



Issue Date: July 11, 2025 Reference/Project No.: 2016-2885-00

To: Shawn Baker Previous Issue Date:

From: Luc Blanchette

Client: Town of Ladysmith

Project Name: Arbutus Water Treatment Plant Phase 2

Subject: Ladysmith Wastewater Treatment Plant SCADA Upgrade

1 INTRODUCTION

The Town of Ladysmith (the Town) has requested that Associated Engineering (Associated) prepare recommendations for technical standards for an upcoming Request for Proposals (RFP) to upgrade the existing process control graphics at the Ladysmith Wastewater Treatment Plant (WWTP).

This memo and accompanying specifications provide an overview of the recommended scope of work and standards to deliver a new graphics system that meets the needs of the Town.

2 BACKGROUND

The Town of Ladysmith Wastewater Treatment Plant is currently using GeoSCADA graphics running on hardware that is due for an upgrade. New hardware frequently is incompatible with older software, especially operating system software. Operating system software should be kept up to date to minimize exposure to cybersecurity threats. The Town's operational personnel also are seeking additional features from their control graphics.

The Town no longer maintains a support contract for the GeoSCADA software. Upgrading the software will have significant expense, and presents an opportunity to upgrade the clarity, usability, and functionality of the graphics.

Other municipalities in the Town's area have transitioned to using VTSCADA software and have had good experiences. There are also contractors available in the area who are familiar with VTSCADA software, making finding support easier than for GeoSCADA. For these reasons the Town has requested that Associated write this memo and specifications with the understanding that the new graphics will be using VTSCADA software.

The Town has indicated that they have purchased one physical server computer with the intention of installing multiple Virtual Machines (VMs) on it to run the VTSCADA software. The Town has existing virtual machine licensing, using Scale Computing's hypervisor system, and the new installation will take advantage of the higher availability provided by virtual machines.

3 DESIGN CONSIDERATIONS

The existing GeoSCADA software has experienced issues interfacing with the software alarm dialing system, Win-911. The existing software alarm dialing system is also not natively compatible with VTSCADA software, which offers its own integral alarm dialing system. It is technically possible to continue using Win-911 with VTSCADA, but an additional software layer is required to make it work. The existing software has already exhibited communication issues, and The Town have expressed interest to find a different solution.

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There are two major architectures for alarm annunciation systems: hardware-based dialers and software-based dialers.

VTSCADA software has an integral software-based alarm dialing system, which can use SMS messaging, landline telephone calls, and Voice over IP (VoIP) telephone calls to annunciate alarms.

Barnett Engineering is a commonly used Canadian manufacturer of hardware alarm dialers. They have an extensive install base throughout western Canada.

3.1 Software-Based Alarm Callouts

To issue SMS messages, VTSCADA only supports USB SMS modems. USB devices are not easily shared between multiple VMs. Therefore, for a redundant pair of VTSCADA servers to both be able to annunciate alarms via SMS, two modems, each with a dedicated SIM card and SMS plan would be required. For cost-savings, one can be enrolled with an unlimited texting plan while the “standby” SIM card needs only to have a pay-as-you-go SMS plan. Because two SIMs are required, this presents an opportunity to procure one SMS from each of two mobility providers to allow for continued operation should one network be unavailable.

VTSCADA can make landline telephone calls using a hardware voice modem, a Grandstream HT813. This ethernet-connected device which connects to a copper telephone line can be contacted by either server to make telephone calls.

VTSCADA can make VoIP telephone calls to annunciate alarms. VoIP alarm annunciation requires a reliable internet connection and a service that provides clear audio. VTSCADA explicitly lists the Twilio VoIP provider, which is also capable of issuing SMS messages via IP. Troubleshooting VoIP telephony can be more difficult than troubleshooting landline telephony, since the conversion from data to audio over copper telephone lines occurs in a third-party off-premises system. However, given that VTSCADA explicitly lists Twilio as a supported provider, they will be more likely to have a collaborative approach to troubleshooting. As with all such services, an ongoing fee is required to maintain a Twilio account.

VTSCADA can also issue alarm emails. This can be sent to an email-to-SMS service to generate text messages. This avenue of communication depends on a reliable internet connection, and a reliable third-party SMS service. Troubleshooting may be more difficult in this case, as a third-party off-premises system is required for the functionality.

3.2 Hardware-Based Alarm Callouts

A hardware alarm dialer may alternatively be installed to annunciate alarms. This would be installed in a controller cabinet and connected to the plant network. To enable a hardware alarm dialer, PLC programming is required: the PLC sends alarm messages to the alarm dialer.

A Barnett Engineering ProTalk Link is a modular hardware alarm dialer from a Canadian manufacturer that works well for this application. This can be outfitted for network communications, cellular communications, and landline communications all in one device.



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3.3 Alarm recommendations

To allow for operational flexibility, ease of acknowledgement, and ease of receiving alarms even in places of limited cellular reception, Associated recommends making SMS messaging the default method of annunciating alarms. It is Associated's understanding that because of the poor cellular reception available in the LWWTP, the Town would prefer to use VoIP Messaging as the default.

Because the VTSCADA alarm system allows viewing and acknowledging of alarms seamlessly integrated with the graphical user interface, Associated recommends taking advantage of this system. The VoIP system allows both voice and SMS messages to be sent using the Twilio VoIP service.

To provide additional redundancy should the SCADA servers fail, Associated recommends adding a hardware alarm dialer. Because VoIP over internet is the default method, Associated recommends using landline connectivity to issue telephone calls over the analog telephone line. Since the Town already maintains a landline telephone number for alarm dialing, this is how we have written these documents.

When developing the graphics, it is important to ensure that the users of the system have a chance to shape its development. For this reason, Associated recommends the contractor who develops the graphics first meet with operations to determine goals and objectives, then prepare design guidelines that will guide the development of the overall graphics system. The Town should have an opportunity to review these guidelines to ensure they will meet their needs before programming begins in earnest.

When implementing the graphics, it is important to ensure that the functionality has been tested. Testing user interactions with the control system requires interfacing with real equipment, so a testing plan should be developed to ensure that potential consequences have been identified, equipment that needs to be provided is available, and any process consequences are identified.

A sample HMI Programming Standards document has been enclosed as Appendix A to provide an example of an HMI programming standards document and to be used for discussion at the graphical requirements meeting.

4 SCOPE OF WORK

1. Graphics Upgrades:

- Configure two new owner-supplied Graphics Servers for running, developing/configuring, and serving WWTP Human-Machine Interface (HMI) graphics.
- Arrange, attend, and chair a virtual meeting to guide graphical requirements and standards.
- Develop new Graphical Design Guidelines including Alarm Philosophy to guide graphics development for replacement of WWTP HMI Graphics.
- Arrange, attend, and chair a half-day workshop with Owner and Operations representatives to review Graphical Design Guidelines.

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- Develop new graphics using new graphical software to interface with WWTP Process Control System in accordance with Graphical Design Guidelines.
- Install and configure graphical software including graphics developed for interfacing with WWTP Process Control System.
- Configure existing thin clients to access new Graphics Servers.
- Develop Site Acceptance Testing (SAT) plan and submit for review.
- Using reviewed SAT plan, commission the new graphics, testing all functionality and place into service for burn-in period.
 - Coordinate with operations personal as required.
- Turn over system to Owner.

2. Alarming Upgrades:

- Supply, install, and configure new hardware landline alarm dialer.
- Configure plant controller to annunciate alarms using hardware alarm dialer only if software has failed.
- Configure new graphics software to annunciate alarms in accordance with Alarm Philosophy.
- Commission the new alarming systems, testing all alarms, and place into service for burn-in period.
- Turn over system to Owner.

5 DETAILS

For recommended details to implement the systems, please see the specifications in Appendix B. These specifications have been organized according to MasterFormat:

- 40 62 00, Computer System Hardware and Ancillaries, including configuration of servers;
- 40 68 00, Process Control Software, including the development of graphics guidelines, installation and configuration of VTSCADA and the installation and configuration of the hardware alarm dialer configuration software;
- 40 78 63, Alarm Dialers, including the supply, installation, and configuration of the hardware analog telephone alarm dialer
- 40 80 00, Commissioning of Process Systems, discussing the testing of the new graphics software and alarm dialing systems.



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6 CLOSURE

These documents were prepared for the Town of Ladysmith as guiding documents to be included in a Request for Proposals for the upgrades to the existing Ladysmith Wastewater Treatment Plant SCADA systems including alarm annunciation and graphics.

The services provided by Associated Engineering (B.C.) Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

Associated Engineering (B.C.) Ltd.
Engineers & Geoscientists BC Permit Number 1000163

Prepared by:

Luc Blanchette, P.Eng.
Electrical Engineer

Derek Desaulniers, P.Eng.
Senior Electrical Engineer

A handwritten signature in blue ink, appearing to read 'Keith Kohut', written over a horizontal line.

Keith Kohut, M.A.Sc., P.Eng.
Project Engineer

LB/CB/KK/nhd

Enclosure:

- Appendix A – Recommended HMI Programming Standards
- Appendix B – Recommended Technical Specifications



**Associated
Engineering**

*GLOBAL PERSPECTIVE.
LOCAL FOCUS.*

TECHNICAL MEMORANDUM

APPENDIX A – RECOMMENDED HMI PROGRAMMING STANDARDS

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1 HMI Programming Standards

1.1 OVERVIEW

This document outlines the general requirements for HMI programming, both panel and computer based. All functionality described is mandatory and will be tested during the Factory Acceptance Testing, Site Acceptance Testing or Commissioning stages of the project, as required. All functionality described within the document must be present during these tests, failure to produce sufficient evidence of the described functionality will result in failure of the testing procedure.

The intent of the HMI screens is to give an overall means of controlling a process or facility from a graphical interface, this document outlines the requirements for developing suitable HMI graphics and must be followed accordingly. All HMI's (current and future) will use the same graphical screens, including but not limited to the following:

- Log-in/Security:** The operator must login successfully before accessing the system, this function is provided by the Login screen. Each operator must have a unique login and password, common logins and passwords are to be discouraged.
- Navigation Menus:** A main menu at the top of the screen gives access to important system functions such as the Alarm Summary, Alarm History, Real/Historical Trends, Reports, PLC/HMI Tools, Setpoints and other applicable systems like Power Monitoring and Security. The menu also includes a status bar to indicate the status of important process information, the current user logged in and the date and time. A second menu gives access to the different process sections. Both menus are visible from most other screens, where not available, a button is required to return the user to the overview/summary page or the previous screen.
- Overview/Summary:** The main overview screen displays all critical plant data and gives an overall graphical representation of the facility, including all major components. In larger facilities, summary screens are required to display all critical data for a specific process area which otherwise would not fit on a single overview screen.
- Process Screens:** Individual process screens are required for each applicable process section and should be separated out similar to the Process & Instrumentation Drawings applicable to the project. The process screens should flow in a logical manor and have clickable arrows on each end of the piping graphic linking the previous/next process section. Each graphic shall be suitably laid out such that it occupies a majority of the screen and is easy to read. All process piping is to be animated based on applicable pump and valve status feedbacks. Line sizes shall vary based on major and minor process lines; major lines being thicker than small lines.
- Historical Trending:** A separate screen is required for historical trending and should be located on the HMI screens. This is an analysing tool for the operator allowing the display of

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multiple analog points at a time. The display is configurable for zoom, scrolling, and quick selection of groups for trend points. This trending is an event driven logger using deadbands suitable for the process application. Data retention shall be for a minimum of 400 days. Preconfigured data grouping buttons shall be provided to allow for fast switching of trend data. If trend groups are not defined in the detailed control document, group trends by measurement type: e.g., levels, pressures, flowrates etc.

- Real Time Trending:** This screen is used to display multiple real time trending of process values and is accessed via the main navigation bar. Real time trending is a time -based graph usually on a 12- or 24-hour period that is not recorded. This is typically a high resolution display of the process data as they are not deadband filtered for tag data. If trend groups are not defined in the detailed control document, group trends by measurement: e.g., levels, pressures, flowrates etc. The trend scales must automatically adjust to the maximum device range of whichever pen is selected. A user of the HMI shall also have the ability to customize which pens are displayed on a particular graph, giving the ability to compare multiple values as desired.
- Alarm Summary:** All active alarms are shown on one screen, including their associated description and alarm level. Alarms are acknowledged and reset only from this screen. Alarms that were once active, but have since cleared will remain on the Alarm Summary until they have been acknowledged. Depending on the HMI software in use, acknowledged or self cleared alarms change colour to indicate status. The Alarm Summary button shall flash red when there are unacknowledged alarms and appear normal when there are no unacknowledged alarms.
- Alarm Banner:** An Alarm Banner along to very bottom of the page displays the most recent two active alarms and is present on all major process screens. This is typically a reduced form of the Alarm Summary, and shall follow the same color and blinking conventions as the Alarm Summary.
- Setpoint Screens** All system setpoints shall be made available on separate screens, multiple if required. Setpoints should be grouped by their pertinent process section, for example Raw Water, Clarifier, Distribution, etc. The setpoint page(s) shall also include delay timer setpoints for alarms and the ability to disable individual alarms. Alarm Enables/Disables and delays may be located on a separate setpoint screen from normal process setpoints. Setpoint changes shall be logged in the Operation History showing date, time and user that changed the setpoint.
- Operation History:** All alarm and event occurrences are appended to this screen, it is meant to give the operator a tool for tracking the time of occurrence of alarms and events. Events include: system events, setpoint changes, changes in state of tracked equipment and logical states in the process.

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1.2 ACCESS LEVELS

Three system access levels will exist: Operator, Supervisor and Developer. The Operator level has rights to view process values, modify some setpoints, acknowledge alarms and control various process equipment. The Supervisor has all these access rights plus the ability to modify all setpoints and reset flow totalizers. The Developer user has unrestricted access rights and is only used for screen maintenance and development purposes. Supervisor and Developer users will have access to the user database and are able to add/delete users as well as set passwords.

The Detailed Control Document will identify the access levels of setpoints and controls.

