Today
764.5 hrs
45874.5 starts
Pump 2
STOPPED
OFF
Hand
Auto
Today
764.5 hrs
45874.5 starts
Alarms



3.4 Bill of Materials and Procurement Strategy

A detailed, itemized list of equipment is included in **Appendix C. Infrastructure and VTScada BOM**. The components listed will fulfill the proposed architecture and were developed through close coordination with a VTScada representative.

A combination of CH2M resale agreements with vendors and City contracts were utilized to purchase the equipment, as summarized below. In December 2019, a PO was issued to CH2M to purchase the agreed-upon items (Resolution 263-19).

Equipment Item	Total	City Purchase Value	CH2M Purchase Value
Software	$145,850	$0	$145,850
Hardware – Fixed Assets	$155,834	$71,501	$84,334
Hardware – Minor Equipment	$95,034	$37,495	$57,539
Total	$396,718	$108,996	$287,722

CH2M and the CITY have also agreed that the equipment will be initially shipped to the Denver lab for the purposes of installation and configuration of software, equipment programming and testing before being sent to the site for installation and deployment.

4. Task 4 Scope of Work Details

4.1 Task 4.1: SCADA In-Lab Configuration

The objective of this subtask will be to procure and prepare the SCADA software and hardware for use. In this task, CH2M will, in a lab environment, assemble the Nutanix HCI hardware and install the VTScada HMI software. CH2M will configure and test the system for base functionality with a testbench PLC. This task may be done concurrently with **4.2 SCADA Standards for Process Graphics and HMI Screens**.

In the lab, the tasks involved will be but not limited to the following:

- Installation and configuration of Nutanix AOS software
- Installation and configuration of VMWare ESX Server along with vCenter
- Creation and configuration of Windows 2019 Active Directory Domain and all SCADA VMs
- Creation and configuration of DMZ Read-Only domain replica and DMZ-related VMs
- Configuration and setup of all firewalls in the network including traffic policies and automation
- Configuration of GPS time synchronization servers and subsequent stratum distribution to network
- Setup and configuration of thin and thick HMI clients
- Setup and configuration of Cisco core switches and integration into the current network
- Creation of new Cisco IE 2000 running config template for current switches in order to integrate into the IP scheme and security model
- Creation of all user accounts for domain access and remote connectivity
- Setup and configuration of new mesh radios for Noland and Westside as replacement for current "canopy" wireless network
- Creation and configuration of automated backups for all critical infrastructure and VMs.
- Creation of detailed documentation for the entire new system, including all new assets, configuration files, network diagrams and Active Directory forest layout

Deliverables

1. Status update(s) on progress of all related activities.

Task Assumptions

1. All software and hardware will be installed, configured, and tested by CH2M in a lab environment.
2. Shipping of hardware to site is included.
3. One site visit (2 days) is included in this task to confirm specifications for radio replacement.

Notes

1. Purchase of SCADA software will include two (2) seats for developer training.

4.2 Task 4.2: SCADA Standards for Process Graphics and HMI Screens

The objective of this subtask will be to develop SCADA Standards for Process Graphics and HMI screens. Operational control and process layout (i.e. functional specifications) will be based on the existing Lookout system and the approved functional requirements. Advantages of the new SCADA software will be utilized where possible, but limitations may exist due to PLC and RTU programming and available data. CH2M will publish the

SCADA Standards for Process Graphics and HMI Screens and a Summary of System Control for CITY approval. This task may be done concurrently with **4.1 SCADA In-Lab Configuration**.

Deliverables

1. SCADA Standards for Process Graphics and HMI Screens and Summary of System Control

Task Assumptions

1. The next subtask will not begin until CITY approves the SCADA Standards.
2. Workshop format (no travel for remote staff) will be used to review deliverables.

4.3 Task 4.3: SCADA Application Development

The objective of this task will be to develop and lab-test the new SCADA application, which conforms to functional requirements of CITY and the SCADA Standards defined, and approved, in the previous subtask. There will be a single application with two hardware installation sites for the entire system. The SCADA application will be implemented to replace the existing Lookout system with similar screens and functionality while being prepared for future enhancements. CH2M will develop the Process Operator-Use Training Manual upon completion of application development. This task may begin upon approval of the deliverables for **4.2 SCADA Standards for Process Graphics and HMI Screens**.

Deliverables

1. New SCADA application, including two data concentrators (to be purchased as part of this task).
2. Process Operator-Use Training Manual, 1 electronic copy.

Task Assumptions

1. No control process changes will be made to PLCs or RTUs; however, minor data tables changes may be made to make data available to the new SCADA application.
2. The basic process graphics layout will be based on the existing Lookout system.
3. CH2M will develop a standard naming convention for all SCADA tags based on location, function, and device type. The City will have an opportunity to review the proposed naming conventions and approve prior to implementation.
4. Workshop format (no travel for remote staff) will be used to review deliverables.

Special Considerations

1. Advantages of the new SCADA software will be utilized where possible, but limitations will exist due to PLC and RTU programming and available data. Historian data collection will be implemented, and data points will be archived as specified by FAY personnel.

4.4 Task 4.4: SCADA Hardware Deployment

The objective of this task is to install the physical hardware at the individual facilities. During the deployment process, the current SCADA system will be maintained along with the new SCADA system.

Also, during the deployment process, the network IP scheme will be updated to better utilize layers 2 and 3 for segmentation and separation of all the networks. This will require a strategic implementation of segments being migrated in a controlled fashion, so that we can keep track of all endpoints in the system and also permit a successful migration with minimal or no down time. This task may begin upon completion of task **4.3 SCADA Application Development**.

Deliverables

1. New hardware installed onsite.

2. Process Operator-Use Training Manual, 1 electronic copy.

Task Assumptions

1. Onsite deployment will be completed in two, 1-week trips, one for each facility. A team of 3 CH2M staff will travel to the site for each week of deployment.

4.5 Task 4.5: SCADA Application Deployment

The objective of this task will be to install the new SCADA application at the two installation sites. CH2M will perform the installations and startups for each site. The installations and startups will be performed sequentially, unless other provisions are arranged, and those provisions are approved with CITY. Each application will be installed in parallel to the existing Lookout system. A Performance Acceptance Test (PAT) will be performed after each installation by validating the new SCADA application against the existing Lookout system. Site-Training will be performed concurrently with PAT. CH2M will warrant the Site-Specific SCADA applications from associated application errors for a period of one (1) year from completion of PAT. This task may begin upon completion of **4.4 SCADA Hardware Deployment**.

After a reasonable period of time and proven confidence in the system is realized, the legacy environment will be turned off and decommissioned. This is to ensure that in the highly unlikely event a major problem is encountered, normal operation of the SCADA environment will be maintained and serves as a way to make a seamless migration to the new system with no down time.

Deliverables

1. Functional, Field-Tested SCADA application.
2. PAT Documentation and Results, one (1) for each installation site.
3. Site-Training Completed Checklist for each installation site.
4. If required, an update to the Process Operator-Use Training Manual based on field changes.

Task Assumptions

1. Previous task successfully completed.
2. Installation of new SCADA applications will be sequential, unless other provisions are arranged, and those provisions are approved with CITY. Deployment will occur at one facility during one week, then the system will be allowed to operate for two weeks to identify any items requiring troubleshooting. Deployment at the second facility will occur after the first facility has been allowed to operate for two weeks, to identify any items requiring troubleshooting.
3. Data from the existing historian will be saved for future use in a hard-drive format accessible by staff. This scope of work does include import of the current historian data into the new VTScada application. Level of effort for that task may be reviewed during the application deployment and discussed with City staff at that time.
4. Demolition of Lookout system will be performed by others.

5. Task 4 Estimated Level of Effort and Schedule

CH2M developed the level-of-effort shown in Table 1 to complete the software and hardware upgrades.

For the software upgrade component, CH2M gathered information about the existing system to include, but not limited to: I/O counts, current HMI screens counts, features desired by operations, etc. The level-of-effort was developed by:

1. Analyzing the of the current Lookout system HMI application size and components
2. Evaluating the functional requirements to meet in the new application

3. Contrasting the anticipated size of the new application with a comparable project
4. Assessing the complexity of programming in the new SCADA software

SCADA Software Programming and Application Development Task Breakdown	Hours
SCADA Standards for Process Graphics and HMI Screens	
Widgets/Common Objects	160
Tag/Parameter Database	160
Navigation	8
Alarm Summary	8
Maintenance Summary	8
Communication Summary	8
Remote Status Summary	8
Security Configuration Standards	4
Alarming Configuration Standards	4
Paging Configuration Standards	4
Trending Configuration Standards	4
Historian Configuration Standards	4
Workshop and Documentation	48
Subtotal	**428**
SCADA Application Development	
Noland Process Screens	320
West Side Process Screens	320

SCADA Software Programming and Application Development Task Breakdown	Hours
BMS Process Screens	80
Remote Sites/Lift Stations Process Screens	80
Alarming and Paging Configuration	80
Historian Configuration	80
Data Concentrator	80
Workshop and Documentation	48
Subtotal	**1088**

The anticipated durations and schedule of each task are summarized below, assuming that all equipment is received in the CH2M Denver lab by the end of March 2020.

