Functional Specification

Lift Stations

Las Virgenes Municipal Water District

Calabasas, CA

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Revision History

Rev	Date	Author	Description
A	Dec 18th, 2020	Shereef Elbarbary	For Review
C	June 7th 2021	Brian Bocchicchio	Added Sump Pump to Design

Table of Contents

1 Lift Stations Process Control Description

Process Areas Involved:

- Lift Station #1 (PLC 23 & PLC 42)
- Lift Station #2 (PLC 24 & PLC 43)

1.1 Reference Documents

1. Site Drawings
2. Network Drawing
3. P&IDs
   - 6518021-PID-01 - Lift Station Process & Instrumentation Diagram
4. I/O List
5. Instrument List
6. Vendor O&M and Configuration Manuals

Note: Although not always shown, all tag names in this document are proceeded by "LS1_" or "LS2_" unless otherwise noted.

1.2 Process Summary

1.2.1 | Background

1. The Las Virgenes Municipal Water District, located in Calabasas, California, is a tertiary treatment facility, receiving wastewater from the Western Los Angeles County and Eastern Ventura County and discharging treated effluent using it to irrigate public and commercial landscaping, or discharge to Malibu Creek.

2. Each Lift Station is equipped with three pumps (MN-1100X, MN-1200X) and a generator (JN-11015, JN-12015) as a backup power source. The pumps maintain around 75-80 inches of wastewater in each respective wet well (LIT-11005, LIT-12005) before beginning to pump to the next stage. The flow indicators (FIT-1100X, FIT-1200X) monitors the sewer flow while the carbon scrubbers (XN-11014, XN-12014) scrub the Hydrogen Sulfide (H_2S) in the wet wells. Once the wastewater leaves the Lift Station number 1, it proceeds to Lift Station number 2. Once flow leaves Lift Station number 2 it then proceeds to the Wastewater Collection System.

1.2.2 | Process Operation

What brings the lift stations into service?

1. Station never stops; however flow can be partially diverted to the City of Los Angeles.
   A. Diversion going to the City of Los Angeles is a manual operation utilizing a flow diversion valve.
2. When the LIT-11005 goes above 75 inches a lift station lead pump will kick on
   A. When lead pump reaches 95% the lag pump will be called to start
   B. Lag2 will start once lead lag1 hit 95% pumping capacity
3. Lag2 will be called to stop once the speed feedback hits 60%
   A. Lag1 and lead will follow the same convention

1.3 Process Monitoring and Control PLC I/O Parameters

The PLC designated Lift_Station_1_PLC and Lift_Station_2_PLC are located in the Lift Station buildings and perform data acquisition and control for the following general categories of input and output parameters associated with the Lift Station process.

1.3.1 | Analog Inputs

1. Lift Station Pumps 1-3
    A. Speed Feedback
    B. Temperature
    C. Vibration
    D. Flow (MGD)
2. Lift Station Wet well level (Bubbler)
3. Lift Station Wet well level (Ultrasonic)
4. Oxygen (O_2) Sensor (19.5%-22%)
5. Combustible gas sensor (0-100%)
6. Hydrogen Sulfide (H_2S) (0-50 mg/L or PPM)
7. Air compressor pressure (0-300 PSI)

1.3.2 | Analog Outputs

1. Lift Station Pumps 1-3 speed setpoint

1.3.3 | Digital Inputs

1. Lift Station Pumps 1-3 run/off/fault
    A. high temperature
    B. auto (remote)
    C. reverse flow
2. Valve A and B open/close/fault
3. Generator run/off/fault
4. Drywell Flooded fault
5. Bubbler low pressure
6. Wet well level high
7. AC power fail
8. UPS battery level low
9. Transfer switch on emergency
10. Station air compressor fail
11. Scrubber running
12. Sump Pump Running

1.3.4 | Digital Outputs

1. Lift Station Pumps 1-3 Start command

2. Valve A and B open command
3. Bubbler purge

1.3.5 | Computed Points

1. Lift Station Pumps 1-3 runtime
2. Lift Station Generator runtime

1.4 General Control Description

Key operational goals:

1. Maintain wet well level between 75-80 inches
2. Provide operational monitoring of pump status (on/off/fault/auto), pump flow (MGD), wet well indication, oxygen level, pump temperature, pump speed, UPS, generator status (on/off/fault), compressor (fail/pressure), pump vibration alarming, combustible gas sensor, hydrogen sulfide sensor, valve (opened/closed/auto)

1.5 Hardwired Controls and Interlocks

To facilitate non-PLC manual operation, all components in the Lift Station have the capability of Local Manual control at the component Local Control Stations (LCSs). Control modes for each component operate as follows:

1. N/A

1.6 PLC-based Process Monitoring and Control

1.6.1 | For all lift station components, the PLC will monitor all statuses and process parameters available at the LCSs:

1. Lift station pump: running/off/fault/temperature/flow/temperature fail/reverse flow/auto/vibration alarm/vibration reading/speed/pump start
2. Pump station: temperature
3. Scrubber: running/off
4. Valve: opened/closed/auto
5. Wet well: level (reference on 0-170 inches)/level (reference 0-26 FT)/wet well level high
6. Oxygen: level sensor
7. Hydrogen Sulfide (H_2S): level sensor
8. Compressor: pressure/fault
9. Generator: running/off/fault
10. Power: ac power fault/transfer emergency switch
11. UPS: battery level low
12. Drywell: drywell flooded
13. Bubbler: low air pressure fault

1.6.2 | Lift Station PLC-based Control Modes – Pumps

1. When pumps are set to PLC-AUTO they will operate to regulate wet well level between 75-80 inches as indicated by plant staff. When in PLC-AUTO the three pumps will utilize a Lead-Lag1-Lag2 designation.
    a. Pump Starting Conditions
        i. This designation will operate as follows: Lead pump is the first pump that will turn on when the wet well reaches an operator adjustable on setpoint of 75 inches. Once the pump turns on the pump will utilize PID control to maintain the operator setpoint between 75 and 80 inches.
        ii. If the wet well rises too fast for the lead pump to keep up the Lag1 pump will turn on (based upon lead pump reaching 95% speed feedback).
            1. Once Lag1 pump is started it will be regulated by the speed commands dictated by the PID control.
        iii. If the wet well rises too fast for the lead and Lag1 pump to keep up the Lag2 pump will turn on (based upon lead and Lag1 pump reaching 95% speed feedback).
            1. Once Lag2 pump is started it will be regulated by the speed commands dictated by the PID control.
    b. Pump Stopping Conditions
        i. The Lag2 pump will first turn off if the Lead and Lag1 pump speed feedback is less than or equal to 60%
        ii. Lag1 pump will be the second to turn off if the Lead pump speed is less than or equal to 60%
        iii. The Lead pump will turn off if wet well is less than or equal to an operator adjustable value of 40 inches.
            1. In this event all pumps will be called to stop if in Auto
2. Operator will have the option to use either the ultrasonic or bubbler wet well reading for control of the lift station. This will be selectable via a toggle button.
3. If any pump is “running” and there is no flow on the meter a “no flow alarm will be generated”.
4. Pumps in PLC-AUTO will have a start delay and stop delay timer of 3 seconds.
5. When pumps are set to PLC-MANUAL they will operate based upon the operator’s entered setpoint. The pumps minimum speed 40% (possibly 25 Hz) should be considered for both PLC-MANUAL and PLC-AUTO. Pump speed should not go below the minimum setting to avoid damage to pump.
6. All pumps collectively should operate in either PLC-AUTO or PLC-MANUAL.
7. If devices are switched from PLC-AUTO to PLC-MANUAL pumps should utilize bumpless transfer of speed commands to ensure pumps do not jump or drop too dramatically during the transition.
8. Normal operation of lift station can use up to all three pumps at one given time.
9. Pumps will be cycled from (lead ← lag1← lag2 ←lead) every 12 hours (9am – 9pm)
    a. Will need to make sure that there is a bumpless transfer on “pump cycling”
    b. Pumps will also utilize this cycling if they fail to start in Auto.
10. Runtime for pumps shall be recorded to the Wonderware historian
11. Sump Pump

a. If sump pump is running for an operator adjustable amount of time (15 minutes) a discrete alarm will be activated

12. Compressor
    a. If sump pump is running for an operator adjustable amount of time (15 minutes) a discrete alarm will be activated

1.6.3 | Lift Station PLC-based Control Modes – Valves

1. Valve A (16") and Valve B (10"). Valves in PLC-AUTO will operate in the following fashion. Valve A will be in service when pumps are active. Valve A or B open status should serve as a permissive before pumps start. If flow becomes too high 90" the Valve B should be called to open.
    i. SWI (Software interlock)
        1. If both valves are closed no pumps can start in PLC-AUTO and PLC MANUAL
2. Valves in PLC-MANUAL will be called to open or close based upon the operator selection. The Valve A or B should remain open while the lift station is in service.
3. In the case of a faulted Valve A the Valve B should be called to open if the lift station is in service.