1.3 SETPOINTS

Adjustable and non-adjustable setpoint ranges are listed in the Detailed Control Document. All control setpoints, analog ranges and associated alarms described within this document are assumed to be operator adjustable setpoints. Unless otherwise noted, the ability to adjust a particular setpoint is dictated by the setpoints user access level. The adjustable setpoint ranges must be within the minimum and maximum range of the instrument unless specified otherwise in this document. The HMI must not accept adjustable setpoints outside the permitted ranges.

Setpoint values entered which conflict with other setpoints associated with the same device or range will not be accepted. Setpoint verification may be done in the HMI via scripting logic or in the controller logic. For example, the low setpoint value cannot be greater than the high setpoint value and vice versa.

All setpoints and associated alarms described within this document must include user access levels, if they are not identified then it is automatically assumed as operator accessible. During the commissioning stage of the project, access levels may change based on client and operator input. It is the responsibility of the programmer to incorporate these changes and red-line the Detailed Control Document.

1.4 REPORTING

Non-Historian applications:

All reporting requirements will be handled at the main HMI. Statistical values, such as minimum, maximum, average, and totals must be tracked within the controller (refer to Control Programming Guidelines for further control-related tracking requirements).

Daily, weekly, monthly, and yearly reports must automatically generate an Excel spreadsheet with relevant values identified in the Detailed Control Document. The operator shall be allowed to enter manual laboratory data, including date and time of data, via an HMI pop-up screen: these values will automatically be added to the generated reports in their pertinent sections. The reports shall populate Excel sheets automatically and save each sheet for retrieval on the specified frequency. Excel is used as a default spreadsheet reporting means, alternates are possible but must meet the intended functionality.

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Historian applications:

Reports shall be generated by the reporting software specifically supported and provided by the database supplier; The reporting software shall use a database Historian as a raw data source and shall produce the reports described below in the frequency as outlined for each report. The operator shall be allowed to enter manual laboratory data via the HMI screens and after a confirmation of entry and date entered the data shall be manually inserted into the Historian at 12:01 am of the day selected. The reports shall populate Excel sheets on demand and allow for export into an editable copy for operator alteration.

The reporting shall include everything identified in the contract documents and include all requirements listed in the latest operation approvals as required by the governing body applicable to this project. Prior to commissioning a sample report must be generated by the programmer and submitted to the engineer for review and approval.

Where vendor packages are responsible for obtaining information that must be logged, this information must be recorded by the Historian. The required data will be identified in the Detailed Control Document.

All logged data shall use a deadband to reduce unnecessary data logging. A time based trigger shall be used such that even if process values do not change, data is still logged routinely. This trigger is intended to prevent NULL database results for reports.

The programmer is responsible for the setup of all HMI and database Historians supplied under the contract. This includes computer setup, network assignments, software installation and Historian configuration.

1.5 REMOTE ACCESS

Remote access will be provided for the operators, vendors and programming contractors via a secure VPN connection into the station's router. Remote viewing software, UltraVNC shall be installed and configured to serve the HMI's graphics to remote users. This shall be password protected.

Windows Remote Desktop Connection will also be enabled for each Windows User.

1.6 SCREENS, GRAPHICS & OPERATOR CONTROLS

The term "selecting", as used in the following description, means selecting an object on the touchscreen by touching its respective area on the HMI screen. Any items that are selectable are highlighted by the HMI software when pressed upon.

1.7 USE OF ANIMATIONS

Animations shall be used to indicate statuses. Normal operating conditions shall not result in a repetitive or blinking animation. For example, rotating impellers shall not be used to illustrate running status.

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Blinking animations shall be reserved for unacknowledged alarms.

Wherever momentary pushbuttons are linked to pushbutton variables in a controller they shall only be “set” by the HM software: the controller will “reset” the value. Only if momentary pushbuttons are linked to internal HMI-software variables may they be reset by the HMI software.

1.8 GRAPHIC COLORS

Graphical colours are broken down into two groups, operational colours and process schematic line colours, following Alberta Environmental Protection guidelines.

Operational Colours:

On / Open	-	Green
Off / Closed	-	Red
Unacknowledged Alarm	-	Flashing Yellow
Acknowledged Alarm	-	Yellow

Process Colours:

Raw Water	-	Dark Green
Potable Water	-	Blue
Gas	-	Orange
Oil	-	Burgundy
Steam	-	Purple
Air	-	White
Chemical Line	-	TBD by Engineer
Fire Protection	-	Red
Wastewater	-	Brown

Graphical line weights will be used to indicate major process verses minor processes. The thicker line will highlight the major process flow.

Color must not be the sole method by which any information is communicated. This applies both to animations and static graphics.

All color-based animations must be supplemented by some other form of animation, such as a textual indication or line-weight changes.

Alarm colors must not obscure the current on/open/off/closed status of a device, especially when they have been acknowledged.

High Performance graphics are typically mono-chromatic and the colours as described apply when they are in alarm.

HMI PROGRAMMING STANDARDS

1.9 ALARMS

All enabled alarms are permitted to alarm regardless of whether the process or equipment is in auto or manual. There are three distinct alarm behaviours:

Level 1 Critical. Action is required to restore normal operations. If a horn is present in the system, the horn will sound when this type of alarm activates and will continue sounding until all alarms have been acknowledged. Acknowledgement is required to silence the horn. Once the condition is cleared, reset is required to remove the alarm from the alarm summary and thus remove any interlocks associated with the alarm. The alarm summary will not consider the alarm to have "Returned to Normal" until it has been reset. The primary purpose of a Level 1 is to lock out equipment due to a significant event; eg/ a motor thermal overload trip or a LL tank alarm to protect a pump from running dry. These alarms should be used sparingly as they will result in a process stoppage.

Level 2 Important but non-critical, fix the abnormal condition. Acknowledgement is required to silence the horn. The alarm, and any associated interlocks will automatically clear when condition itself has cleared. The alarm will remain displayed on the alarm summary until it has been acknowledged and cleared. This alarm is intended for normal process interlocks such as a low pump level that stops a pump but does not lock it out. When level recovers and the alarm self clears the pump, if it needs to run, can run without operator intervention.

Level 3 Event. Intended for operator notification only. These do not appear in the Alarm Summary. Acknowledgement is not required or possible, and the horn is not triggered for this type of alarm. At minimum, events will log setpoint changes, user logins, motor starts, discrete valve positions, and other events as deemed required.

Alarms will be displayed with color coding to distinguish from Active-Unacknowledged, Active-Acknowledged, Inactive-Unacknowledged, Inactive-Acknowledged in the Alarm Summary and Operational Summary:

1.10 MOTOR OPERATION

All motors that can be controlled by the controller can be selected from the applicable process graphic. The process graphics will display some statuses of the motor, but not all. The process graphics must display all the following information if it is available for the applicable motor:

- Running Status
- Ready Status
- Common Alarm Status
- Speed Feedback
- Role (e.g., Duty, Standby, Out-of-Service)

The Ready Status is defined as being active if no conditions that would prevent the motor from starting or continuing to run are active.

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The Common Alarm Status will activate if any conditions that would prevent the motor from starting or continuing to run, **except** physical or keypad Local/Remote or Hand/Off/Auto switches, are active.

By clicking or touching the motor on the screen, a pop-up window is displayed. The pop-up window displays all the specific details for that motor as well as any buttons to control that piece of equipment. Each pop-up will contain the following information:

- Running Status
- Speed Command
- Speed Feedback
- Remote-Auto/Remote-Manual Pushbuttons
- Remote-Auto/Remote-Manual Status
- Ready to run status
- Run timer values
- Run/Stop push buttons
- Manual Speed Setpoint
- Fail-to-Start/Fail-to-Stop alarm status
- Motor time between restarts setpoint
- Motor Role (e.g., Duty, Standby, or Out of Service)
- Common Alarm Status

Even though each motor is different, they will all share a common pop-up control window. If the motor does not contain a specific indication, such as the speed setpoint for a pump, that item will be absent or be blacked out.

The common alarm status does not illustrate the specific causes for the alarm. However, if this status is clicked from the motor pop-up, a second pop-up, shared among all motors with the same features, will open with a list of alarms that are included in the common alarm status and their statuses.

Common Alarm Status is only affected by motor-specific alarms. If an entire device-set is prevented from running due to a process condition, this would be displayed elsewhere.

When not in Remote-Manual, the Manual Speed Setpoint and/or Run/Stop pushbuttons must be disabled, and their disabled status be visually apparent.

The statuses listed above are described in greater detail in the Control Programming Guidelines.

A motor's role is not controlled from the motor-specific pop-up. Rather a device-set popup may be opened from the process screen. This will show all the motors in a device-set and allow a user to set the roles of each motor in the set. Motor role assignments are described in greater detail in the Control Programming Guidelines.

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1.11 VALVE OPERATION

All valves that can be controlled by the controller can be selected from the applicable process graphic. The process graphics will display some statuses of the valve, but not all. The process graphics must display all the following information if it is available for the applicable valve.

- Open/Close/Travel/Error Status
- Local/Remote Status
- Common Alarm Status
- Position Feedback (%)

The Ready Status is defined as being active if no conditions that would prevent the valve from operating from the control system are active.

The Common Alarm Status will activate if any conditions that would prevent the valve from operating from the control system, **except** physical or keypad Local/Remote switches, are active.

By clicking or touching the valve on the screen, a pop-up window is displayed. The pop-up window displays all the specific details for that valve as well as any buttons to control that piece of equipment. Each pop-up will contain the following information:

- Open/Close/Travel/Error position status
- Remote-Auto/Remote-Manual pushbuttons
- Remote-Auto/Remote-Manual status
- Valve position feedback (% open)
- Local/Remote status
- Valve Controls: Either
 - Open/Close/Stop pushbuttons, or
 - Manual Position Setpoint
- Common Alarm Status
- Role (In Service/Out-of-Service) Status
- In-Service/Out-of-Service Pushbuttons

Even though each valve is different, they will all share a common pop up control window. If the valve does not contain a specific indication, such as the opened/closed status or speed feedback, that item will be absent or be blacked out.

The common alarm status does not illustrate the specific causes for the alarm. However, if this status is clicked from the valve pop-up, a second pop-up, shared among all valves with the same features, will open with a list of alarms that are included in the common alarm status and their statuses.

When not in Remote-Manual, the Manual Position Setpoint or Open/Close/Stop pushbuttons must be disabled, and their disabled status, visually apparent.

8:37 AM Win 911 Server 1 Config Win 911 Test Win 911 Server 2 Config

Alarm Overview Acknowledge ClearSCADA Reset PLC Alarms

Overview Screening Influent Salsnes MBBR DAF Dewatering Disinfection Building Systems Alarms Utilities Help



Screening	Influent	Salsnes	MBBR	DAF	Dewatering	Dewatering	Disinfection
Rocktrap Float LSH101	LIT140 Loss of Echo	Salsnes 1 Plug PLG1305	MBBR Blower 1 B4401	Nikuni RP1471	Sludge Mixer 1 MX3520	Poly Pump 1 CP5590.1	Hypo Pump 1 CP5821
LIT101 Loss of Echo	Influent Pump 1 P1141	Salsnes 2 Plug PLG1315	MBBR Blower 2 B4402	Nikuni RP1472	Sludge Mixer 2 MX3525	Centrifuge 1 CG3530	Hypo Pump 2 CP5822
Inlet Channel LIT100 High	Influent Pump 2 P1142	Salsnes 1	MBBR Blower 3 B4403	Nikuni RP1473	Tank 1 South LIT520.3 Bad Quality	Centrifuge 2 CG3540	Hypo Tank Low Level
Hycor 1	Influent Pump 3 P1143	Salsnes 2		Nikuni RP1474	Tank 1 South LIT520.3 High		Captor Pump 1 CP5843
Hycor 2	Loss of Echo LIT146	PC Sludge Pump 1 PC3510		DAF 1 Rake SC1451	Tank 1 South LIT520.3 Low		Captor Pump 2 CP5847
Grit Cyclone GR3116	Influent Wet Well 1 LIT146 High	PC Sludge Pump 2 PC3520		DAF 2 Rake SC1461	Tank 2 North LIT525.3 Bad Quality		Captor Tank Low Level
Grit Pump GP3118	Influent Wet Well 1 LIT146 Low	Blower 1		DAF 1 Sludge Pump SP3409	Tank 2 North LIT525.3 High		Clearwell Level LIT631 High
Grit Washer GW3117	Loss of Echo LIT147	Blower 2		DAF 2 Sludge Pump SP3410	Tank 2 North LIT525.3 Low		Clearwell Level LIT631 Low
H2S Detector AIT151 High	Influent Wet Well 2 LIT147 High	Hopper 1 Level PIT3510 High		High Flow Poly 1 CP5435.1	Sludge Pump 1 SP3570		Total Chlorine AIT1804.1 Bad Quality
HC Detector AIT152 High	Influent Wet Well 2 LIT147 Low	Hopper 2 Level PIT3520 High		High Flow Poly 2 CP5435.2	Sludge Pump 2 SP3580		Total Chlorine AIT1804.1 High
	High Flow LIT109A			Sludge Level LIT4432 High	Centrifuge Poly LIT559.2 High		Total Chlorine AIT1804.1 Low
	Influent Wet Well High Level LSH151			Sludge Level LIT4442 High	Centrifuge Poly LIT559.2 Low		Spirogester LIT1202 Bad Quality
	MCC Room Intrusion Alarm						Spirogester LIT1202 High
							Spirogester LIT1202 Low