		2020 Projected Schedule										
Task	**Duration**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Task 1: In-Lab Configuration	4 months											
Task 2: Standards for Process Graphics and HMI Screens	3 months											
Task 3: Application Development	3 months											
Task 4: Hardware Deployment	1 month											
Task 5: Software Deployment	2 months											
Task 6: Project Management	10 months											

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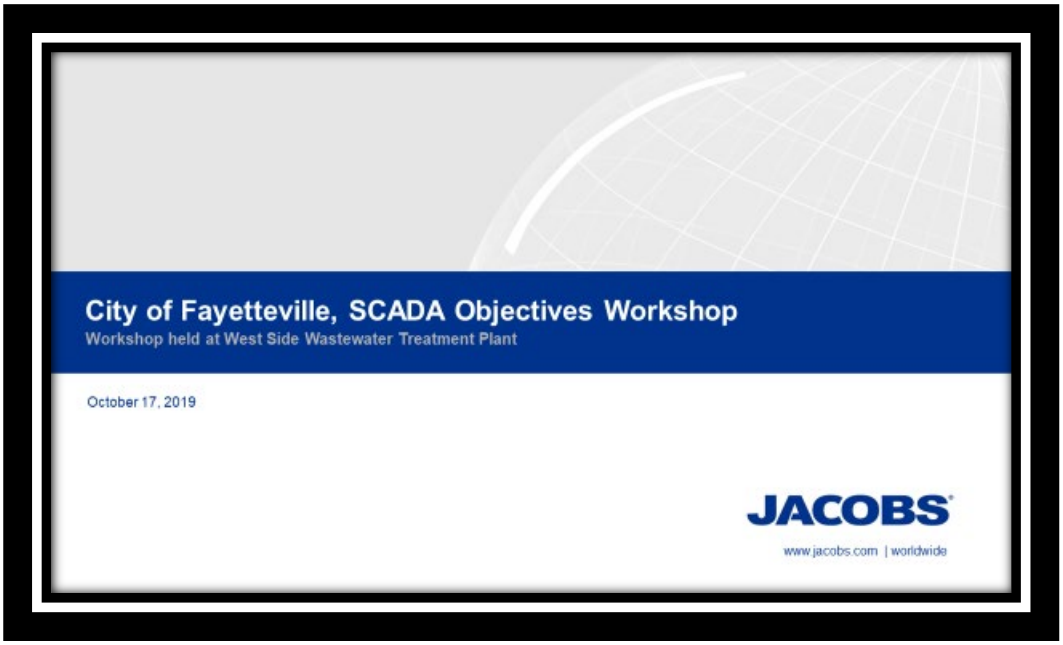
Table 1. Detailed Cost Summary

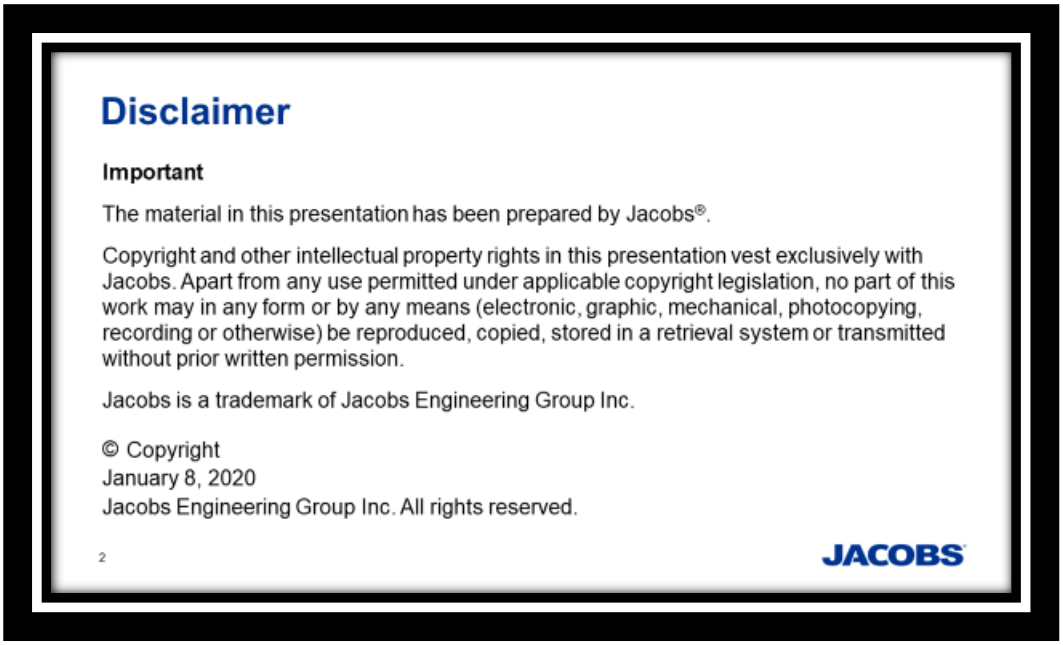
	Role		Subject Matter Expert	Software Lead	Software Professional	OT Coordinator	OT Lead	OT Professional 1	OT Professional 2	Project Manager
	Rate		$ 190	$ 160	$ 140	$ 160	$ 160	$ 140	$ 140	$ 160
	Hours By Employee		445	463	1295	122	330	270	185	160
	Cost By Employee		$ 84,550	$ 74,080	$ 181,300	$ 19,520	$ 52,800	$ 37,800	$ 25,900	$ 25,600
	Hours	Cost								
Task 1: In-Lab Configuration	**680**	**$ 110,640**	**163**	**0**	**0**	**82**	**155**	**120**	**160**	**0**
Labor - Procurement	10	$ 1,840	8			2				
Labor - lab configuration	630	$ 100,650	155			80	155	120	120	
Labor - onsite trip for radio configuration	40	$ 5,600							40	
Expenses - shipping and travel		*$ 2,550*								
Task 2: Standards for Process Graphics and HMI Screens	**480**	**$ 74,000**	**50**	**215**	**215**	**0**	**0**	**0**	**0**	**0**
Labor	480	$ 74,000	50	215	215					
Task 3: Application Development	**1088**	**$ 161,480**	**0**	**108**	**980**	**0**	**0**	**0**	**0**	**0**
Labor	1088	$ 154,480		108	980					
Expenses - Data Concentrator (2)	0	$ 7,000								
Task 4: Hardware Deployment	**540**	**$ 95,434**	**150**	**0**	**0**	**40**	**175**	**150**	**25**	**0**
Labor - Onsite Deployment	300	$ 49,000	100				100	100	0	
Labor - Preparation and Documentation	240	$ 38,400	50			40	75	50	25	
Expenses - travel		$ 8,034								
Task 5: Software Deployment	**290**	**$ 51,256**	**50**	**140**	**100**	**0**	**0**	**0**	**0**	**0**
Labor - Onsite Deployment	250	$ 39,500	50	100	100					
Labor - Documentation	40	$ 6,400		40						
Expenses - travel		$ 5,356								
Task 6: Project Management	**192**	**$ 31,680**	**32**	**0**	**0**	**0**	**0**	**0**	**0**	**160**
Labor	192	$ 31,680	32							160

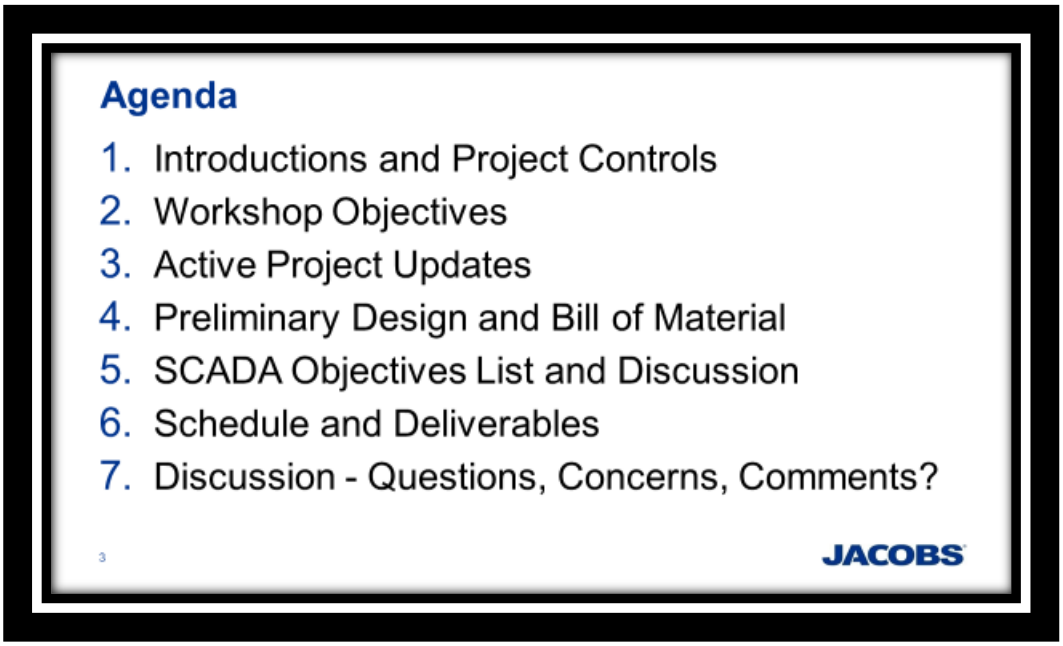
Total Jacobs Labor and Expenses	**3270**	**$**	**524,490**
VTScada Software Purchase		**$**	**71,845**
Total Jacobs Proposal Value		**$**	**596,335**