1.7 Control Location

1. The control logic for this process will reside in Lift_Station_1_PLC and Lift_Station_2_PLC located on the Lift Station buildings.
2. Local Control Stations are located at the Lift Station building. Vendor-provided control panels are located at the Lift Station building.

1.8 Process Displays

A. Process displays for monitoring and operator interaction with the process will be developed for the HMI by the OWNER's Application Programmer and refined through workshops conducted by the OWNER's Application Programmer with the OWNER'S stakeholders.

B. Each HMI display will contain targets to access related displays and equipment control faceplates. The existing lift station unit process display and equipment detail and system status displays will be revised for this project as described below. Auxiliary pop-up displays, to serve as faceplates, data entry windows etc. will be developed as required. To the greatest extent possible, follow the OWNER'S process display standards and utilize or customize the OWNER'S existing HMI screen objects and display templates.

C. Displays will conform to best practices for operator interfaces and contain the following objects:
    1. Pumps operating status
    2. Pump speed feedback/setpoint
    3. Pump vibration alarm
    4. Pump temperature alarm
    5. Valve operating status
    6. Hydrogen sulfide sensor reading
    7. Generator status
    8. Scrubber status

9. Bubbler status
10. AC power status
11. Wet well level
12. Wet well PLC-AUTO Setpoint

1.9 Trends

Develop the following trend display for the HMI:

- Pump flow, speed, wet well level, compressor air pressure

1.10 Alarms

A. OWNER will provide its existing HMI and PLC objects for the OWNER's Application Programmer's use to the extent that they apply to the Work. The OWNER's Application Programmer will develop other objects and control logic as needed to meet the control and monitoring requirements.

B. The Application Programmer will conduct Alarm Rationalization Workshop to review existing alarms and alarms listed herein to determine which alarms will be configured prior to implementation.

C. Alarms will be initiated through the PLC for the following conditions:

1. PLC Alarm Monitoring – Pumps (1-3)
    a) Fail to start/stop
    b) Fault
    c) Vibration alarming
    d) Reverse flow
    e) Temperature alarm
    f) Pump not in Auto
2. PLC Alarm Monitoring – Valves (A-B)
    a) Fail to open/close
3. PLC Alarm Monitoring – Pump Station
    a) Temperature alarm
4. PLC Alarm Monitoring – Wet well
    a) High level (90 inches)
    b) High High level (100 inches)
    c) Low level (40 inches)
5. PLC Alarm Monitoring – Oxygen (O_2) Sensor
    a) Low level (19.5)
6. PLC Alarm Monitoring – Hydrogen Sulfide
    a) High level (10%)
7. PLC Alarm Monitoring – Compressor
    a) Fault
8. PLC Alarm Monitoring – Generator/Power
    a) Generator Fault
    b) AC Power Fault
    c) Transfer Emergency Switch/On Generator Power
9. PLC Alarm Monitoring – UPS
    a) Battery low
10. PLC Alarm Monitoring – Drywell
    a) Flooded alarm
11. PLC Alarm Monitoring – Bubbler
    a) Low air pressure fault
12. PLC Alarm Monitoring – Combustible Gas
    a) High level (0-10% 9% as the high)
13. Sump Pump
    a) Runtime Alarm (Pump runs for longer than 15 minutes)
14. Compressor
    a) Runtime Alarm (Compressor runs for longer than 15 minutes)

1.11 Intouch Edge

The lift stations, in addition to the HMI controls located at the Tapia facility, will utilize a set of panel mount controls. Each lift station will have its own PPC-321 1SW 21.5" display. These panel mount controls will have the ability to write and read all desired values from the PLC as it regards to the particular lift station.

Intouch Edge will exchange event driven data with the System Platform Galaxy Repository ensuring proper synchronization. Intouch Edge will utilize its own development environment with the ability to link System Platform tags as well as be hosted within the Galaxy Repository.

Intouch Edge has the ability to be remotely managed by the Galaxy Repository in order to stop runtime, start runtime, and download new configurations to the remote panel.

If datalink is lost between Intouch Edge panel and Tapia PCS network the data that is typically logged to the historian will be logged locally to the Intouch Edge panel. When connection is restored to the Galaxy Repository the data will then be forwarded to the Wonderware Historian ensuring no gap in data.