Legend

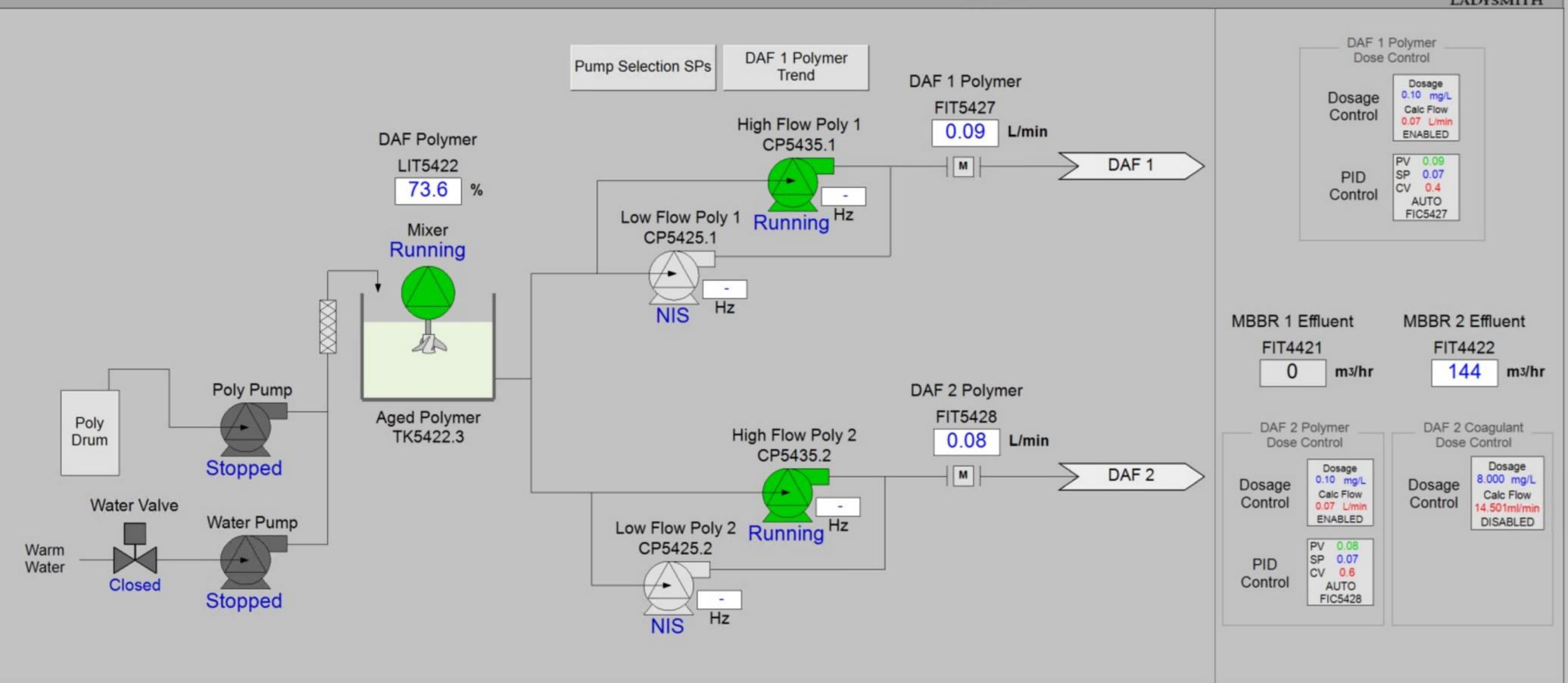
- Stopped or Normal
- Running Auto or Active
- Alarm
- Running Hand or Standby
- Not in Service
- Bad Quality

Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
	2/27/2025 3:55:14.225 PM	...ts.PLC3-Secondary.-Analog In.SLDG_TNK1_LIT520_3.Calculated	State changed from Normal to High, value is 2.8 (Logged data)	Point State	World	0
	2/1/2025 1:40:46.264 PM	DAF 2 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0
4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:32 AM Win 911 Server 1 Config Win 911 Test Win 911 Server 2 Config

DAF Polymer Addition Acknowledge ClearSCADA Reset PLC Alarms

Overview Screening Influent Salsnes MBBR **DAF** Dewatering Disinfection Building Systems Alarms Utilities Help

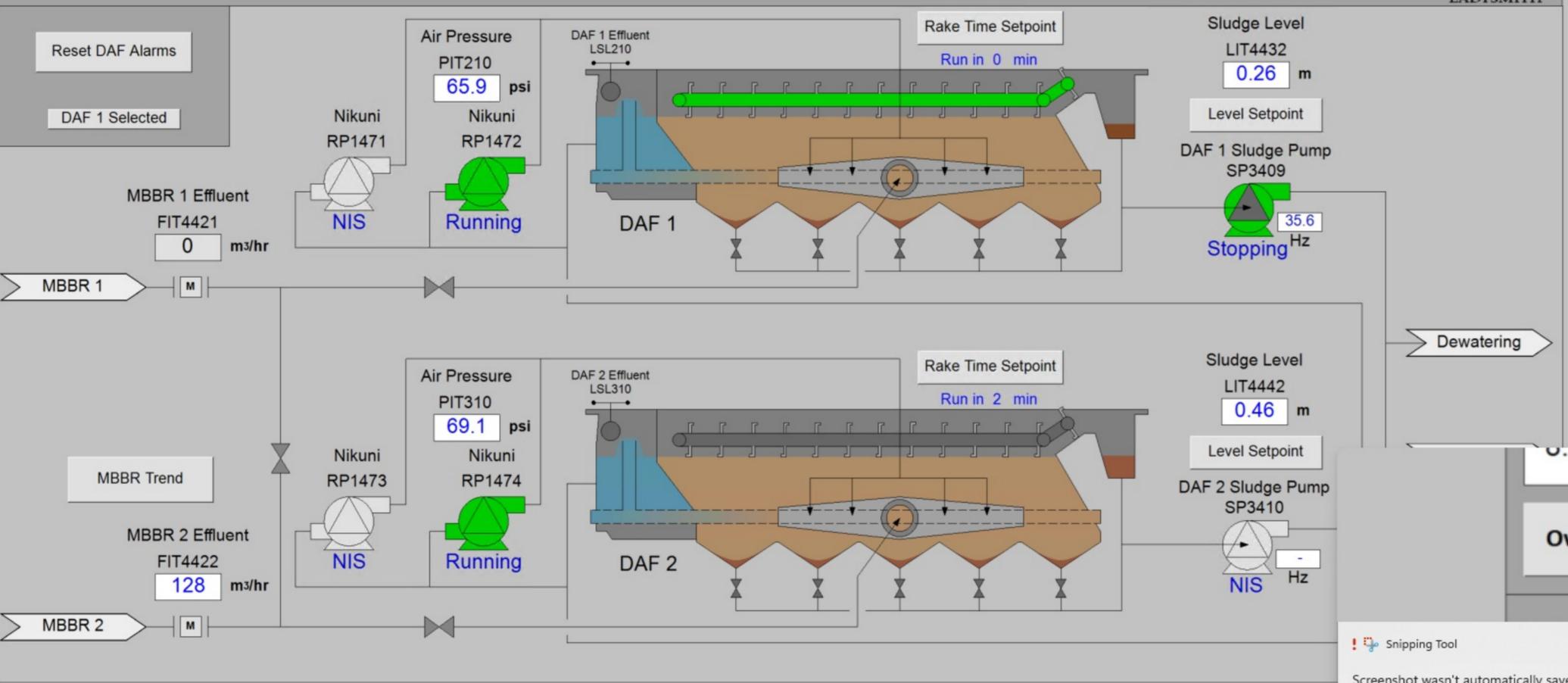



Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
	2/27/2025 3:55:14.225 PM	...ts.PLC3-Secondary-~Analog In.SLDG_TNK1_LIT520_3.Calculated	State changed from Normal to High, value is 2.8 (Logged data)	Point State	World	0
	2/1/2025 1:40:46.264 PM	DAF 2 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0
4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:31 AM Win 911 Server 1 Config Win 911 Test Win 911 Server 2 Config

Dissolved Air Flotation Acknowledge ClearSCADA Reset PLC Alarms

Overview Screening Influent Salsnes MBBR **DAF** Dewatering Disinfection Building Systems Alarms Utilities Help

0.31 AM

Overview

Snipping Tool

Screenshot wasn't automatically saved. Your screenshot was still copied to the clipboard.

Markup and share

Seve...	Time	Source	Message	Category	Area Of Interest
Medi...	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent
Medi...	2/27/2025 3:55:14.225 PM	...ts.PLC3-Secondary-~Analog In.SLDG_TNK1_LIT520_3.Calculated	State changed from Normal to High, value is 2.8 (Logged data)	Point State	World
Medi...	2/1/2025 1:40:46.264 PM	DAF 2 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF
Medi...	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF

1

4

8:33 AM

Win 911 Server 1 Config

Win 911 Test

Win 911 Server 2 Config

Dewatering System

Acknowledge
ClearSCADA

Reset PLC
Alarms

Overview

Screening

Influent

Salsnes

MBBR

DAF

Dewatering

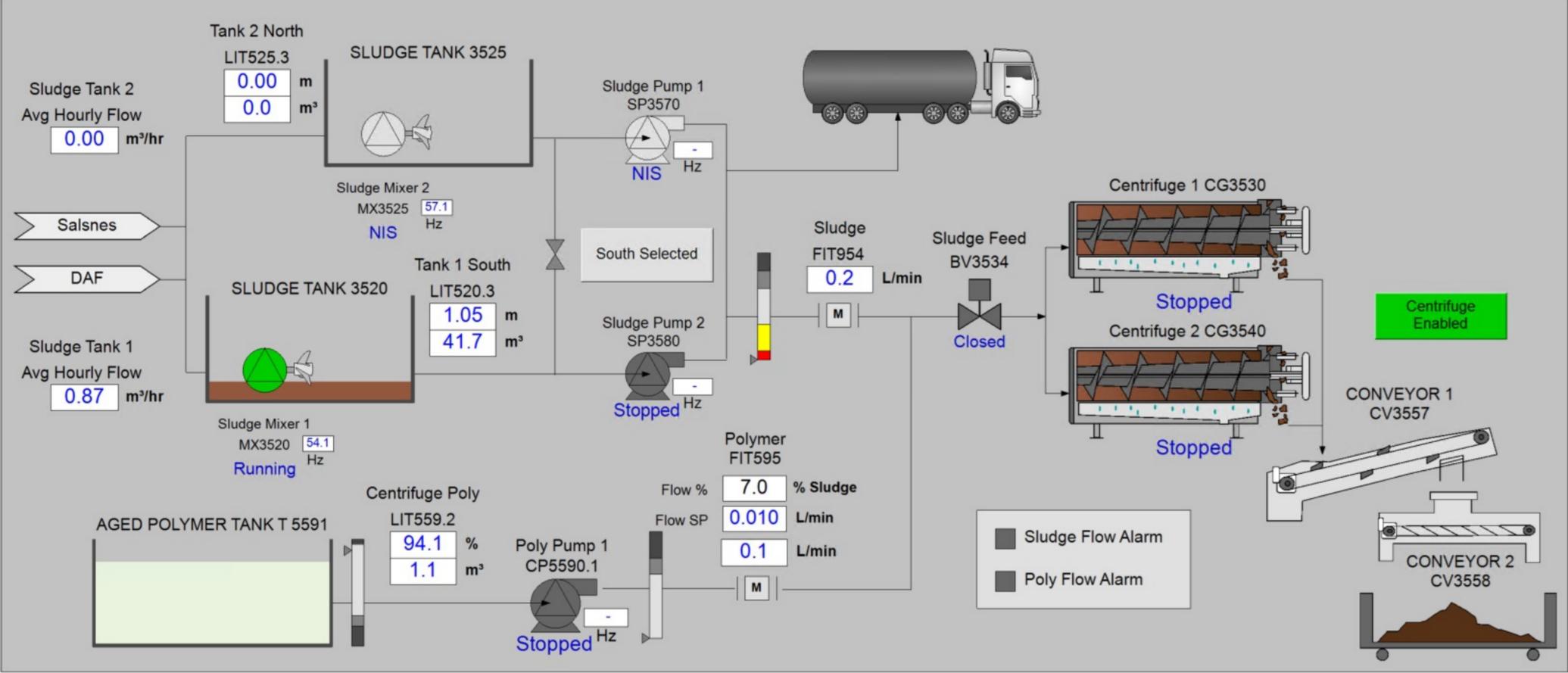
Disinfection

Building Systems

Alarms

Utilities

Help



Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
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4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:33 AM

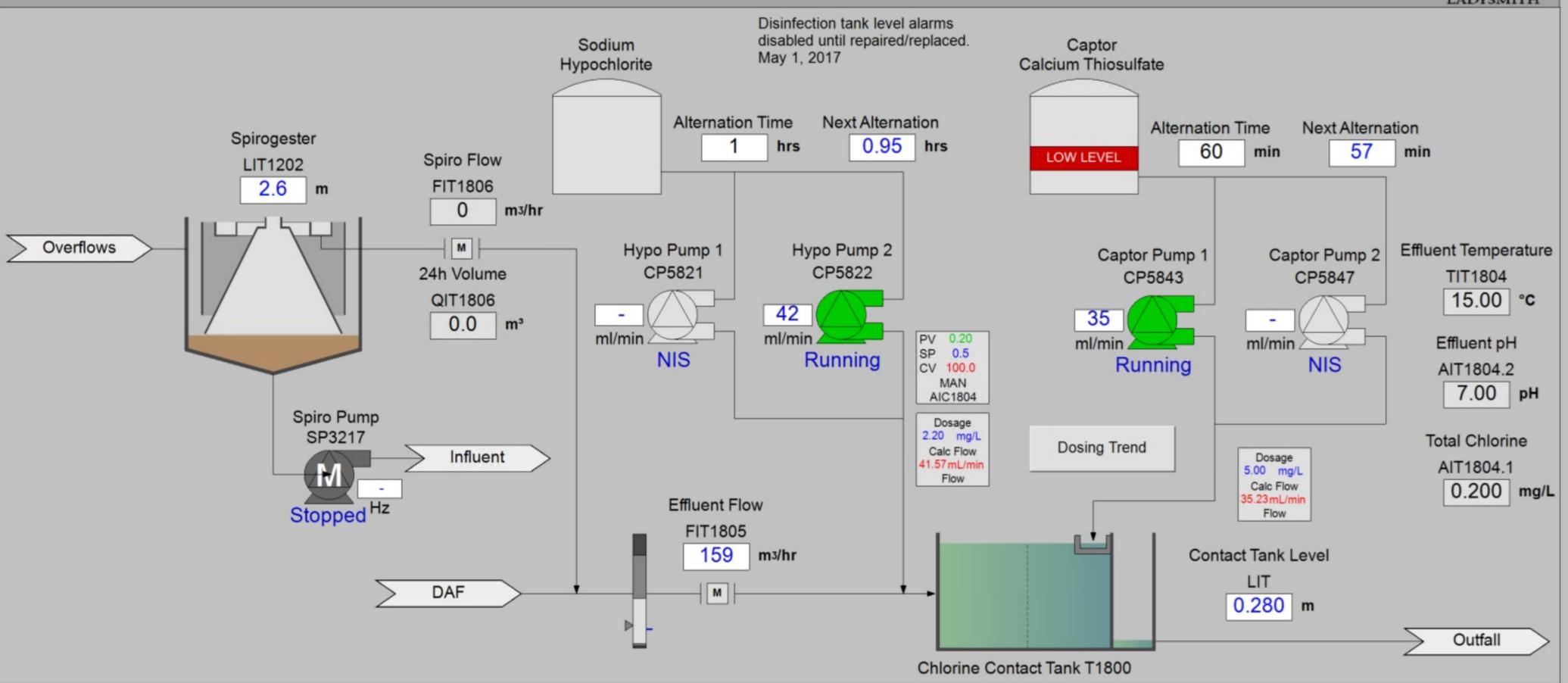
Win 911 Server 1 Config Win 911 Test Win 911 Server 2 Config