Appendix A: SCADA Key Objectives Workshop Presentation and Meeting Notes

A.1 Workshop Presentation






Agenda
1. Introductions and Project Controls
2. Workshop Objectives
3. Active Project Updates
4. Preliminary Design and Bill of Material
5. SCADA Objectives List and Discussion
6. Schedule and Deliverables
7. Discussion - Questions, Concerns, Comments?
3
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Introductions and Project Controls
• Mayo Miller – Project Manager
• Kaitlin Tymrak – Project Manager
• Edgar Campos – Design Engineer
• Jerry Atkins, Jr – Design Engineer
• Greg Weeks – Operations Manager
4
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Introductions and Project Controls
• Mayo Miller: Mayo.Miller@Jacobs.com
• Kaitlin Tymrak: Kaitlin.Tymrak@Jacobs.com
• Edgar Campos: Edgar.Campos@Jacobs.com
• Jerry Atkins, Jr: Jerry.Atkins@Jacobs.com
• Greg Weeks: Greg.Weeks@Jacobs.com
5
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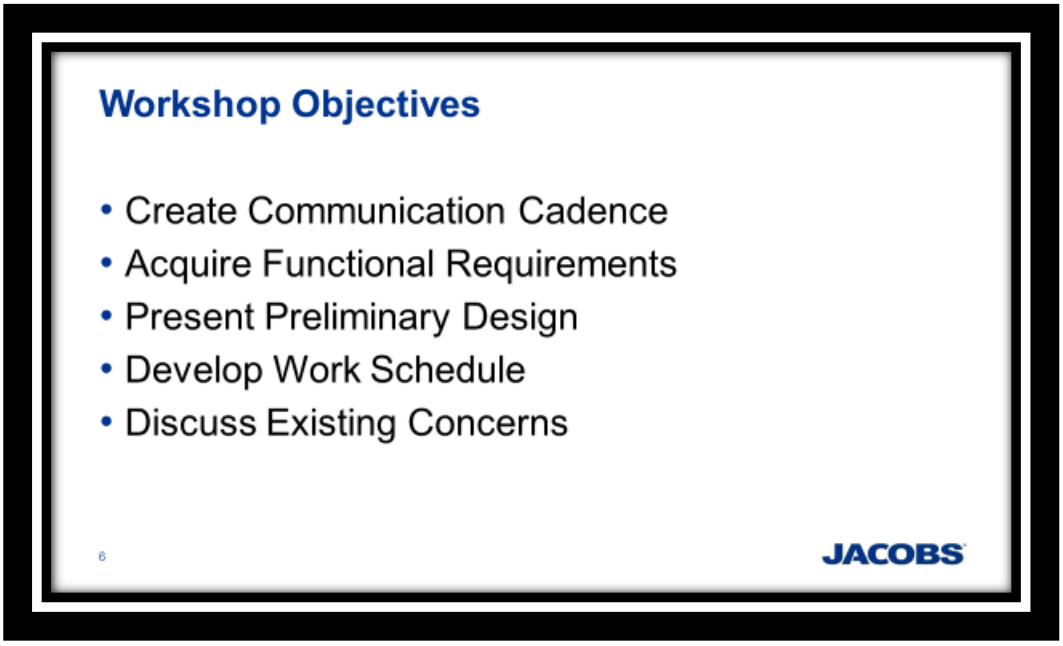
Workshop Objectives
• Create Communication Cadence
• Acquire Functional Requirements
• Present Preliminary Design
• Develop Work Schedule
• Discuss Existing Concerns
6
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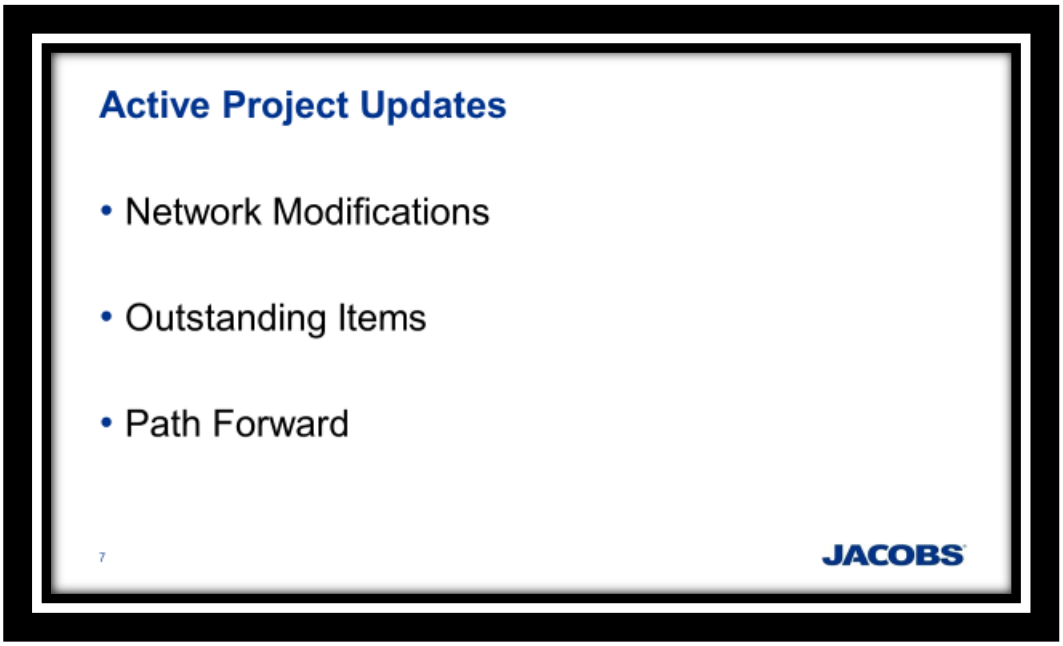
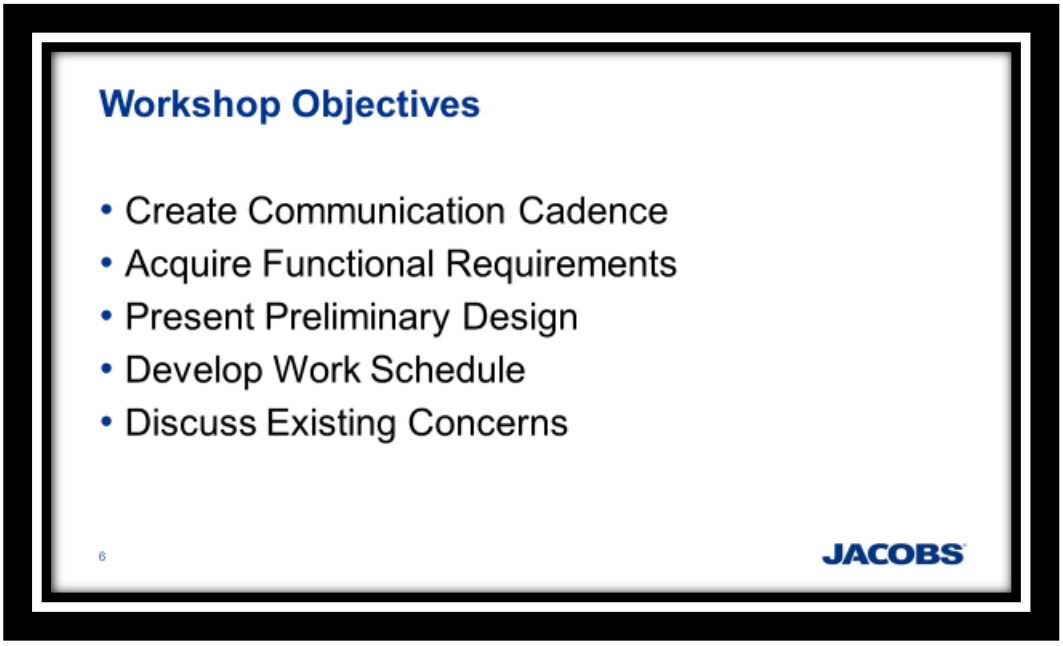
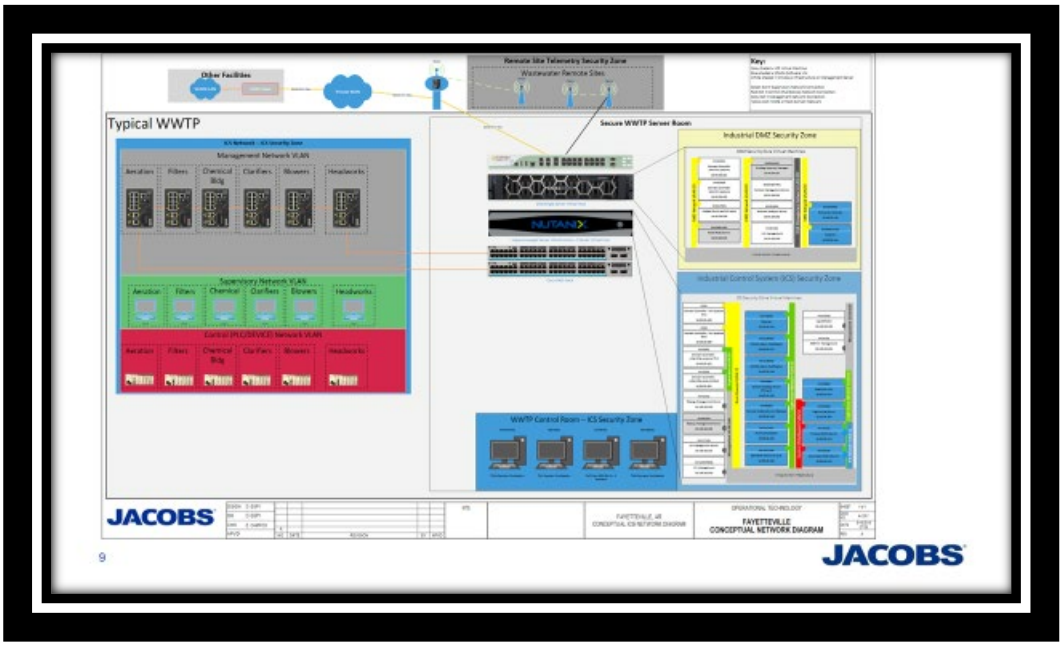
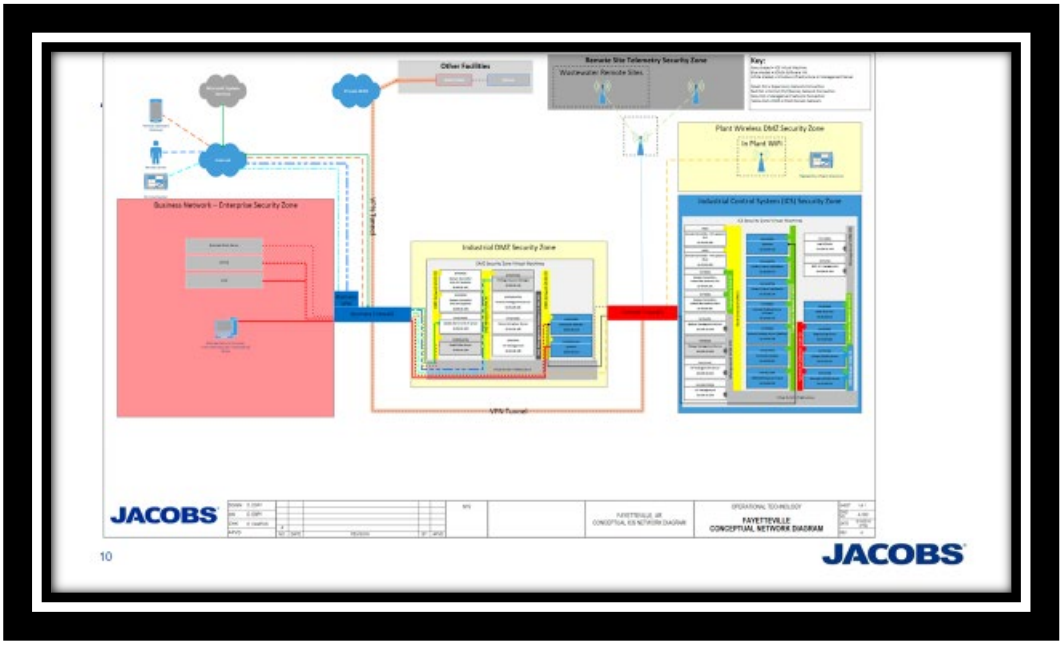
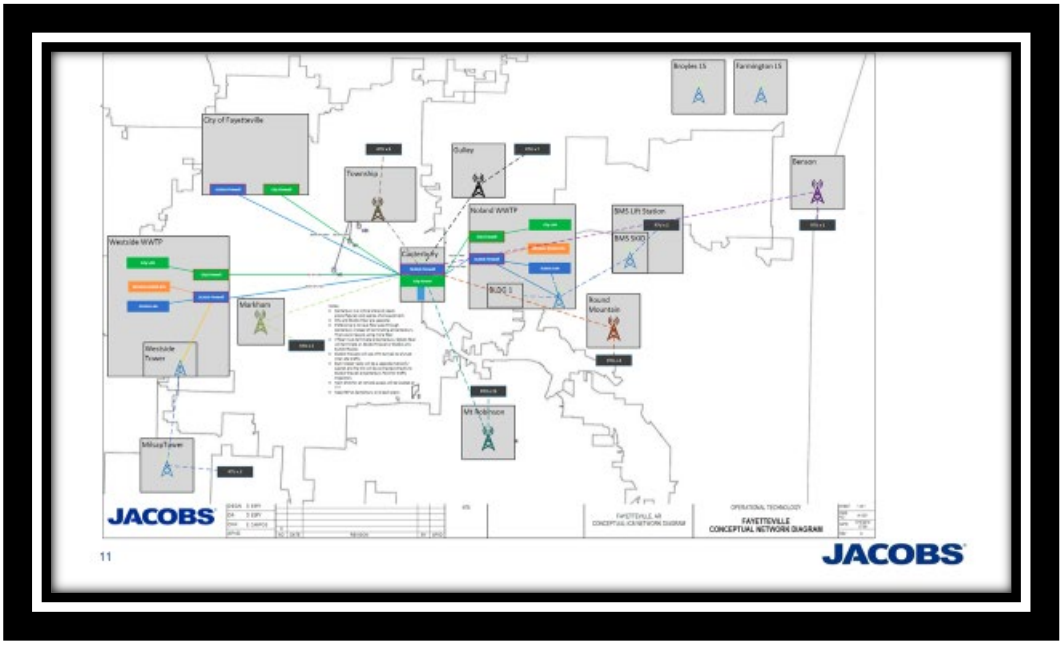