Chlorine Contact Tank

Acknowledge ClearSCADA Reset PLC Alarms

Overview Screening Influent Salsnes MBBR DAF Dewatering **Disinfection** Building Systems Alarms Utilities Help

LADYSMITH



Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
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1	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:35 AM

Win 911 Server 1 Config

Win 911 Test

Win 911 Server 2 Config

Effluent Heat Recovery

Acknowledge
ClearSCADA

Reset PLC
Alarms

Overview

Screening

Influent

Salsnes

MBBR

DAF

Dewatering

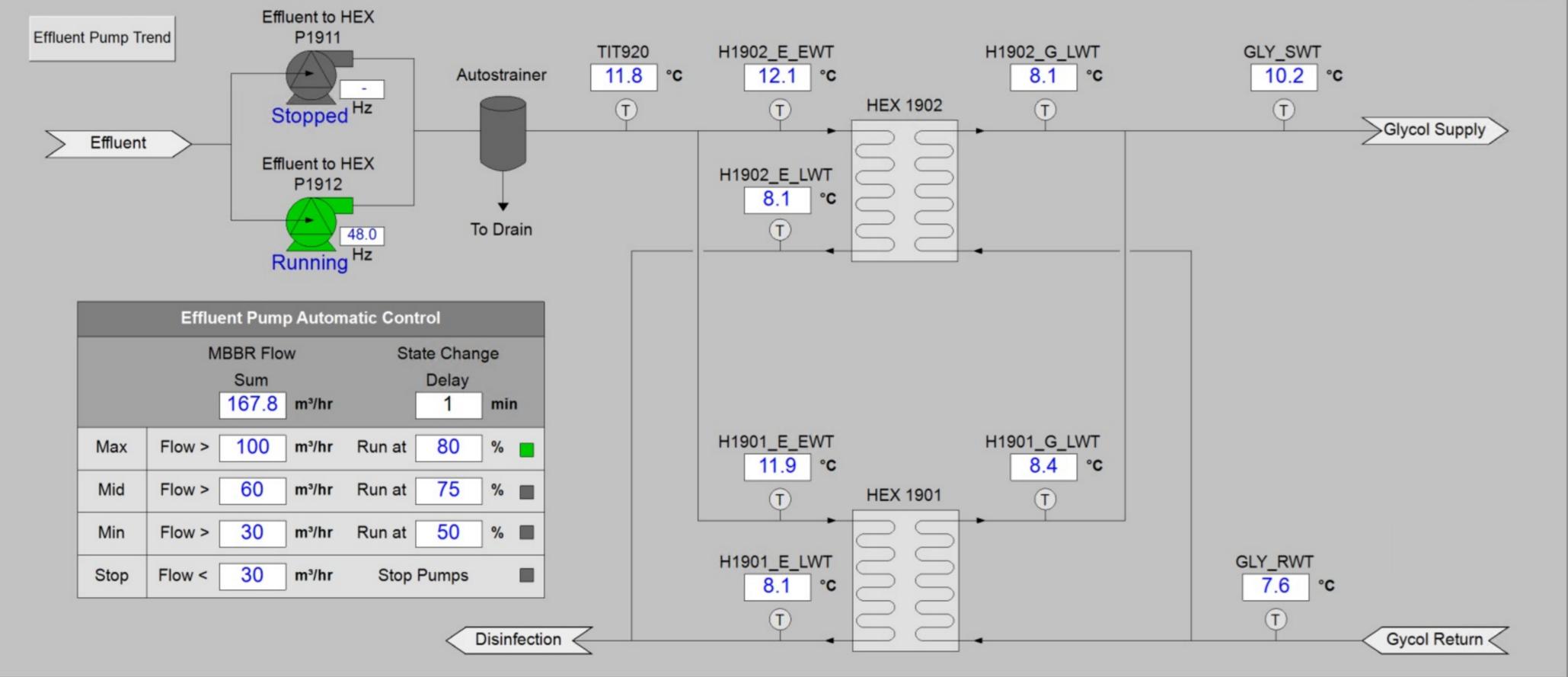
Disinfection

Building Systems

Alarms

Utilities

Help



Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
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	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:39 AM

Win 911 Server 1 Config

Win 911 Test

Win 911 Server 2 Config

Flow Totals

Acknowledge
ClearSCADA

Reset PLC
Alarms



- Overview
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- MBBR
- DAF
- Dewatering
- Disinfection
- Building Systems
- Alarms
- Utilities
- Help

Total Effluent (QIT1805)		Salsnes Influent (QIT1302)		Influent Flume (QIT140)		Centrifuge Sludge (QIT594)		DAF 1 Polymer (QIT5427)		MBBR1 Effluent (QIT4421)	
Abs Total	9666131 m ³	Abs Total	9240233 m ³	Abs Total	10014411 m ³	Abs Total	39037096 L	Abs Total	5810366 L	Abs Total	293375 m ³
Today	711 m ³	Today	715 m ³	Today	886 m ³	Today	0 L	Today	20 L	Today	45 m ³
Yesterday	3359 m ³	Yesterday	3352 m ³	Yesterday	3918 m ³	Yesterday	22000 L	Yesterday	230 L	Yesterday	131 m ³
2 Days Ago	3402 m ³	2 Days Ago	3420 m ³	2 Days Ago	3993 m ³	2 Days Ago	11540 L	2 Days Ago	232 L	2 Days Ago	122 m ³
3 Days Ago	3621 m ³	3 Days Ago	3581 m ³	3 Days Ago	4174 m ³	3 Days Ago	0 L	3 Days Ago	253 L	3 Days Ago	125 m ³
4 Days Ago	3810 m ³	4 Days Ago	3720 m ³	4 Days Ago	4284 m ³	4 Days Ago	13328 L	4 Days Ago	272 L	4 Days Ago	128 m ³
Last Month	1211842 m ³	Last Month	1196603 m ³	Last Month	1405115 m ³	Last Month	3821944 L	Last Month	135324 L	Last Month	239740 m ³

Spirogester Effluent (QIT1806)		Overflow Weir (QIT109)		Centrifuge Polymer (QIT595)		DAF 2 Polymer (QIT5428)		MBBR 2 Effluent (QIT4422)	
Abs Total	60888 m ³	Abs Total	6573 m ³	Abs Total	8937853 L	Abs Total	6659677 L	Abs Total	97954 m ³
Today	0 m ³	Today	0 m ³	Today	0 L	Today	21 L	Today	725 m ³
Yesterday	2 m ³	Yesterday	0 m ³	Yesterday	4393 L	Yesterday	230 L	Yesterday	3489 m ³
2 Days Ago	4 m ³	2 Days Ago	0 m ³	2 Days Ago	2877 L	2 Days Ago	233 L	2 Days Ago	3545 m ³
3 Days Ago	4 m ³	3 Days Ago	0 m ³	3 Days Ago	0 L	3 Days Ago	254 L	3 Days Ago	3804 m ³
4 Days Ago	7 m ³	4 Days Ago	0 m ³	4 Days Ago	3324 L	4 Days Ago	272 L	4 Days Ago	4055 m ³
Last Month	589 m ³	Last Month	0 m ³	Last Month	808405 L	Last Month	144961 L	Last Month	1289652 m ³

Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
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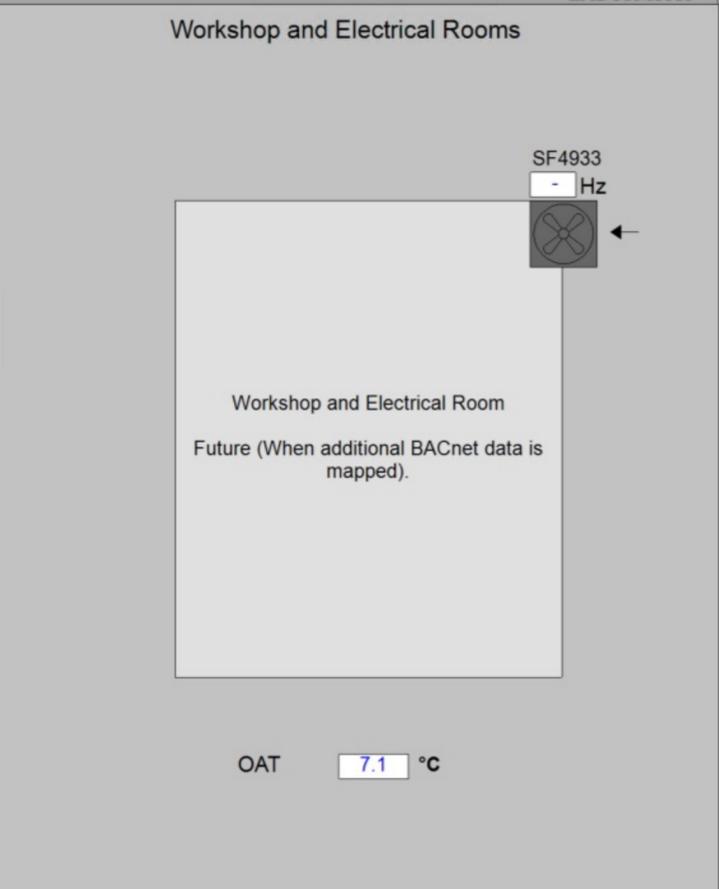
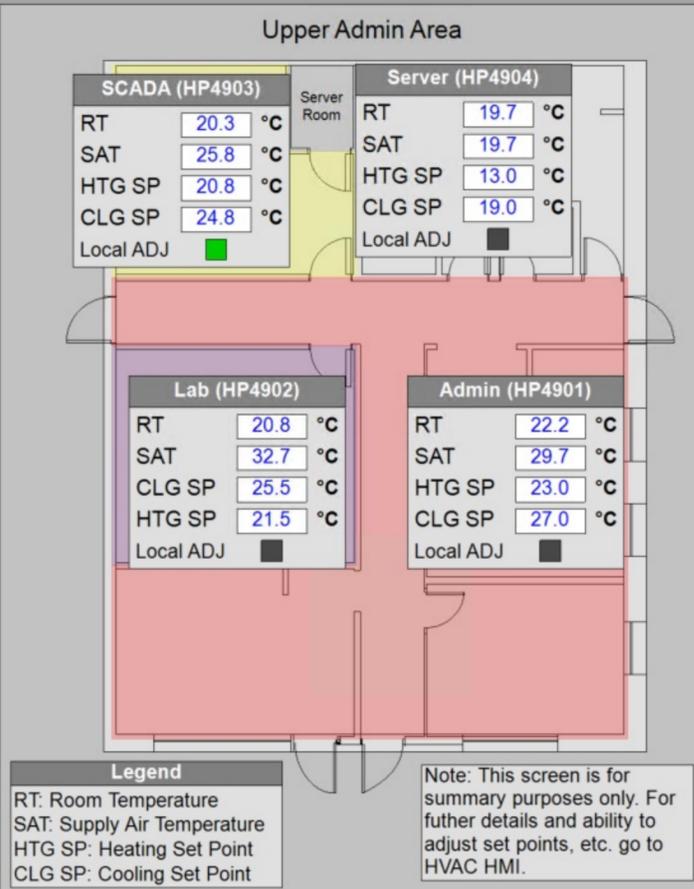
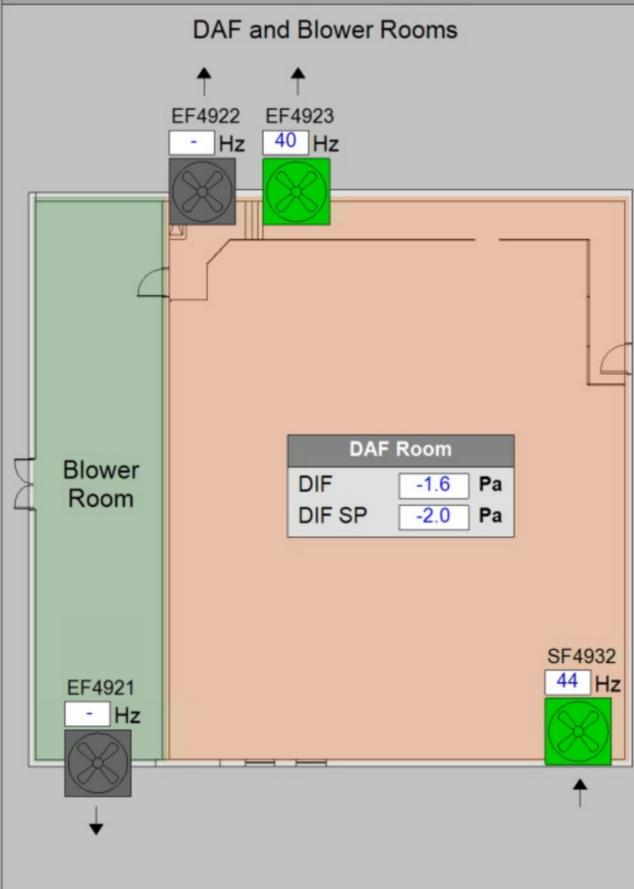
8:37 AM
 Win 911 Server 1 Config Win 911 Test
 Win 911 Server 2 Config

HVAC

Acknowledge ClearSCADA
 Reset PLC Alarms



- Overview
- Screening
- Influent
- Salsnes
- MBBR
- DAF
- Dewatering
- Disinfection
- Building Systems
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- Utilities
- Help



Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
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4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:29 AM

Win 911 Server 1 Config

Win 911 Test

Win 911 Server 2 Config

Influent Pumps

Acknowledge
ClearSCADA

Reset PLC
Alarms

Overview

Screening

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Salsnes

MBBR

DAF

Dewatering

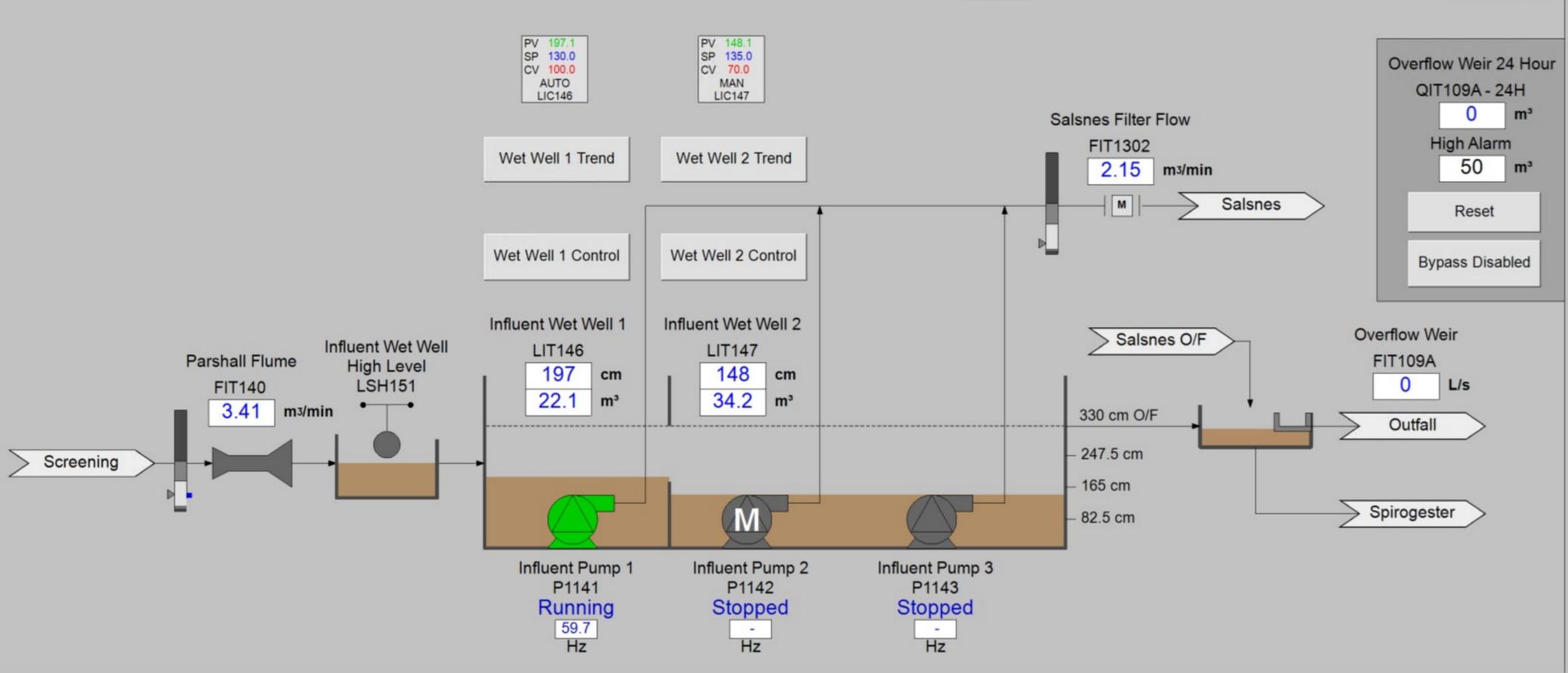
Disinfection

Building Systems

Alarms

Utilities

Help



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4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

Moving Bed Biofilm Reactors

8:30 AM

Win 911 Server 1 Config

Win 911 Test

Acknowledge

ClearSCADA

Reset PLC Alarms

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Blower Manual
 Alarm 6 hours
Reset MBBR Alarms

Moving Bed Biofilm Reactor 1
 MBBR 1B DO: AIT409.1 0.00 mg/L
 MBBR 1 Level: LSH407.3
 MBBR 1C DO: AIT411.1 0.00 mg/L
 MBBR 1 pH: AIT411.3 0.00 pH
 MBBR 1 Temp: AIT411.2 0.0 °C
 MBBR 1 Effluent: FIT4421 0 m³/hr

MBBR Trend

Salsnes →

Blower 1 Air: FIT4401 0 cfm (Stopped)

Blower 2 Air: FIT4402 0 cfm (Stopped)

Blower 3 Air: FIT4403 490 cfm (Running)

Blower Valve 2: VA4402.2 (Opened)

Blower Valve 1: VA4402.1 (Opened)

MBBR 2B DO: AIT417.1 5.80 mg/L

MBBR 2 Level: LSH415.3

MBBR 2C DO: AIT419.1 3.53 mg/L

MBBR 2 pH: AIT419.3 6.47 pH

MBBR 2 Temp: AIT419.2 4.8 °C

MBBR 2 Effluent: FIT4422 121 m³/hr

Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
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4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:38 AM

Win 911 Server 1 Config

Win 911 Test

Network Monitoring

Acknowledge
ClearSCADA

Reset PLC
Alarms

Overview

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Salsnes

MBBR

DAF

Dewatering

Disinfection

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Alarms

Utilities

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PLC COMMUNICATION

- PLC 1 - Headworks
- PLC 2 - Dewatering
- PLC 3 - Secondary Treatment
- PLC 4 - MBBR / DAF
- Reclaimed Water
- Salsnes Filter 1
- Salsnes Filter 2

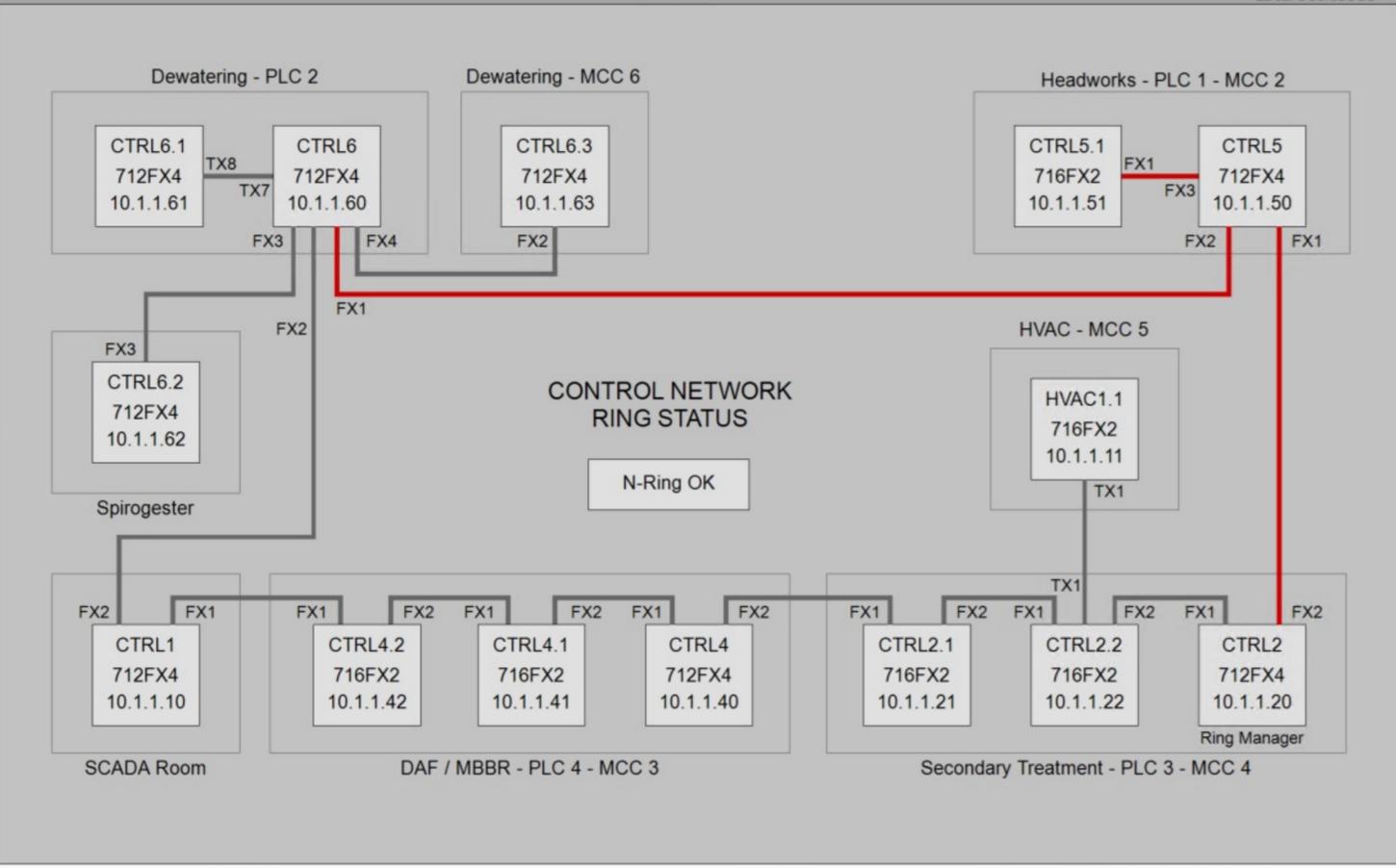
CLEARSCADA SERVER STATUS

SRV-CS01
 IP: 10.0.0.1
 IP: 10.1.1.1

 Standby to
 "SRV-CS02"

SRV-CS02
 IP: 10.0.0.2
 IP: 10.1.1.2

 Main



Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
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4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:34 AM