Active Project Updates
• Network Modifications
• Outstanding Items
• Path Forward
7
JACOBS


Workshop Objectives
• Create Communication Cadence
• Acquire Functional Requirements
• Present Preliminary Design
• Develop Work Schedule
• Discuss Existing Concerns
6
JACOBS


Typical WWTP
JACOBS
9
JACOBS


JACOBS
10
JACOBS



Bill of Materials

- Hardware Total Cost: $231,780
- Software Total Cost: $ 79,300

- Grand Total: $311,080

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SCADA Objectives List
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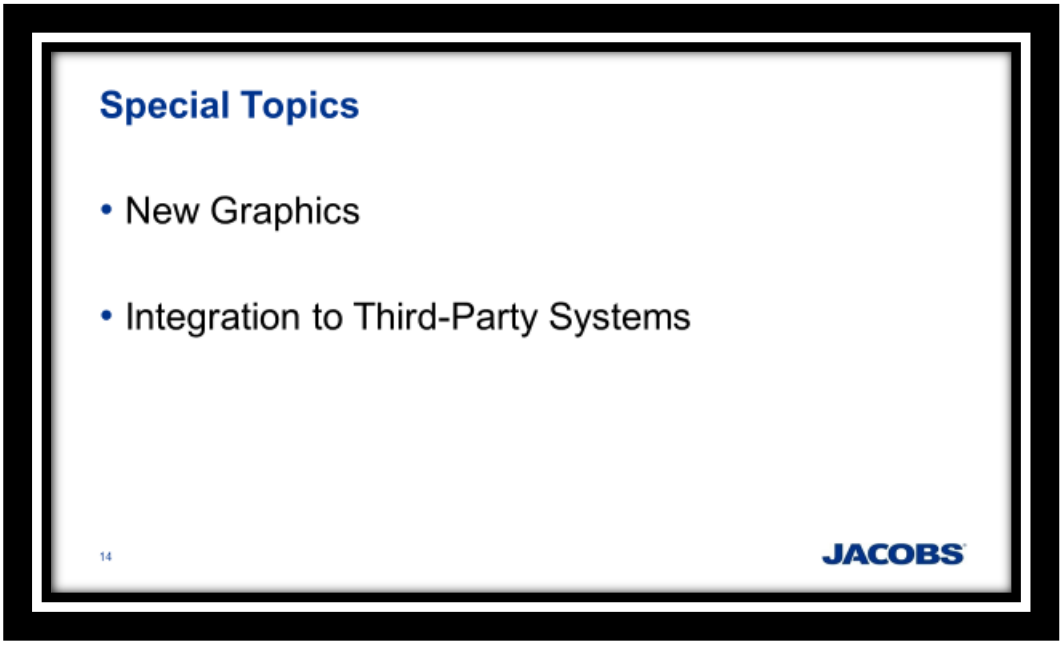
Special Topics
• New Graphics
• Integration to Third-Party Systems
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Schedule and Deliverables

Functional Requirements Workshop	October 2019
Application LOE Development	October/November 2019
Functional Requirements and Software Design TM	October/November 2019
Begin Procurement Process	November/December 2019
Begin Application Development – upon approval of TM	December/January 2020

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Discussion – Question, Concerns, Comments?

- Path Forward

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Special Discussion
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HMI Software Recommendations
The following vendors were evaluated:
• Wonderware
• RockwellPlantPAx
• VTScada
Wonderware System Platform
Rockwell Automation
PlantPAx Distributed Control System
VTScada
Software for Monitoring & Control
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HMI Hardware Evaluation Process

- The evaluation process included the following scoring parameters:
  - General features questionnaire
  - Sample system pricing
  - Vendor demonstrations
  - Site Visits
- Scoring parameters were weighted to determine the recommended SCADA program package

	Original Final Grade Weights	Revised Final Grade Weights
General Questionnaire	20%	20%
Pricing	20%	30%
Demonstration	35%	50%
Site Visit	25%	--

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HMI Analysis Results – General Questionnaire

- Grades were assigned as follows:
  - For technical features, one point was awarded for each question answered "yes". Points possible was 58 out of 100.
  - For maintenance, service, and support, each question was graded relative to the other vendors. Vendors were awarded 0 to 3 points per answer. Points possible was 42 out of 100.

	Wonderware	Rockwell	VTSCADA
Technical Features	56	49	58
Maintenance Features	36	36	36
Total Questionnaire Score (out of 100)	**92**	**85**	**94**

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HMI Analysis Results – Pricing

- SCADA vendors were given the system requirements and preliminary block diagrams to provide pricing proposal
- Pricing proposal includes the same specific requirements at two water treatment plants, two wastewater treatment plants, and one central location
- Pricing proposal includes a 10-year cost of ownership – initial software purchase and annual renewal fees for product updates and technical support
- Jacobs also asked for an annual subscription basis (only Wonderware offers this option)

	Wonderware	Rockwell	VTSCADA
Total Facilities Purchase	$230,860	$299,268	$122,820
10-Year Total Cost	$730,860	$923,560	$288,627
10-year Subscription-Based	$646,000	NA	NA
Total Pricing Score (out of 100)	**75**	**65**	**95**

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HMI Analysis Results – Demonstration

- Each demonstration attendee was asked to grade the SCADA programs
- Each feature was graded on a 1 to 5 rating (5 being the best)

	Wonderware	Rockwell	VTSCADA
Graphics – easy to understand	4.24	3.00	4.71
Reporting – features appear easy to use	3.88	3.12	4.47
Reporting – able to create custom reports	3.71	3.18	4.35
Trending – easy to use	4.29	3.35	4.71
Alarming – easy to use	4.35	3.47	4.53
Alarming – remote notification of alarms	4.00	3.29	4.41
Total Demonstration Score (out of 30)	**24.47**	**19.41**	**27.18**
Total Demonstration Score (out of 100)	**82**	**65**	**91**

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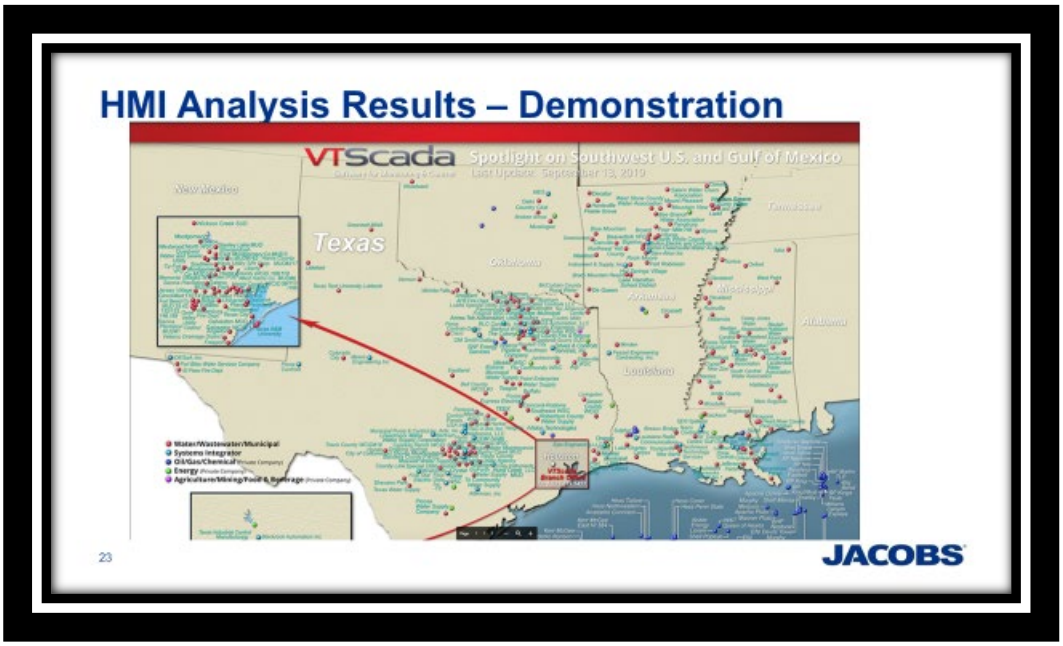
HMI Analysis Results – Demonstration
VTScada
Spotlight on Southwest U.S. and Gulf of Mexico
Texas
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A.2 Meeting Notes

Subject	**FAY SCADA Kickoff - Meeting Notes**		
Project	SCADA Software Upgrade		
Project No.	659031CH.Q10	**File**	FAY_SCADA_Kickoff_MtgNotes_20191017
Prepared by	Jerry Atkins		
Location	Water and Sewer Offices	**Date/Time**	October 17, 2019 / 1:00-4:30 pm
Participants	City of Fayetteville – Keith Macedo, Tim Nyander, Mark Rogers, Aaron Watkins, Lynn Hyke, Brad Fulmer CH2M – Jerry Atkins, Edgar Campos, Greg Weeks, Mayo Miller, Pat Cooley, Tim Luther, Thom Vinson, Matthew Benton, Kaitlin Tymrak (remote), David Espy (remote)		

Meeting Notes

Introduction

- **Culture of Caring** – Be conscious of food intake and how it affects your long term health.
- **Purpose and Objective** – SCADA Objectives Workshop: to define project controls and to present a preliminary design for the future state of the Fayetteville SCADA HMI system, to obtain functional and operational requirements of the future state SCADA HMI system , and to discuss project schedule and path forward.