Win 911 Server 1 Config

Win 911 Test

Win 911 Server 2 Config

Odour Control

Acknowledge
ClearSCADA

Reset PLC
Alarms



Overview

Screening

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Salsnes

MBBR

DAF

Dewatering

Disinfection

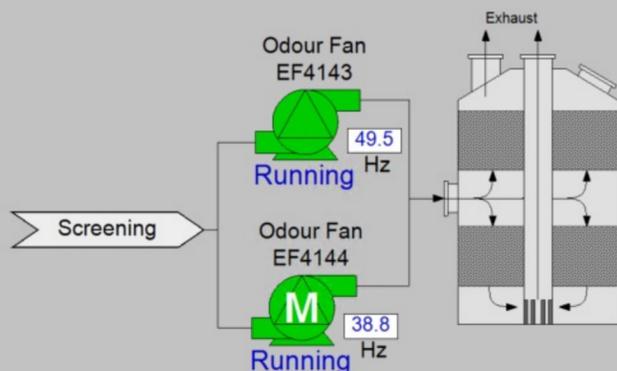
Building
Systems

Alarms

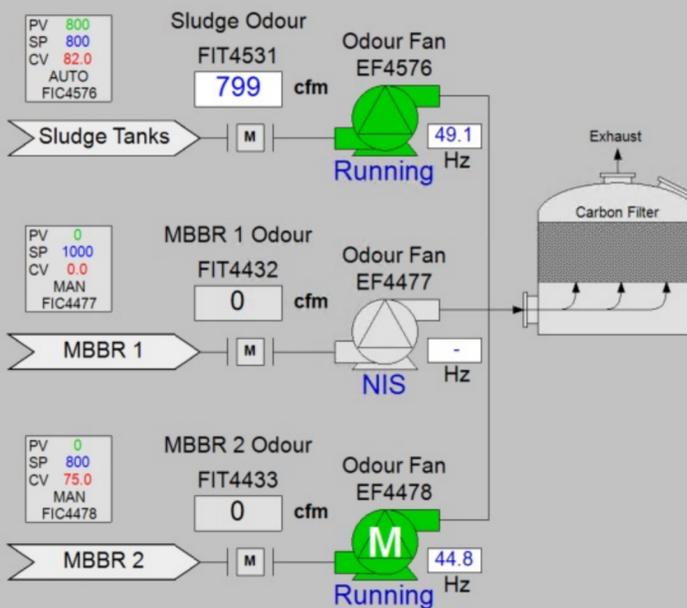
Utilities

Help

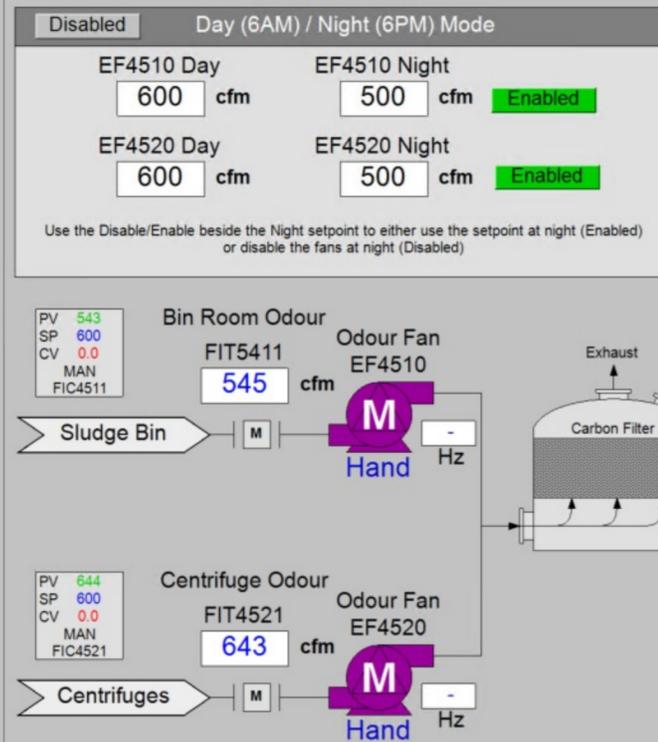
Train A Headworks Foul Air Control



Train B MBBR & Sludge Foul Air Control



Train C Centrifuge Foul Air Control



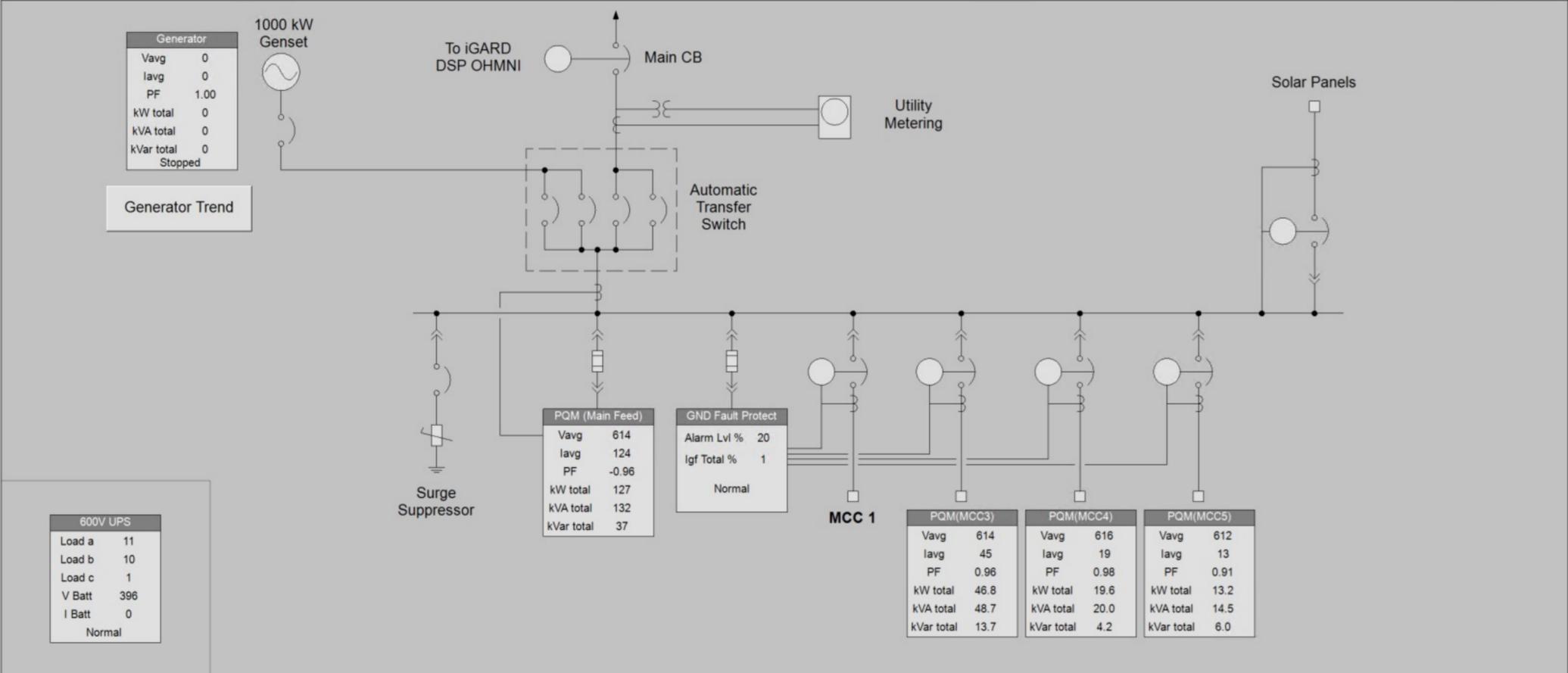
Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
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1	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

1
4

8:38 AM Win 911 Server 1 Config Win 911 Test Win 911 Server 2 Config

Power Monitoring Acknowledge ClearSCADA Reset PLC Alarms

Overview Screening Influent Salsnes MBBR DAF Dewatering Disinfection Building Systems Alarms Utilities Help

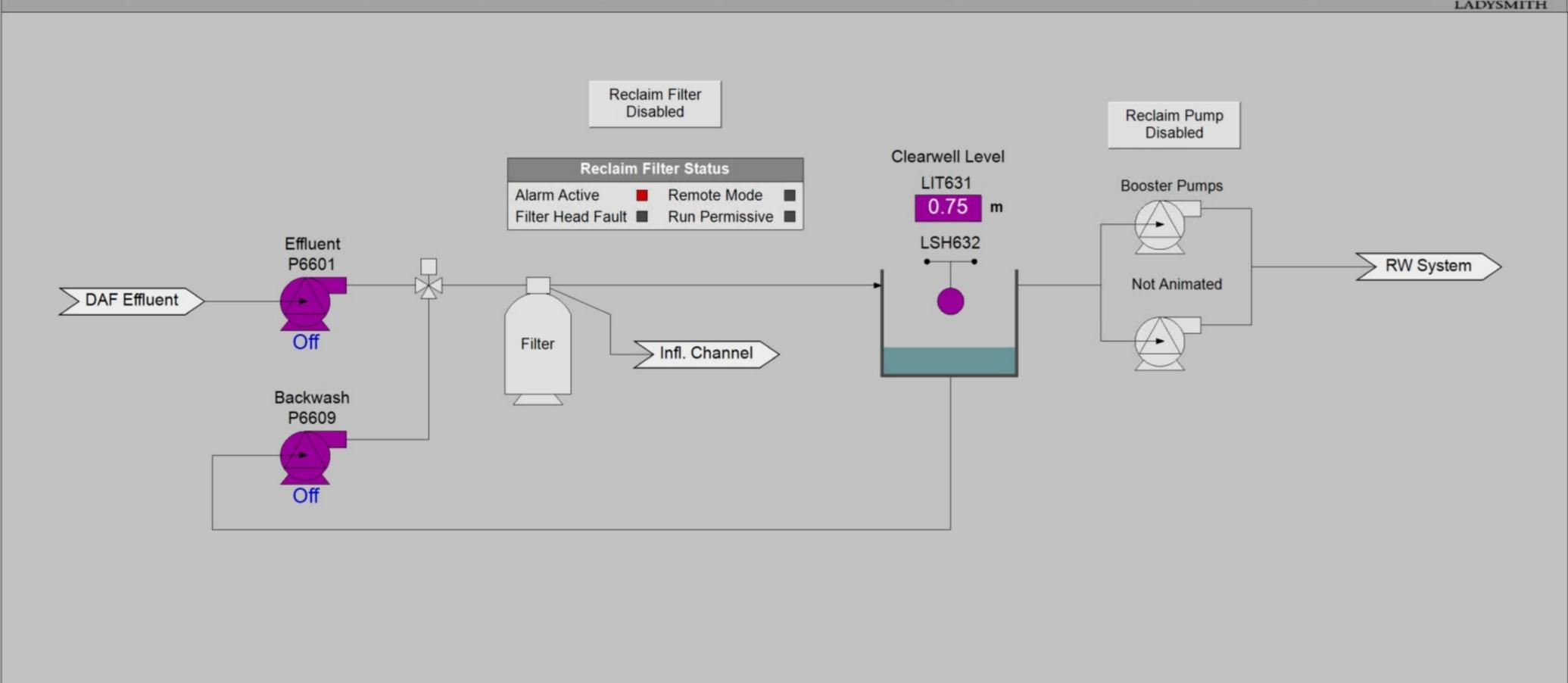



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4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:36 AM Win 911 Server 1 Config Win 911 Test Win 911 Server 2 Config

Reclaimed Water Acknowledge ClearSCADA Reset PLC Alarms

Overview Screening Influent Salsnes MBBR DAF Dewatering Disinfection Building Systems Alarms Utilities Help

Reclaim Filter Status

Alarm Active	Remote Mode
Filter Head Fault	Run Permissive

Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
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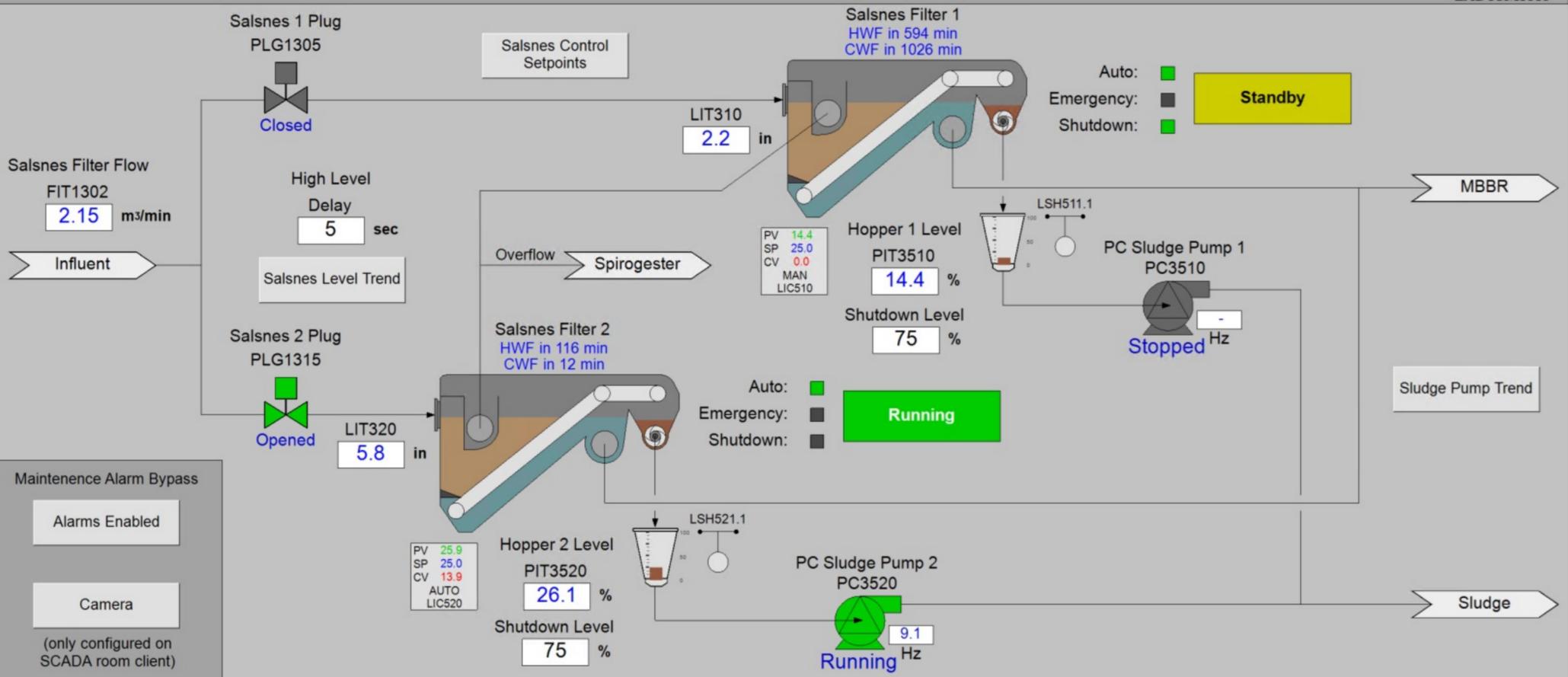
8:29 AM

Win 911 Server 1 Config Win 911 Test Win 911 Server 2 Config

Salsnes Filters

Acknowledge ClearSCADA Reset PLC Alarms

Overview Screening Influent **Salsnes** MBBR DAF Dewatering Disinfection Building Systems Alarms Utilities Help

Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed AI...
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4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0

8:28 AM

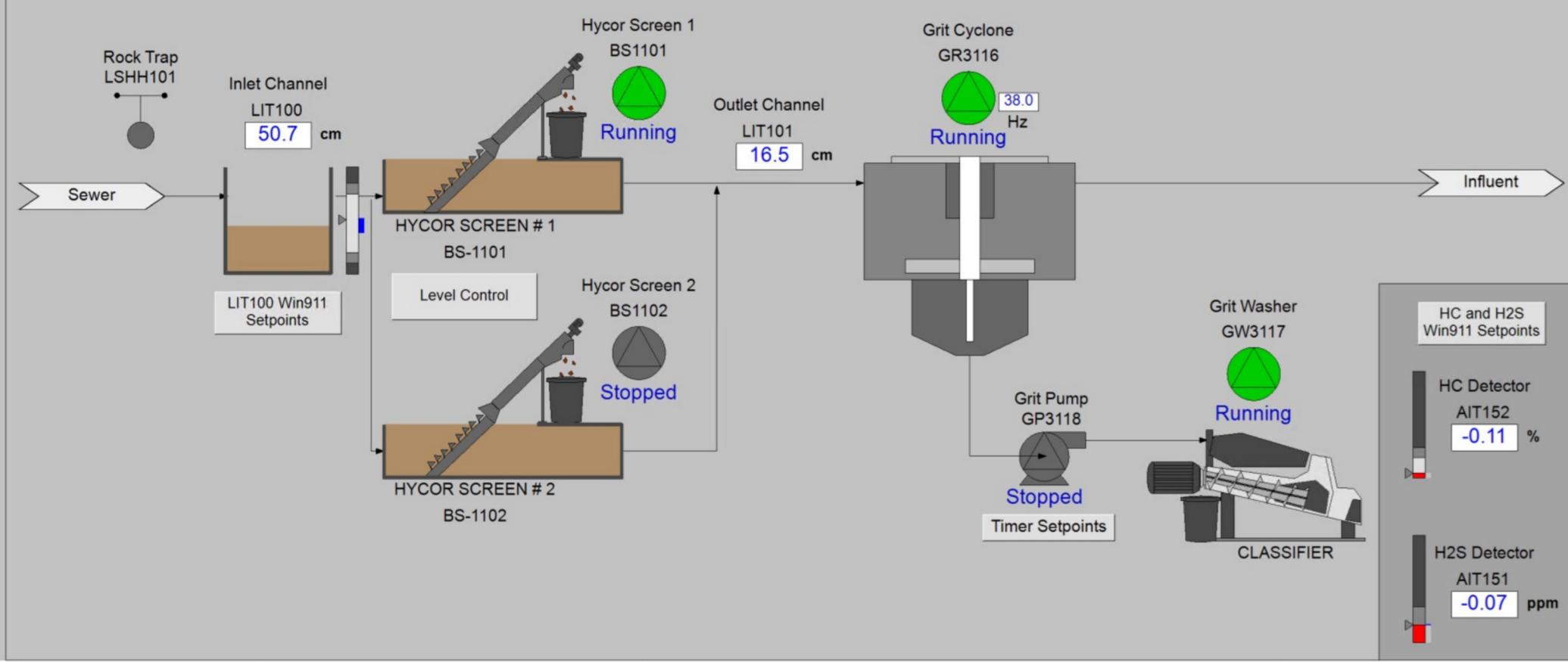
Win 911 Server 1 Config Win 911 Test

Win 911 Server 2 Config

Screening & Grit Removal

Acknowledge ClearSCADA Reset PLC Alarms

Overview **Screening** Influent Salsnes MBBR DAF Dewatering Disinfection Building Systems Alarms Utilities Help