Overview

A PowerPoint presentation was done by Edgar Campos and Jerry Atkins, Jr. with the following agenda.

- **Introductions and Project Controls** – introduce team and communication channels
- **Workshop Objectives** – present concepts to discuss and decisions to achieve during this workshop
- **Active Project Updates** – review the status of current projects which impact the software upgrade
- **Preliminary Design and Bill of Material** – review current drawings and hardware required to achieve desired future HMI system
- **SCADA Objectives List and Discussion** – discuss the 100+ topics from the SCADA Objectives list
- **Schedule and Deliverables** – present tentative schedule and deliverables for the project
- **Discussion – Questions, Concerns, Comments?** – wrap-up the meeting with open discussion
- **Special Discussion** – present VTScada as an alternative software package

1. *City staff as well as CH2M operators would like to add and modify several SCADA screens that currently exist in Lookout. The addition of runtimes of hardware like motors and pumps as well as modifications to other screens were noted. Paul to gather any desired changes from his perspective and his team in order to share with Jerry.*
2. *Server infrastructure BOM details: $300k is for server/networking infrastructure only and the $79k is for corresponding Windows Server, backup software, antivirus and virtualization software. This does not include SCADA software.*
3. *A comparison of SCADA software was presented which was originated from a study lead by Dave in Alabama. Rockwell is still a major and solid vendor that CH2M endorses and supports, but VTScada is a strong option for Fayetteville due to number of features, ease of implementation, simpler architecture, and very significantly cost reductions. The cost difference is so significant and the data and experience CH2M has gathered at other sites was discussed. Keith and the other city members expressed a desire to continue to explore VTScada as an alternative to the more expensive Rockwell product.*
4. *Keith indicated funding can be secured within 6 weeks of receipt of final infrastructure BOM.*

Action Items

Item		Assigned Party
1	Begin development of Task 2 Technical Memorandum	Jerry
2	Finalize hardware BOM and send to Keith	Edgar
3	Finalize software BOM and send to Keith	Edgar/Dave/VTScada rep
4	Provide example installation of VTScada	Edgar/Dave/Jerry/VTScada rep
5	Develop sample screens to include in Task 2 TM	Jerry/VTScada programmer for project
6	(FUTURE) Schedule workshop to review screens	Jerry to coordinate
7	(FUTURE) ION project example demonstration	Kaitlin to coordinate
8	(FUTURE) GIS integration presentation	Kaitlin to coordinate

Appendix B: SCADA Key Objectives List and Topics

Key Business Objectives
Supervisory Control and Data Acquisition System (SCADA) - Control Panels
Documentation is up to date
Surge Suppression is adequate
Critical devices on UPS power
Cabinets are capable of supporting future needs
Components are capable of supporting future needs
Components are standardized
Wiring is capable of supporting future needs
Wiring is standardized
Instrumentation System
Instruments operating with acceptable performance
Instrumentation calibrations performed at regular intervals to industry standards
Surge / lightning protection provided for critical Instrumentation
UPS provided for critical equipment and instruments with alarm notification
Proper grounding provided for antennas, control components, and instrumentation
Field hardware indicator lights reflect common color convention for On /OFF
Use of SMART instruments/BIG data
Network and Communications Systems
Network design capable of supporting future needs
Communication hardware is stable and reliable
Fiber
Media converters
Switches
Routers

Key Business Objectives
Communication system performance provides reliable data service (uptime)
Communication system performance provides adequate data transfer rates (Speed)
There are backup communications contingencies
Supervisory Control and Data Acquisition System (SCADA) - PLC
PLC products capable of supporting future needs
Rockwell
Misc Controllers
Outdated controllers
Design includes appropriate use of redundant PLCs
PLC Code is well documented
PLC Code is easy to troubleshoot
PLC Code is standardized
PLC configuration is standard
PLC Controllers are standardized
PLC IO modules are standardized
PLC communication modules are standardized
Control loop tuning
PLCs automatically time sync'ed
Supervisory Control and Data Acquisition System (SCADA) - HMI
Software products based on leading manufactures and latest technology product line
SCADA Software is stable and reliable
SCADA graphics are standard and documented
SCADA graphics are useful and impactful (High Performance HMI)
Alarm and events are standardized and documented
Alarm configuration includes black boarding and minimizes nuisance alarms
Control system alarming identifies hardware failures
Provide reliable and accurate data to all departments
PLC and Instrumentation hardware is stable and reliable
Hardware and software products based on leading manufactures and latest technology product line
Control system hardware designed to minimize single points of failure

Key Business Objectives
Provide a backup for PLC/HMI/Historian failure. Includes documentation of procedures and defined location of current programs
PCs automatically Time Sync'ed
Virus updates
Supervisory Control and Data Acquisition System (SCADA) - Historian and Reporting
Historical data availability
Automated reports
Data collection configuration is appropriate
Methodology for calculating reporting data is standardized and documented
Operations of Facilities
Minimize plant and system downtime
Processs Automation is appropriate and reliable
Standard control narratives for all facilities
Control narratives provide consistent operation for similar equipment (pumps, valves, motors, sequences)
Control room design is appropriate
Use of automation to provide energy efficiencies (Wire to water, $/MGD, etc)
Use of automation to provide chemical usage efficiencies ($/Mgd)
Provide key operational performance indicators to management staff
Data analysis - Pump cycling, maintenace indicators
Using data from "SMART" devices for operations and Maintenace
Standardization of Products and Systems
Tagnamming conventions are followed (Drawings, HMI, PLC, Historian, etc)
Standard testing forms or procedures are in place
Instrumentation is standardized when possible (brands, technologies, etc.)
Electrical and I&C design criteria standards are used for new design projects
VFDs and configurations are standard

Key Business Objectives
Maintenance: SCADA System, Instrumentation
Equipment maintenance information electronically available (FIM)
Documentation for all existing facilities (including P&IDs, electrical one-lines, interconnect drawings, network diagrams)
Computer Maintenance Management System (CMMS)automated
Maintenance procedures documented and followed for instrumentation and SCADA hardware
Documentation available for network and computer configurations
Documentation available for application software configuration
Centralized data repository for programs with change management
Security: Cyber and Physical
SCADA network design provides isolation from business systems (physical hardware and data separation access)
Cyber security assessment related to the SCADA system and connected network (hardwired and wireless) are performed
Network topology provides access isolation
Evaluate physical access controls including gate, building access, control rooms, cabinet doors, well houses
Software changes are logged and alerted
Disaster recovery - provide alternate site for control
Use of DMZ for isolation
Use of encryption
Technology
The use of current technologies are used when appropriate
SMART instruments and drives
integration with GIS/SAP/LIMS/Billing/Weather outside users of data
Advanced diagnostic tools, Software
Virtualization
Terminal Servers
Active Directory
Web/Mobile enabled solutions
Wireless devices
Biometric security

Appendix C: Infrastructure and VTScada BOM

Trihedral, Inc. • Millenia Lakes One • 4700 Millenia Boulevard, Suite 260 • Orlando, Florida 32839-6014 • USA
Phone: (407) 888-8203 • Fax: (407) 888-8213
http://www.trihedral.com

Quotation

Quote Number	Q17442
Terms	Net 30 Days
Date	02-06-2020
Sales Person	Alan Hudson
Valid Until	03-07-2020
Tax Info.	Tax ID# 26-0449423

Bill To

City of Fayetteville - AR
2435 Industrial Drive
Fayetteville, AR 72701
USA

Ship To

City of Fayetteville - AR
2435 Industrial Drive
Fayetteville, AR 72701
USA

City of Fayetteville, AR - Noland Plant / West Side Plant

#	Qty.	Product	Unit Price	Ext. Price
1	1	~•~VTScada 10K Dual Server Premium~•~	$ 32,295.00	$ 32,295.00
1	2	VTScada 10K - Development Runtime		
2	2	VTScada 10K - Alarm Notification		
3	1	VTScada 10K - Thin Client - Unlimited		
4	1	VTScada Training Course Credit - $1,000.00		
5	1	Bundle SupportPlus		
6	1	Bundle 24/7 Emergency Support		
7	1	Bundle Discount		

One additional course credit to be added

Proposed SupportPlus Expiry Date: One Year from Purchase Date
Bundle Value for Renewals: $32,295.00
*Future Annual SupportPlus Renewals: $4,844.25

Group Totals

Subtotal:	$ 32,295.00
Total:	$ 32,295.00

Noland Plant - DMZ

#	Qty.	Product	Unit Price	Ext. Price
1	1	VTScada 10K - Runtime - New - Includes Three Months of SupportPlus	$ 4,395.00	$ 4,395.00
2	1	VTScada 10K - 3rd Party Data Sharing - New - Includes Three Months of SupportPlus	$ 2,295.00	$ 2,295.00
3	1	SupportPlus - Additional Nine Months	$ 752.67	$ 752.67
4	1	24/7 Emergency Support	$ 334.50	$ 334.50

Proposed SupportPlus Expiry Date: One Year from Purchase Date
License Value for Renewals: $6,690.00
*Future Annual SupportPlus Renewals: $1,003.50

Group Totals

Subtotal:	$ 7,777.17
Total:	$ 7,777.17

Noland Plant - Redundant Server

#	Qty.	Product	Unit Price	Ext. Price
1	1	VTScada 10K - Runtime - New - Includes Three Months of SupportPlus	$ 4,395.00	$ 4,395.00
2	1	SupportPlus - Additional Nine Months	$ 494.46	$ 494.46
3	1	24/7 Emergency Support	$ 219.75	$ 219.75

Proposed SupportPlus Expiry Date: One Year from Purchase Date
License Value for Renewals: $4,395.00
*Future Annual SupportPlus Renewals: $659.25

Group Totals

Subtotal:	$ 5,109.21
Total:	$ 5,109.21

Operator Workstation Runtimes

#	Qty.	Product	Unit Price	Ext. Price
1	2	VTScada 10K - Runtime - New - Includes Three Months of SupportPlus	$ 4,395.00	$ 8,790.00
2	2	VTScada 10K - 3rd Party Data Sharing - New - Includes Three Months of SupportPlus	$ 2,295.00	$ 4,590.00
3	2	SupportPlus - Additional Nine Months	$ 752.67	$ 1,505.34
4	2	24/7 Emergency Support	$ 334.50	$ 669.00

Proposed SupportPlus Expiry Date: One Year from Purchase Date
License Value for Renewals: $6,690.00 (Per License)
*Future Annual SupportPlus Renewals: $1,003.50 (Per License)

Group Totals

Subtotal:	$ 15,554.34
Total:	$ 15,554.34

West Side Plant - Redundant Server

#	Qty.	Product	Unit Price	Ext. Price
1	1	VTScada 10K - Runtime - New - Includes Three Months of SupportPlus	$ 4,395.00	$ 4,395.00
2	1	SupportPlus - Additional Nine Months	$ 494.46	$ 494.46
3	1	24/7 Emergency Support	$ 219.75	$ 219.75

Proposed SupportPlus Expiry Date: One Year from Purchase Date
License Value for Renewals: $4,395.00
*Future Annual SupportPlus Renewals: $659.25

Group Totals

Subtotal:	$ 5,109.21
Total:	$ 5,109.21

Quotation Totals

Currency:	US Dollar
Subtotal:	$ 65,844.93
Total:	$ 65,844.93

Total = $66,845 with one additional course credit to be added

Notes

*Future Annual SupportPlus, which includes technical support and software upgrades, is calculated at 15% per annum of the combined license components. This rate will never increase as long as SupportPlus is maintained. This does not include 24/7 Emergency Support.

Terms and Conditions:

Terms and Conditions: VTScada is licensed exclusively in accordance with the VTScada Software License Agreement (Standard Conditions), VSLASC v6.1 - 2017-11-14, and the VTScada Software Standard Support Services Agreement (Standard Conditions), VSSSSASC v 1.2 Jan-18-16, available at https://www.trihedral.com/license-agreement.

VTScada support and upgrade pricing are in accordance with the previously accepted license agreement terms and any differing purchase order terms proposed will not be accepted without written agreement by Trihedral.

A SupportPlus renewal quote contains grandfathered pricing that is contingent upon the receipt of a purchase order before the quote expiry date (as agreed to under the VTScada license terms of the original license). Purchase orders received with an alteration of previously accepted terms, or after the quote expiry date, will require a re-quote of the renewal price at current pricing.

Quotation Accepted By

Quote Number Q17442

Print Name _____

Title _____

Signature _____

Date _____

Site	DESCRIPTION	QTY	Manufacturer	Reseller Price Ext	Type	Model	Part#	TOTAL	Vendor	Contract	TYPE OF EXPENSE
Noland	Hyper converged server	1	Nutanix	$15,577.00	Hardware	NX-1365-G7-4208-CM	NX-1365-G7-4208-CM	**$15,577.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	C-MEM-32R4-26A-CM	18	Nutanix	$0.00	Hardware	C-MEM-32R4-26A-CM	C-MEM-32R4-26A-CM	**$0.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	C-HDD-2TB-A5-A-CM	6	Nutanix	$0.00	Hardware	C-HDD-2TB-A5-A-CM	C-HDD-2TB-A5-A-CM	**$0.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	C-SSD-960GB-A5-A-CM	3	Nutanix	$0.00	Hardware	C-SSD-960GB-A5-A-CM	C-SSD-960GB-A5-A-CM	**$0.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	C-NIC-10GSFP2-A-CM	3	Nutanix	$0.00	Hardware	C-NIC-10GSFP2-A-CM	C-NIC-10GSFP2-A-CM	**$0.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	Hyper converged server 3 year hardware maintenance	3	Nutanix	$3,687.00	Hardware	S-HW-PRD-1065-G7-3YR	S-HW-PRD-1065-G6-3YR	**$3,687.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Noland	SFP network module	6	Nutanix	$132.48	Hardware	C-CBL-3M-SFP+-SFP+-CM	C-CBL-3M-SFP+-SFP+-CM	**$132.48**	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Noland	Hyper converged server 3 year software maintenance	1	Nutanix	$27,094.00	Hardware	SW-AOS-STR-PRD-3YR	SW-AOS-STR-PRD-3YR	**$27,094.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	L-CORES-STR-PRD-3YR	48	Nutanix	$0.00	Hardware	L-CORES-STR-PRD-3YR	L-CORES-STR-PRD-3YR	**$0.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	L-FLASHTIB-STR-PRD-3YR	3	Nutanix	$0.00	Hardware	L-FLASHTIB-STR-PRD-3YR	L-FLASHTIB-STR-PRD-3YR	**$0.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
Noland	Freight Charges	1	Nutanix	$550.00	Hardware	Freight	Freight	**$550.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	Hyper converged server	1	Nutanix	$15,577.00	Hardware	NX-1365-G7-4208-CM	NX-1365-G7-4208-CM	$15,577.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	C-MEM-32R4-26A-CM	18	Nutanix	$0.00	Hardware	C-MEM-32R4-26A-CM	C-MEM-32R4-26A-CM	$0.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	C-HDD-2TB-A5-A-CM	6	Nutanix	$0.00	Hardware	C-HDD-2TB-A5-A-CM	C-HDD-2TB-A5-A-CM	$0.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	C-SSD-960GB-A5-A-CM	3	Nutanix	$0.00	Hardware	C-SSD-960GB-A5-A-CM	C-SSD-960GB-A5-A-CM	$0.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	C-NIC-10GSFP2-A-CM	3	Nutanix	$0.00	Hardware	C-NIC-10GSFP2-A-CM	C-NIC-10GSFP2-A-CM	$0.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	Hyper converged server 3 year hardware maintenance	3	Nutanix	$3,687.00	Hardware	S-HW-PRD-1065-G7-3YR	S-HW-PRD-1065-G7-3YR	$3,687.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	SFP network module	6	Nutanix	$132.48	Hardware	C-CBL-3M-SFP+-SFP+-CM	C-CBL-3M-SFP+-SFP+-CM	$132.48	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	Hyper converged server 3 year software maintenance	1	Nutanix	$27,094.00	Hardware	SW-AOS-STR-PRD-3YR	SW-AOS-STR-PRD-3YR	$27,094.00	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
West Side	L-CORES-STR-PRD-3YR	48	Nutanix	$0.00	Hardware	L-CORES-STR-PRD-3YR	L-CORES-STR-PRD-3YR	$0.00	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
West Side	L-FLASHTIB-STR-PRD-3YR	3	Nutanix	$0.00	Hardware	L-FLASHTIB-STR-PRD-3YR	L-FLASHTIB-STR-PRD-3YR	$0.00	**CH2M Hill Engineers**	Jacobs/CH2M	Fixed Asset
West Side	Freight Charges	1	Nutanix	$550.00	Hardware	Freight	Freight	$550.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
for Both	Backup server with 5 year hardware maintenance	1	Dell	$14,568.50	Hardware	R730 3.2 TB HD 128GB Mem Dual Intel Xeon 10 Core Processors	(210-ACXU)	$14,568.50	**CH2M Hill Engineers**	Res#273-18 Contract: 2018011-01	Fixed Asset
DMZ	Network DMZ Switch	1	Cisco	$2,248.22	Hardware			$2,248.22	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
Spare	Firewall with 3 years support bundle	1	Fortinet	**$4,189.00**	Hardware	Fortigate 100E	FG-100E-BDL-950-36	**$4,189.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Canterbury	Firewall with 3 years support bundle	1	Fortinet	**$4,189.00**	Hardware	Fortigate 100E	FG-100E-BDL-950-36	**$4,189.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Noland	Firewall with 3 years support bundle	1	Fortinet	**$4,189.00**	Hardware	Fortigate 100E	FG-100E-BDL-950-36	**$4,189.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	Firewall with 3 years support bundle	1	Fortinet	**$4,189.00**	Hardware	Fortigate 100E	FG-100E-BDL-950-36	**$4,189.00**	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Noland	Firewall - Two Factor Authentication	1	Fortinet	$624.00	Hardware	FortiToiken for MFA	FTM-ELIC-20	$624.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	Firewall - Two Factor Authentication	1	Fortinet	$624.00	Hardware	FortiToiken for MFA	FTM-ELIC-20	$624.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Noland	Network Switch- Internet and maintenance	1	Cisco	$1,499.24	Hardware			$1,700.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
West Side	Network Switch- Internet and maintenance	1	Cisco	$1,499.24	Hardware			$1,700.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
West Side	Network Switch- Edge Business and Maintenance	1	Cisco	$1,991.96	Hardware			$3,040.89	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
West Side	Network Switch- Edge Voice and Maintenance	1	Cisco	$1,304.64	Hardware			$1,890.71	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
Noland	Network Switch- Edge Business and Maintenance	1	Cisco	$1,991.96	Hardware			$3,040.89	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
Noland	Network Switch- Edge Voice and Maintenance	1	Cisco	$1,304.64	Hardware			$1,890.71	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
Noland	Core Network Switches and maintenance	2	Cisco	$11,421.46	Hardware			$21,000.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Fixed Asset
West Side	Core Network Switches and maintenance	1	Cisco	$11,421.46	Hardware			$21,000.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Fixed Asset
Noland	Network Stacking Modules	2	Cisco	$826.50	Hardware			$1,653.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
West Side	Network Stacking Modules	2	Cisco	$826.50	Hardware			$1,653.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
West Side	Fiber Network Switch and maintenance	1	Cisco	$15,500.00	Hardware			$15,500.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Fixed Asset
West Side	Fiber network SFP modules	24	Cisco	$2,565.00	Hardware			$2,565.00	**City of Fayetteville**	Res#110-17 Contract:AR233	Minor Equipment
Noland	Network Time Server	1	TimeTools	$1,570.00	Hardware	T550-00	T550-00	$1,570.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Noland	Network Time Server Maintenance	1	TimeTools	$180.00	Hardware	SPP-GPS	SPP-GPS	$180.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	Network Time Server	1	TimeTools	$1,570.00	Hardware	T550-00	T550-00	$1,570.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
West Side	Network Time Server Maintenance	1	TimeTools	$180.00	Hardware	SPP-GPS	SPP-GPS	$180.00	**CH2M Hill Engineers**	Jacobs/CH2M	Minor Equipment
Noland	Network racks and cabinets	2	APC	**$4,366.38**	Hardware			**$4,366.38**	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
Noland	Network cable management	2	APC	$400.00	Hardware			$400.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
Noland	Rack PDU	2	APC	$800.00	Hardware			$800.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
Noland	Rack Environmental Sensors	1	APC	$750.00	Hardware			$750.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
Noland	UPS	1	APC	$7,000.00	Hardware			$7,000.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Fixed Asset
West Side	Network racks and cabinets	1	APC	**$2,183.19**	Hardware			**$2,183.19**	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
West Side	Network cable management	1	APC	$400.00	Hardware			$400.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
West Side	Rack PDU	2	APC	$800.00	Hardware			$800.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
West Side	Rack Environmental Sensors	1	APC	$750.00	Hardware			$750.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
West Side	UPS	1	APC	$7,000.00	Hardware			$7,000.00	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Fixed Asset
Both Sites	Wireless mesh radios	15	UBNT	**$1,485.00**	Hardware			**$1,485.00**	**City of Fayetteville**	Res#273-18 Contract: 2018011-01	Minor Equipment
Both Sites	Desktop computers	4	Dell	$1,244.88	Hardware	Dell Thick Clients	Dell OptiPlex 5060 Micro	**$4,979.52**	**CH2M Hill Engineers**	Res#273-18 Contract: 2018011-01	Minor Equipment
Both Sites	Desktop computer monitors	8	Dell	$12.00	Hardware	E Series Behing Monitor Mount	Dell 575-BBMK	**$96.00**	**CH2M Hill Engineers**	Res#273-18 Contract: 2018011-01	Minor Equipment
Both Sites	Thin client computers	8	Dell	$269.46	Hardware	Dell Wyse 3040 Thin Client	Dell 210-APYV	**$2,155.68**	**CH2M Hill Engineers**	Res#273-18 Contract: 2018011-01	Minor Equipment
Both Sites	This client monitors	22	Dell	$203.99	Hardware	Dell 24 Inch Monitor	Dell P2419H	**$4,487.78**	**CH2M Hill Engineers**	Res#273-18 Contract: 2018011-01	Minor Equipment
Both Sites	Cellular wireless modems (backup connectivity)	2	Sierra Wireless	$589.00	Hardware			**$1,178.00**	**City of Fayetteville**	Jacobs/CH2M	Minor Equipment
All locations	Patch Cables CAT6a			$3,000.00	Hardware			**$3,000.00**	**City of Fayetteville**	Jacobs/CH2M	Minor Equipment
Noland	Virtual Server Software	1	VMWare	$4,625.00	Software			**$4,625.00**	**CH2M Hill Engineers**	Res#213-17 Contract: ADSPO16-130651	Software
West Side	Virtual Server Software	1	VMWare	$4,625.00	Software			**$4,625.00**	**CH2M Hill Engineers**	Res#213-17 Contract: ADSPO16-130651	Software
Noland	Virtual Server Software	1	VMWare	$510.00	Software			**$510.00**	**CH2M Hill Engineers**	Res#213-17 Contract: ADSPO16-130651	Software
Noland	Backup Software	3	Veeam	$3,382.56	Software			$10,147.68	**CH2M Hill Engineers**	Res#213-17 Contract: ADSPO16-130651	Software
West Side	Backup Software	3	Veeam	$3,382.56	Software			$10,147.68	**CH2M Hill Engineers**	Res#213-17 Contract: ADSPO16-130651	Software
3 Sites	Windows Server Licenses	30	Microsoft	$25,000.00	Software			$25,000.00	**CH2M Hill Engineers**	Res#213-17 Contract: ADSPO16-130651	Software
Both Sites	Remote access software	50	BeyondTrust	$12,000.00	Software			$12,000.00	**CH2M Hill Engineers**	Jacobs/CH2M	Software
Both Sites	Network Analyzer/Cybersecurity	1	CyberX	$12,000.00	Software			$36,000.00	**CH2M Hill Engineers**	Jacobs/CH2M	Software
Both Sites	Single sign-on appliance	1	Fortinet	$1,495.00	Software			$1,495.00	**CH2M Hill Engineers**	Jacobs/CH2M	Software
Both Sites	Microsoft Office 365	1	Microsoft	$2,000.00	Software			$2,000.00	**CH2M Hill Engineers**	Jacobs/CH2M	Software
Both Sites	Disaster Recovery/Change Management software	120	MDT Software	$39,300.00	Software			$39,300.00	**CH2M Hill Engineers**	Jacobs/CH2M	Software