Seve...	Time	Source	Message	Category	Area Of Interest	Suppressed Al...
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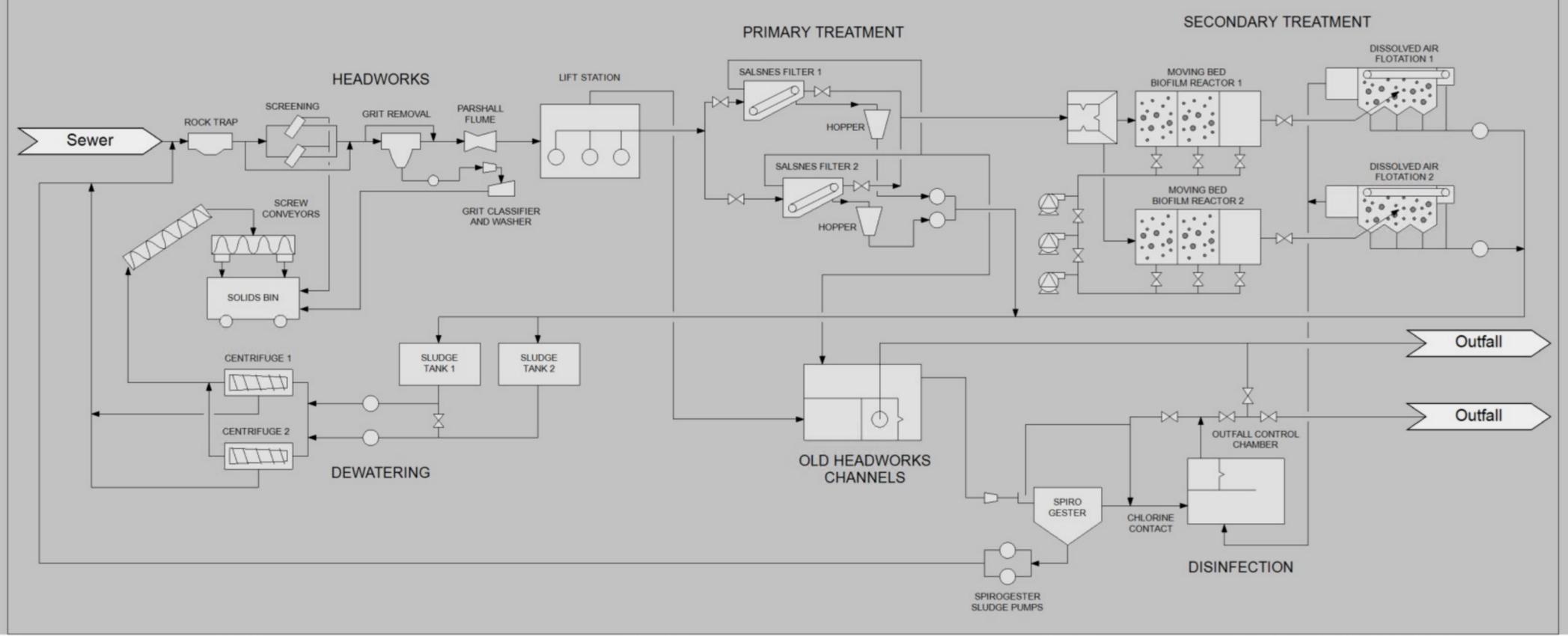
8:27 AM
 Win 911 Server 1 Config
 Win 911 Server 2 Config
 Win 911 Test

System Overview

Acknowledge
 ClearSCADA
 Reset PLC
 Alarms



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- Screening
- Influent
- Salsnes
- MBBR
- DAF
- Dewatering
- Disinfection
- Building Systems
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- Utilities
- Help



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1	3/19/2025 7:29:50.250 AM	Wet Well 1	State changed from Normal to High, value is 181 (Current data)	Point State	WWTP.Influent	0
	2/27/2025 3:55:14.225 PM	...ts.PLC3-Secondary.-Analog In.SLDG_TNK1_LIT520_3.Calculated	State changed from Normal to High, value is 2.8 (Logged data)	Point State	World	0
	2/1/2025 1:40:46.264 PM	DAF 2 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0
4	1/28/2025 1:24:45.573 AM	DAF 1 High Flow Poly Pump Low Current	State changed from Normal to Alarm, value is 1 (Current data)	Point State	WWTP.DAF	0



**Associated
Engineering**

*GLOBAL PERSPECTIVE.
LOCAL FOCUS.*

TECHNICAL MEMORANDUM

APPENDIX B – RECOMMENDED TECHNICAL SPECIFICATIONS

C:\Users\blanchette\Downloads\mem_ladysmithWWTP_SCADA_Upgrades(1..6).docx



Part 1 General**1.1 SUMMARY**

- .1 Section Includes:
 - .1 Selection, Installation and Configuration of Computer System Hardware and Accessories in this contract.

1.2 MAINTENANCE MATERIAL SUBMISSIONS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals. Including reviewed shop drawings identified above and:
 - .1 Copies of Official License Documentation and Certificates, in name of the Town.
 - .2 Electronic copy of Software Installation files for installed software.

1.3 SITE CONDITIONS

- .1 Existing Conditions:
 - .1 A 42U Server Rack is available in the network closet. Servers and workstation shall be installed here.
 - .2 3x Thin Clients are installed throughout the plant.

Part 2 Products**2.1 OWNER-SUPPLIED PRODUCTS**

- .1 New Products
 - .1 Two Graphics Servers shall be deployed by the Owner. These will be Virtual Machines, running on the Scale Computing hypervisor system, deployed to meet specifications noted for software.
 - .2 Microsoft Office Licensing shall be purchased by the Owner.
 - .3 Microsoft Windows Licensing shall be purchased by the Owner.
- .2 Existing Products
 - .1 Existing thin clients will continue to be used for accessing new VTSCADA system.

Part 3 Execution**3.1 CONFIGURATION OF COMPUTERS**

- .1 Configuration of Server Computers:
 - .1 Ensure operating system is installed and licensed in the name of the Town.
 - .2 Install Microsoft Office Suite, including Microsoft Excel on Server Computers.

- .3 Install VTSCADA Software on 2 new Server Computers:
 - .1 Refer to Section 40 68 00 – Process Control Software for installation and configuration of VTSCADA Software.
 - .2 Ensure Microsoft Excel Add-in is installed and configured
- .4 Install Alarm Dialer Software:
 - .1 Refer to Section 40 78 63 for installation and configuration of alarm dialer software.
- .2 Configuration of Thin Clients:
 - .1 Configure existing thin clients with shortcuts that will access the VTSCADA system. Configure thin clients to automatically connect to VTSCADA system upon power-up, where graphics may be seen, but not modified until a VTSCADA user logs in.

3.2 HARDWARE INSTALLATION

- .1 Install Servers
 - .1 Install server computers in server rack.
 - .2 Connect to Power Distribution Units, backed by UPS in server rack.

3.3 SOFTWARE INSTALLATION AND LICENSING

- .1 All electronic software licenses to be registered in the name of the Town, installed and activated on computers, and original license documentation turned over at completion of contract.
 - .1 Where an email address is required to register software, coordinate with the Town for a general-purpose SCADA email address.

END OF SECTION

Part 1 General**1.1 GENERAL**

- .1 This section describes the Provision, Programming, Installation, of Human Machine Interface (HMI) software in this contract.

1.2 PROGRAMMING SUB-CONTRACTORS

- .1 The work as specified in this section shall be performed by a qualified controls and instrumentation sub-contractor with at least 5 years' experience doing similar work with similar systems.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings
 - .1 Arrange a virtual meeting with Owner to guide graphical requirements and graphical standards to be used. The results of this meeting shall be incorporated into the Project HMI Graphical Standards document:
 - .1 Pre-development meeting shall be arranged with at least 7 calendar days' notice.
 - .2 Arrange an in-person workshop with Owner to review Graphical Standards Document:
 - .1 Schedule meeting with at least 14 calendar days' notice.
 - .2 Provide Graphical Standards Document at least 14 calendar days before scheduled meeting.
 - .2 Sequencing
 - .1 The existing Geo SCADA Expert system will remain in place until the new system has been commissioned. The new system must be programmed in such a way as to not conflict with the existing system.

1.4 ACTION AND INFORMATIONAL SUBMISSIONS

- .1 Submittals: Submit the following items:
 - .1 Product Data:
 - .1 HMI Programming Software.
 - .1 Identify specific license terms, including required renewals for any subscription-based software.
 - .2 Paid and free-of-charge installed software packages, such as office suites and remote viewing software.
 - .2 HMI Graphical Design Guidelines document.
 - .1 Submit prior to developing draft HMI graphics.
 - .3 Draft HMI graphics screenshots
 - .1 Screenshots shall encompass all Process Displays, Alarm Displays, and Trending Displays.

- .2 Screenshots to identify:
 - .1 Operator control operations.
 - .2 Animated displays.

1.5 MAINTENANCE MATERIAL SUBMISSIONS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals. Including reviewed shop drawings identified above and:
 - .1 Copies of Official License Documentation and Certificates, in name of the Town.
 - .2 HMI Configuration and Graphics software exports in electronic format, editable, and not password protected.
 - .3 HMI display screenshots in PDF format.
 - .4 Include electronic copy of Software Installation files for HMI programming Software.
 - .5 Include electronic copy of software installation files for paid and free installed software packages, such as office suites and remote viewing software.

1.6 SITE CONDITIONS

- .1 Existing Conditions:
 - .1 Current HMI Software is Geo SCADA Expert.
 - .2 Current Alarm dial-out software is Win-911
 - .3 Current Controllers are manufactured by Allen-Bradley/Rockwell Automation
 - .4 A detailed Control Philosophy or Control Narrative document is not available. However, a database export and graphical screenshots have been provided. Contractor may request copies of the existing HMI program to conform to replicate all available. All design and programming clarifications to be submitted to Owner.

Part 2 Products

2.1 HMI SOFTWARE

- .1 HMI software shall be Trihedral VTSCADA.
 - .1 Software shall be licensed for both Development and Runtime with sufficient tags to monitor and control all functions for the facility that are currently available from the existing HMI system.
 - .2 Include the VTSCADA Alarm Notification System.
 - .3 Include a 5-pack of Thin Client Licenses.

Part 3 Execution**3.1 DEVELOPMENT OF HMI DESIGN GUIDELINES**

- .1 Arrange a meeting with operations staff, Engineer, and City project team to determine graphical requirements and graphical standards to be used for all HMIs. The results of this meeting shall be formed into a Project HMI Graphical Standards document.
 - .1 This document shall discuss:
 - .1 Security and Access Rights, including:
 - .1 Roles and Privileges
 - .2 User Role Assignment Philosophy
 - .3 Login Requirements (Auto Login, Auto Logout, access rights when logged out)
 - .2 Use of Colour
 - .3 Usage from a Keyboard-Monitor-Mouse station.
 - .4 Usage from a Touchscreen station.
 - .5 Use and behaviour of thin clients.
 - .6 Iconography and symbology for:
 - .1 Pipelines/Process Lines
 - .2 Pumps
 - .3 Valves
 - .4 Instruments
 - .5 Tanks
 - .6 Other Equipment
 - .7 Display and Entry
 - .1 Read-Only Analog Values
 - .2 Read/Write Analog Values
 - .1 Including requirements to limit invalid or unauthorized entries
 - .3 Momentary Pushbuttons
 - .1 Including requirements to limit unauthorized entries and optional warning messages.
 - .2 Latched Switches Including requirements to limit unauthorized entry and optional warning messages.
 - .4 Static Text
 - .5 Animated Text Displays
 - .6 Embedded Trends on Process Screens
 - .8 Process Screen hierarchy:
 - .1 Process Level 0: Town Map with navigation links on the map corresponding to sites monitored from this system.
 - .1 Process Level 0 shall indicate key performance indicators for each station.
 - .2 Process Level 1: Plant Overview Dashboard(s)

- .1 Process Level 1 shall indicate key performance indicators and/or trends for each plant system
- .3 Process Level 2: Plant System Dashboard(s)
 - .1 Process Level 2 typically provides key performance indicators and trends for the selected system.
- .4 Process Level 3: Plant System Diagrammatic Displays
 - .1 Process Level 3 typically provides simplified Process & Instrumentation Diagrams, illustrating piping connections, equipment, control loops, and indicators, as well as the status of interlocks for the depicted equipment. Some information may instead be captured in Process Level 3 or Level 4.
- .5 Process Level 4: Subsystem/Device Diagnostic Popups
 - .1 These could be used for:
 - .1 Providing operating procedures for individual pieces of equipment.
 - .2 Providing help information for equipment control and diagnostics.
 - .3 Containing detailed shut downs.
 - .4 Containing interlock and permissive information.
- .9 Alarms:
 - .1 Alarm Priorities
 - .1 Guidelines shall include a list of alarms, their priorities, and whether they are latched and require operator reset or whether they self-reset.
 - .2 Alarm Philosophy:
 - .1 Ensure that discussion of Hardware Alarm Dialer is included. Refer to Section 40 78 63 – Alarm Dialers.
 - .2 Identify sequence of alarm annunciation methods, including SMS and Voice telephone calls.
 - .3 Alarm enable/disable functionality.
 - .4 Alarm delay modification functionality.
 - .3 Alarm Indications on Process Screens
 - .4 Alarm Banner
 - .5 Alarm Summary
 - .6 Alarm History
 - .7 Alarm Configuration Page(s)
- .10 Trending and Reporting:
 - .1 Full-Screen Trending Page(s)
 - .2 Full-Screen Reporting Page(s)
 - .1 Guidelines shall note that page(s) will automatically save a snapshot of the reporting page(s) to PDF, automatically saved to the server, daily.