113 West Mountain Street
Fayetteville, AR 72701
(479) 575-8323

Resolution: 226-19

File Number: 2019-0601

CH2M HILL ENGINEERS, INC:

A RESOLUTION TO APPROVE AN OUT-OF-SCOPE AGREEMENT WITH CH2M HILL ENGINEERS, INC. IN AN AMOUNT NOT TO EXCEED $38,860.00 FOR SOFTWARE UPGRADES TO THE SCADA SYSTEM USED BY WASTEWATER TREATMENT FACILITY OPERATIONS, LIFT STATION OPERATIONS, AND WATER DISTRIBUTION SYSTEM OPERATIONS, AND TO APPROVE A BUDGET ADJUSTMENT

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FAYETTEVILLE, ARKANSAS:

Section 1: That the City Council of the City of Fayetteville, Arkansas hereby approves an out-of-scope agreement with CH2M Hill Engineers, Inc., a copy of which is attached to this Resolution, in an amount not to exceed $38,860.00 for software upgrades to the SCADA system used by the City's wastewater treatment facility operations, lift station operations and water distribution system operations.

Section 2: That the City Council of the City of Fayetteville, Arkansas hereby approves a budget adjustment, a copy of which is attached to this Resolution.

PASSED and APPROVED on 10/1/2019

Approved:

Lioneld Jordan, Mayor

Attest:

Lisa Branson, Deputy City Clerk

CITY CLERK / TREASURER
CITY OF
FAYETTEVILLE
ARKANSAS
WASHINGTON COUNTY

113 West Mountain Street
Fayetteville, AR 72701
(479) 575-8323

Resolution: 263-19

File Number: 2019-0801

SCADA HARDWARE AND SOFTWARE PURCHASES:

A RESOLUTION TO APPROVE THE PURCHASE OF SUPERVISORY CONTROL AND DATA ACQUISITION HARDWARE AND SOFTWARE FROM MULTIPLE VENDORS IN THE TOTAL AMOUNT OF $396,717.79 FOR USE BY THE WATER AND SEWER OPERATIONS DIVISION, AND TO APPROVE A PROJECT CONTINGENCY IN THE AMOUNT OF $39,672.00

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FAYETTEVILLE, ARKANSAS:

Section 1: That the City Council of the City of Fayetteville, Arkansas hereby approves the purchase of Supervisory Control and Data Acquisition (SCADA) Hardware and Software from multiple vendors in the amount of $396,717.79, as shown in the spreadsheet attached to this Resolution, for use by the Water and Sewer Operations Division, and further approves a project contingency in the amount of $39,672.00.

PASSED and APPROVED on 12/3/2019

Approved:

Lioneld Jordan, Mayor

Attest:

Kara Paxton, City Clerk Treasurer

CITY CLERK / TREASURER
CITY OF FAYETTEVILLE
ARKANSAS
WASHINGTON COUNTY

City of Fayetteville, Arkansas

113 West Mountain Street
Fayetteville, AR 72701
(479) 575-8323

Text File

File Number: 2019-0801

Agenda Date: 12/3/2019 **Version:** 1 **Status:** Passed

In Control: City Council Meeting **File Type:** Resolution

Agenda Number: A. 5

SCADA HARDWARE AND SOFTWARE PURCHASES:

A RESOLUTION TO APPROVE THE PURCHASE OF SUPERVISORY CONTROL AND DATA ACQUISITION HARDWARE AND SOFTWARE FROM MULTIPLE VENDORS IN THE TOTAL AMOUNT OF $396,717.79 FOR USE BY THE WATER AND SEWER OPERATIONS DIVISION, AND TO APPROVE A PROJECT CONTINGENCY IN THE AMOUNT OF $39,672.00

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FAYETTEVILLE, ARKANSAS:

Section 1: That the City Council of the City of Fayetteville, Arkansas hereby approves the purchase of Supervisory Control and Data Acquisition (SCADA) Hardware and Software from multiple vendors in the amount of $396,717.79, as shown in the spreadsheet attached to this Resolution, for use by the Water and Sewer Operations Division, and further approves a project contingency in the amount of $39,672.00.

City of Fayetteville Staff Review Form

City Council Meeting Date - Agenda Item Only
N/A for Non-Agenda Item

Tim Nyander	11/15/2019	WATER SEWER (720)
Submitted By	**Submitted Date**	**Division / Department**

Action Recommendation:

Staff recommends the approval of the purchase of Supervisory Control and Data Acquisition (SCADA) hardware and software from multiple vendors in the amount of $396,717.79 for water and wastewater operations, and approval a contingency in the amount of $39,672.00.

Budget Impact:

5400.720.XXXX-XXXX.00	Water and Sewer
Account Number	Fund
02017.1	Sanitary Sewer Rehabilitation
Project Number	Project Title

Budgeted Item?	Yes	Current Budget	$	5,593,747.00
		Funds Obligated	$	2,704,602.10
		Current Balance		
Does item have a cost?	Yes	Item Cost	$	436,389.79
Budget Adjustment Attached?	No	Budget Adjustment	$	-
		Remaining Budget		

V20180321

Purchase Order Number: _____ **Previous Ordinance or Resolution #** _____

Change Order Number: _____ **Approval Date:** _____

Original Contract Number: _____

Comments:

CITY OF
FAYETTEVILLE
ARKANSAS

CITY COUNCIL MEMO

MEETING OF DECEMBER 3, 2019

TO: Mayor and City Council

THRU: Don Marr, Chief of Staff
Susan Norton, Director of Communications and Marketing

FROM: Tim Nyander, Utilities Director

DATE: November 15, 2019

SUBJECT: **Purchase of Supervisory Control and Data Acquisition Hardware and Software for Water and Wastewater Operations**

RECOMMENDATION:
Staff recommends the approval of the purchase of Supervisory Control and Data Acquisition (SCADA) hardware and software from multiple vendors in the amount of $396,717.79 for water and wastewater operations, and approval a contingency in the amount of $39,672.00.

BACKGROUND:
City Information Technology (IT), Utilities, and CH2M/Jacobs staff have been working on the review and re-design of the City's water and wastewater SCADA system for the past 18 months. The City has placed a priority on the following. We have focused the review on the following areas:

- Reliability, decreased maintenance
- Resiliency in by design (power, equipment, configuration)
- Focus on change management and leverage current industry standards
- Plug and play replacements
- Focus on consistent hardware, software, and programming methodology
- Cybersecurity
- Increased mobile access for staff
- Improved reporting
- Improved automation
- Future integration with Automated Meter Infrastructure (AMI)

DISCUSSION:
City Council approved an agreement with CH2M Hill Engineers, Inc. on October 1, 2019 to develop a new SCADA design, assist with the selection of new SCADA software, and develop a comprehensive list of hardware to support the new design. City staff and CH2M held a meeting at the West Side Wastewater Treatment plant on October 17th where CH2M's national SCADA team presented their network design, software, and hardware recommendations. City staff reviewed and provided several iterations of comments that CH2M integrated into their final recommendations. Staff is requesting approval to procure all software and hardware described in CH2M's SCADA recommendations.

The software and hardware items will be procured through various existing cooperative purchasing agreement already approved by the City Council, or through CH2M/Jacobs directly if they are able to provide the best price by leveraging their larger purchasing power. The SCADA specific software will be procured through CH2M/Jacobs due to their shared purchasing power and ability to obtain preferred pricing.

BUDGET/STAFF IMPACT:
Funds are available in the Sanitary Sewer Rehabilitation account within the Water and Sewer Fund.

Attachments:
Bill of Materials for SCADA Hardware and Software Purchases

Fayetville Bill of Materials
Updated: 11-15-19

Site	DESCRIPTION	QTY	Manufacturer	TOTAL	Vendor	Contract
	HARDWARE					
Noland	Hyper converged server	1	Nutanix	$15,577.00	Jacobs/CH2M	Jacobs/CH2M
Noland	Hyper converged server 3 year hardware maintenance	3	Nutanix	$3,687.00	Jacobs/CH2M	Jacobs/CH2M
Noland	SFP network module	6	Nutanix	$132.48	Jacobs/CH2M	Jacobs/CH2M
Noland	Hyper converged server 3 year software maintenance	1	Nutanix	$27,094.00	Jacobs/CH2M	Jacobs/CH2M
Noland	Freight Charges	1	Nutanix	$550.00	Jacobs/CH2M	Jacobs/CH2M
West Side	Hyper converged server	1	Nutanix	$15,577.00	Jacobs/CH2M	Jacobs/CH2M
West Side	Hyper converged server 3 year hardware maintenance	3	Nutanix	$3,687.00	Jacobs/CH2M	Jacobs/CH2M
West Side	SFP network module	6	Nutanix	$132.48	Jacobs/CH2M	Jacobs/CH2M
West Side	Hyper converged server 3 year software maintenance	1	Nutanix	$27,094.00	Jacobs/CH2M	Jacobs/CH2M
West Side	Freight Charges	1	Nutanix	$550.00	Jacobs/CH2M	Jacobs/CH2M
for Both	Backup server with 5 year hardware maintenance	1	Dell	$14,568.50	National IPA	Res#273-18 Contract: 2018011-01
DMZ	Network DMZ Switch	1	Cisco	$2,248.22	Cisco State Contract	Res#110-17 Contract:AR233
Spare	Firewall with 3 years support bundle	1	Fortinet	$4,189.00	NETSource	Jacobs/CH2M
Canterbury	Firewall with 3 years support bundle	1	Fortinet	$4,189.00	NETSource	Jacobs/CH2M
Noland	Firewall with 3 years support bundle	1	Fortinet	$4,189.00	NETSource	Jacobs/CH2M
West Side	Firewall with 3 years support bundle	1	Fortinet	$4,189.00	NETSource	Jacobs/CH2M
Noland	Firewall - Two Factor Authentication	1	Fortinet	$624.00	NetSource	Jacobs/CH2M
West Side	Firewall - Two Factor Authentication	1	Fortinet	$624.00	NetSource	Jacobs/CH2M
Noland	Network Switch- Internet and maintenance	1	Cisco	$1,700.00	Converge One	Res#110-17 Contract:AR233
West Side	Network Switch- Internet and maintenance	1	Cisco	$1,700.00	Converge One	Res#110-17 Contract:AR233
West Side	Network Switch- Edge Business and Maintenance	1	Cisco	$3,040.89	Converge One	Res#110-17 Contract:AR233
West Side	Network Switch- Edge Voice and Maintenance	1	Cisco	$1,890.71	Converge One	Res#110-17 Contract:AR233
Noland	Network Switch- Edge Business and Maintenance	1	Cisco	$3,040.89	Converge One	Res#110-17 Contract:AR233
Noland	Network Switch- Edge Voice and Maintenance	1	Cisco	$1,890.71	Converge One	Res#110-17 Contract:AR233
Noland	Core Network Switches and maintenance	2	Cisco	$21,000.00	Converge One	Res#110-17 Contract:AR233
West Side	Core Network Switches and maintenance	1	Cisco	$21,000.00	Converge One	Res#110-17 Contract:AR233
Noland	Network Stacking Modules	2	Cisco	$1,653.00	Converge One	Res#110-17 Contract:AR233
West Side	Network Stacking Modules	2	Cisco	$1,653.00	Converge One	Res#110-17 Contract:AR233
West Side	Fiber Network Switch and maintenance	1	Cisco	$15,500.00	Converge One	Res#110-17 Contract:AR233
West Side	Fiber network SFP modules	24	Cisco	$2,565.00	Converge One	Res#110-17 Contract:AR233
Noland	Network Time Server	1	TimeTools	$1,570.00	TimeTools	Jacobs/CH2M
Noland	Network Time Server Maintenance	1	TimeTools	$180.00	TimeTools	Jacobs/CH2M
West Side	Network Time Server	1	TimeTools	$1,570.00	TimeTools	Jacobs/CH2M
West Side	Network Time Server Maintenance	1	TimeTools	$180.00	TimeTools	Jacobs/CH2M
Noland	Network racks and cabinets	2	APC	$4,366.38	CDWG	Res#273-18 Contract: 2018011-01
Noland	Network cable management	2	APC	$400.00	CDWG	Res#273-18 Contract: 2018011-01
Noland	Rack PDU	2	APC	$800.00	CDWG	Res#273-18 Contract: 2018011-01
Noland	Rack Environmental Sensors	1	APC	$750.00	CDWG	Res#273-18 Contract: 2018011-01
Noland	UPS	1	APC	$7,000.00	CDWG	Res#273-18 Contract: 2018011-01
West Side	Network racks and cabinets	1	APC	$2,183.19	CDWG	Res#273-18 Contract: 2018011-01
West Side	Network cable management	1	APC	$400.00	CDWG	Res#273-18 Contract: 2018011-01
West Side	Rack PDU	2	APC	$800.00	CDWG	Res#273-18 Contract: 2018011-01
West Side	Rack Environmental Sensors	1	APC	$750.00	CDWG	Res#273-18 Contract: 2018011-01
West Side	UPS	1	APC	$7,000.00	CDWG	Res#273-18 Contract: 2018011-01
Both Sites	Wireless mesh radios	15	UBNT	$1,485.00	CDWG	Res#273-18 Contract: 2018011-01
Both Sites	Desktop computers	4	Dell	$4,979.52	DELL	Res#273-18 Contract: 2018011-01
Both Sites	Desktop computer monitors	8	Dell	$96.00	DELL	Res#273-18 Contract: 2018011-01
Both Sites	Thin client computers	8	Dell	$2,155.68	DELL	Res#273-18 Contract: 2018011-01
Both Sites	Thin client monitors	22	Dell	$4,487.78	DELL	Res#273-18 Contract: 2018011-01
Both Sites	Cellular wireless modems (backup connectivity)	2	Sierra Wireless	$1,178.00		Jacobs/CH2M
All locations	Patch Cables CAT6a			$3,000.00		Jacobs/CH2M
	Hardware Total			$250,867.43		
	SOFTWARE					
Noland	Virtual Server Software	1	VMWare	$4,625.00	VMWare	Res#213-17 Contract: ADSPO16-130651
West Side	Virtual Server Software	1	VMWare	$4,625.00	VMWare	Res#213-17 Contract: ADSPO16-130651
Noland	Virtual Server Software	1	VMWare	$510.00	VMWare	Res#213-17 Contract: ADSPO16-130651
Noland	Backup Software	3	Veeam	$10,147.68	NetSource	Res#213-17 Contract: ADSPO16-130651
West Side	Backup Software	3	Veeam	$10,147.68	NetSource	Res#213-17 Contract: ADSPO16-130651
3 Sites	Windows Server Licenses	30	Microsoft	$25,000.00	CDW	Res#213-17 Contract: ADSPO16-130651
Both Sites	Remote access software	50	BeyondTrust	$12,000.00		Jacobs/CH2M

Both Sites	Network Analyzer/Cybersecurity	1	CyberX	$36,000.00	3 year term covers both plants, Special deal with CyberX through Jacobs	Jacobs/CH2M
Both Sites	Single sign-on appliance	1	Fortinet	$1,495.00	Converge One	Jacobs/CH2M
Both Sites	Microsoft Office 365	1	Microsoft	$2,000.00		Jacobs/CH2M
Both Sites	Disaster Recovery/Change Management software	120	MDT Software	$39,300.00		Jacobs/CH2M
	Software Total			**$145,850.36**		
	Grand Total Software and Hardware			$396,717.79		