- .2 Guidelines shall include a list of values to be displayed and saved.
- .3 Reporting Data Export:
 - .1 Guidelines shall note that the system will use export functionality to generate a CSV or Microsoft Excel file of daily-calculated values.
 - .2 Guidelines shall include a list of values to be exported.
- .11 Navigation:
 - .1 To Process Screens from others:
 - .1 Between Process Screens.
 - .2 To Alarm Screens from others.
 - .3 Between alarm screens.
 - .4 To Trend Screens from others.
 - .5 Between trend screens.

3.2 INSTALLATION AND LICENSING

- .1 Install all software required for a fully functional VTSCADA system, in accordance with the graphical design guidelines, and alarm philosophy.
- .2 All electronic software licenses to be registered in the name of the City, installed and activated on computers, and original license documentation turned over at completion of contract.
 - .1 Where an email address is required to register software, coordinate with the Town for a general-purpose SCADA email address.

3.3 PROGRAMMING OF HMI SOFTWARE

- .1 Develop HMI graphics in accordance with reviewed HMI Design Guidelines Document.
- .2 Provide graphics screenshots for review and comment by Owner. Revise accordingly.
- .3 Ensure that HMIs automatically power on after a power outage is resolved and power returns.
- .4 Ensure that graphics and all associated systems automatically launch on restart.
- .5 Ensure that all alarm logging is functional, local historical trends are functional, and industry- and software-standard alarm database maintenance is automatically handled as applicable.
- .6 Ensure that graphics and configuration are downloadable from HMI.

3.4 CONFIGURATION OF THIN CLIENTS

- .1 Three touchscreen thin clients are installed in the facility. Configure these to provide automatic-upon-power-on access to the HMI graphics, but logged out of the graphical software such that a passer-by could not modify the system.

3.5 CONFIGURATION OF ALARM DIALING FUNCTIONALITY

- .1 Update existing Controller Programming in accordance with Alarm Philosophy. Refer to 40 78 63 – Alarm Dialers for details on operation of Alarm Dialer.
- .2 Configure VTSCADA software to annunciate alarms using SMS messages via the SMS Modem in accordance with Alarm Philosophy. Refer to Section 40 78 63 – Alarm Dialers for details on SMS Modem.
- .3 Configure VTSCADA software to annunciate alarms using voice calls via the Analog Telephone Adapter (ATA) in accordance with Alarm Philosophy. Refer to section 40 78 63 – Alarm Dialers for details on ATA.

3.6 PROGRAMMING OF DAILY SUMMARY VALUES

- .1 Configure existing controller programming such that daily-summary values, such as minimum, maximum, and average values, identified in the HMI Design guidelines reporting section, are calculated by the controller to be read by the HMI software.

END OF SECTION

Part 1 General**1.1 GENERAL**

- .1 This section describes the Provision, Programming and Installation of Alarm Dialer Hardware in this contract.

1.2 PROGRAMMING SUB-CONTRACTORS

- .1 The work as specified in this section shall be performed by a qualified controls and instrumentation sub-contractor with at least 5 years' experience doing similar work with similar systems.

1.3 ACTION AND INFORMATIONAL SUBMISSIONS

- .1 Submittals: Submit the following items
 - .1 Product Data:
 - .1 Alarm Dialer Hardware
 - .1 Identify model number
 - .2 Paid and free-of-charge software packages, including licensing terms.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Owner-Supplied Services:
 - .1 The Owner shall procure a Voice over IP account to be used by the software alarm dialing system. The Owner shall provide necessary configuration settings to the Contractor to allow for configuration of software.

1.5 MAINTENANCE MATERIAL SUBMISSIONS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals. Including reviewed shop drawings identified above and:
 - .1 Copies of Official License Documentation and Certificates, in name of the Town.
 - .2 Export of alarm configuration in electronic format compatible with software used.
 - .3 Export of modem configuration in electronic format compatible with software used.
 - .4 Electronic copy of Software Installation files for installed software.

1.6 SITE CONDITIONS

- .1 Existing Conditions:
 - .1 A 55W 24 VDC power supply is available in the MCC-4 control section for 24 VDC UPS-backed power. Use this to provide power to the new Alarm Dialer.
 - .2 A telephone line is currently run to the existing SCADA servers. Preserve this connection while adding new Alarm Dialer and Analog Telephone Adapter.

- .3 Server Rack is available with UPS-backed power.

Part 2 Products

2.1 ALARM DIALER

- .1 Alarm Dialer shall be Barnett Engineering ProTalk Link Series, including:
 - .1 Master Module.
 - .2 Telephone Module.
 - .3 PLC Module.

Part 3 Execution

3.1 HARDWARE INSTALLATION

- .1 Supply and Install Hardware Alarm Dialer
 - .1 Supply and install new 1A 24 VDC DIN-rail mount breaker, powered from 24 VDC Power Supply PS1 inside MCC-4 control section.
 - .2 Install Alarm Dialer on DIN-Rail inside MCC-4 control section and supply and install power connection.
 - .3 Supply and install new analog telephone cable from telephone termination board to alarm dialer.
 - .1 Run telephone cable in new rigid metal conduit.
 - .4 Supply and install Ethernet cable between Hardware Alarm Dialer and network switch in same control cabinet
 - .1 Label Ethernet cables on each side indicating “ALM-DLR”

3.2 SOFTWARE INSTALLATION AND LICENSING

- .1 Install alarm dialer configuration software on both servers. Refer to Section 40 62 00 – Computer System Hardware and Accessories for details.
- .2 All electronic software licenses to be registered in the name of the Town, installed and activated on computers, and original license documentation turned over at completion of contract.
 - .1 Where an email address is required to register software, coordinate with the Town for a general-purpose SCADA email address.

3.3 CONFIGURATION OF ALARM DIALING FUNCTIONALITY

- .1 Configuration of Hardware Alarm Dialer
 - .1 Update existing Controller Programming in accordance with Alarm Philosophy. Refer to 40 68 00 – Process Control Software for details on existing controllers and Alarm Philosophy.
 - .2 SCADA software is capable of initiating alarm callouts. Hardware Alarm Dialer shall only initiate callouts if HMI software has failed.
 - .3 Only one controller, the “Alarming Controller”, PLC-3, shall interface with Hardware Alarm Dialer.

- .1 If alarms identified on the Alarm Philosophy are only available on other controllers, configure the Alarming Controller to obtain these via PLC-to-PLC communications.
 - .2 Configure the HMI software to periodically update a changing value, a “heartbeat,” in the Alarming Controller.
 - .3 Configure the Alarming Controller to only initiate alarms in the Hardware Alarm Dialer if the heartbeat stops changing for a length of time identified in the alarming philosophy.
 - .1 Configure the Alarming Controller to initiate alarms in the Hardware Alarm Dialer for alarms identified on the Alarm Philosophy.
 - .4 Configure the Hardware Alarm Dialer to annunciate in English the descriptions identified in the Alarm Philosophy
 - .5 Configure the Hardware Alarm Dialer to call specific operators at specific times as identified in the Alarm Philosophy.
- .2 Configuration of SMS Modems
- .1 Coordinate with Owner, who will provide VoIP account settings for configuring alarm callout software
 - .2 Configure VTSCADA software to annunciate alarms in accordance with the Alarm Philosophy using VoIP.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Requirements to verify and commission graphical and control elements for the control system.
- .2 Section supplements, but does not supersede, specific requirements of other Sections.

1.2 REFERENCES

- .1 Definitions:
 - .1 Pre-Start Up: The work required to bring the project to a state or readiness for placing systems into service. Includes field quality control checks, including manufacturer “commissioning” for individual products and subsystems.
 - .2 Start-Up: The work required to verify performance of the products, subsystems and overall system operates as expected. Includes both manual and automatic performance checks. Also known as Site-Acceptance Testing.
 - .3 Burn-In: The operational period in which all systems are placed into automatic operation and allowed to operate as normal. Additional requirements, such as provision of testing water may be required to initiate automatic operation of equipment.
 - .4 Commissioning: The combined activities of Pre-Start-Up, Start-Up, and Burn-In.

1.3 ADMINISTRATIVE REQUIREMENTS:

- .1 Coordination:
 - .1 Owner will observe some or all Pre-Start-Up, Start-up, and Burn-in activities at their discretion.
 - .1 Request, in writing, a Start-Up Inspection by Owner.
 - .2 Give 14 days notice before Start-Up Inspection.
 - .2 Owner’s Performance Testing: Performance testing of equipment or systems by Owner will not relieve Contractor from compliance with specified start-up and testing procedures.
 - .3 Cooperate fully with Owner during stages of acceptance and occupancy of facility.
- .2 Start-Up Workshop
 - .1 At 60 % construction completion stage, schedule Progress Workshop with Owner to review progress, discuss schedule of equipment start-up activities and prepare for Commissioning. Agenda topics include the following:
 - .1 Review duties and responsibilities of Contractor and Subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of Subcontractors and manufacturer’s representatives in the process.
 - .3 Contingency plans to respond to potential emergencies.
 - .4 Safety and environmental considerations.

- .2 Meeting will be chaired by Owner, who will record and distribute minutes.
- .3 Ensure Subcontractors and relevant manufacturer representatives are present at 60 % construction completion stage, at subsequent Commissioning meetings, and when otherwise required.
- .3 Observation of Starting and Testing:
 - .1 Owner will observe start-up and commissioning.
- .4 Conflicts:
 - .1 Report conflicts between requirements of this Section and other Sections to Owner and obtain interpretation or clarification before starting commissioning work.
 - .2 Failure to report conflicts and obtain interpretation or clarification will result in application of the more stringent requirement.
- .5 Excess Administration:
 - .1 Contractor shall pay the Owner costs related to excess contract administration if third and subsequent verifications occur where:
 - .1 Verification of reported results fail to receive Owner 's acceptance,
 - .2 Repetition of second verification again fails to receive acceptance, or
 - .3 Owner deems Contractor's request for second verification was premature.
 - .2 The cost of the Owenr's excess contract administration will be based on a rate of \$200 per hour.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Commissioning Schedule:
 - .1 Create and submit detailed Commissioning schedule
 - .2 Allow in the schedule adequate time for Commissioning activities prescribed in technical specification Sections and commissioning Sections including:
 - .1 Acceptance of Commissioning reports
 - .2 Verification of reported results
 - .3 Repairs, retesting, re-commissioning, and re-verification
 - .4 Training
- .2 Start-Up Documentation:
 - .1 Assemble start-up documentation and submit to Owner for review and acceptance before beginning commissioning.
 - .2 Start-up documentation to include:
 - .1 Site-Acceptance Testing (SAT) Plan: A procedure for testing all aspects of the functions of the graphics configurations, including communication to all devices, alarms, trends, historical logging, navigation, pushbuttons, switches, and any other features of the logic. It shall:
 - .1 Identify responsibilities of each party.
 - .2 Contain contingency plans to respond to potential emergencies.

- .3 Identify any owner-provided resources required to test equipment/functionality.
- .4 Safety and environmental considerations.
- .5 Sequence of events and start-up schedule.
 - .1 If commissioning will be broken into multiple commissioning packages, identify which products and systems will be commissioned by which package.
- .6 Plan shall be broken into individual tests including:
 - .1 Description of Test: Identify the testing procedure and expected outcome, including actual process changes expected and/or any simulations required.
 - .2 Tag: Identify the HMI tag(s) associated with the testing procedure.
 - .3 Animation: Check box indicating the expected behaviours were verified using the graphics.
 - .4 Alarm: Check box indicating confirmation of the expected alarm notification in the graphics system.
 - .5 Contractor sign-off.
 - .6 Owner sign-off.
 - .7 SAT to be generally conducted in manual mode first, followed by automatic operation.

Part 2 Products

Not used

Part 3 Execution

3.1 ENVIRONMENTAL PROTECTION

- .1 Comply with all requirements of federal, provincial and local jurisdictions having authority.

3.2 STARTING AND TESTING

- .1 Contractor to provide and pay costs of the following:
 - .1 inspections, including disassembly and re-assembly after approval, and for starting, testing, adjusting, and
 - .2 temporary testing equipment.

3.3 PRE-START-UP

- .1 Conduct networking tests, including but not limited to ping checks.

3.4 START-UP

- .1 Conduct Site-Acceptance Testing, in accordance with SAT plan, witnessed by the Owner

- .2 Correct any deficiencies uncovered during testing.
- .3 Owner shall assist in Start-Up process, operating equipment and systems, troubleshooting, and making adjustments as required.
 - .1 Make adjustments as needed, during these checks, to enhance performance and meet environmental or user requirements.
- .4 Provide written documentation of all tests successfully completed, with deficiencies corrected, to Owner.
- .5 Provide training of new system. Training to be provided in two x 4 hour training blocks. Coordinate with Owner for dates and times to conduct training.

3.5 BURN-IN

- .1 For the burn-in period, both the existing and the new graphics systems shall operate concurrently. Operations are asked to exclusively use the new graphics system and report any operational issues, inconsistencies or comments during that time.
 - .1 Incidents should be noted with a timestamp of the occurrence.
- .2 For burn-in period, Contractor's commissioning team shall be available to respond to requests for assistance by Engineer or Owner. Team to consist of representatives of Contractor and Contractor's mechanical, electrical and instrumentation staff or subcontractors, as appropriate.
- .3 Contractor's commissioning team to be available within 4 hours' notice during burn-in period. Contractor's representative and the commissioning team may be required to be at site outside of normal working hours during the burn-in period, at the discretion of Owner or Engineer and shall be available within four hours' notice.
- .4 Period of time for continuous automatic operation for acceptance of burn-in is 80 hours with all systems operating continuously without fault and functioning in accordance with specified rates, methods and performance.
- .5 Failure of any part of Work during the period of continuous automatic operation will require restart of that portion or system of Work, following rectification of the fault or failure.
- .6 If it is necessary to suspend start-up, commissioning or continuous operation during the commissioning period due to deficiencies or failure in any system, the full cost of interruption, call-back, testing and resumption of start-up, commissioning, or continuous operation shall be paid by Contractor.

END OF SECTION