2 Current Lift Stations IO

This section lists all the current IO as they will be positioned into the new cards

R=Rack, S=Slot, C= Channel

2.1 Lift Station #1 IO

Tag name	Description	IO Type	Current Cabinet	R/L	Card	R	S	C
None	PLC	Other	PLC 23	LOCAL	1769-L30ER	0	0	
LS1_TIT_11001	LIFT STATION 1 PUMP 1 RTD 100 OHM PLATINUM EXISTING	AI	PLC 23	LOCAL	1769-IR6	0	1	0
LS1_TIT_11002	LIFT STATION 1 PUMP 2 RTD 100 OHM PLATINUM THREE WIRE, BOLT ON, THERM X 830 B 36	AI	PLC 23	LOCAL	1769-IR6	0	1	1
LS1_TIT_11003	LIFT STATION 1 PUMP 3 RTD 100 OHM PLATINUM EXISTING	AI	PLC 23	LOCAL	1769-IR6	0	1	2
LS1_TIT_PS	LIFT STATION 1 PUMP STATION TEMO 100 OHM PLATINUM THREE WIRE, BOLT ON, THERM X 830 B 36	AI	PLC 23	LOCAL	1769-IR6	0	1	3
Spare	SPARE	AI	PLC 23	LOCAL	1769-IR6	0	1	4
Spare	SPARE	AI	PLC 23	LOCAL	1769-IR6	0	1	5
LS1_LIT_11005_ROS	LIFT STATION 1 WET WELL LEVEL ROSEMOUNT 2088 BUBBLER	AI	PLC 23	LOCAL	1769-IF4I	0	2	0
LS1_FIT_11001	LIFT STATION 1 PUMP 1 FLOW KROHNE 1FC 2020F	AI	PLC 23	LOCAL	1769-IF4I	0	2	1
LS1_FIT_11002	LIFT STATION 1 PUMP 2 FLOW KROHNE 1FC 2020F	AI	PLC 23	LOCAL	1769-IF4I	0	2	2
LS1_FIT_11003	LIFT STATION 1 PUMP 3 FLOW KROHNE 1FC 2020F	AI	PLC 23	LOCAL	1769-IF4I	0	2	3
LS1_FT_11001	LIFT STATION 1 PUMP 1 SPEED FEEDBACK CUTLER HAMMER SV9000	AI	PLC 23	LOCAL	1769-IF4I	0	3	0
LS1_FT_11002	LIFT STATION 1 PUMP 2 SPEED FEEDBACK CUTLER HAMMER SV9000	AI	PLC 23	LOCAL	1769-IF4I	0	3	1
LS1_FT_11003	LIFT STATION 1 PUMP 3 SPEED FEEDBACK CUTLER HAMMER SV9000	AI	PLC 23	LOCAL	1769-IF4I	0	3	2
LS1_LIT_11005_SIEM	LIFT STATION 1 WET WELL LEVEL SIEMENS MILLTRONICS, 7ML10341AA1 ULTRASONIC	AI	PLC 23	LOCAL	1769-IF4I	0	3	3
LS1_AIT_11009	LIFT STATION 1 OXYGEN LEVEL MSA A ULTX SENS 12 1 0-25%	AI	PLC 23	LOCAL	1769-IF4I	0	4	0

LS1_AIT_11010	LIFT STATION 1 COMBUSTIBLE GAS MSA A ULTX SENS 31 1	AI	PLC 23	LOCAL	1769-IF4I	0	4	1
LS1_AIT_11011	LIFT STATION 1 HYDROGEN SULFIDE MSA A ULTX SENS 16 1	AI	PLC 23	LOCAL	1769-IF4I	0	4	2
LS1_PT_AIR_COMPRESSOR	LIFT STATION 1 AIR COMPRESSOR PRESSURE, ROSEMOUNT 3051TG 4A2B21A M5	AI	PLC 23	LOCAL	1769-IF4I	0	4	3
LS1_FC_11001	LIFT STATION 1 PUMP 1 SPEED SETPOINT CUTLER HAMMER SV9000	AO	PLC 23	LOCAL	1769-OF4VI	0	5	0
LS1_FC_11002	LIFT STATION 1 PUMP 2 SPEED SETPOINT CUTLER HAMMER SV9000	AO	PLC 23	LOCAL	1769-OF4VI	0	5	1
LS1_FC_11003	LIFT STATION 1 PUMP 3 SPEED SETPOINT CUTLER HAMMER SV9000	AO	PLC 23	LOCAL	1769-OF4VI	0	5	2
SPARE	SPARE	AO	PLC 23	LOCAL	1769-OF4VI	0	5	3
LS1_PB_ALM_RESET	LIFT STATION 1 PLC ALARM RESET PUSHBUTTON	DI	PLC 23	LOCAL	1769-IA8I	0	6	0
LS1_AC_POWER_FAIL	LIFT STATION 1 AC POWER FAIL	DI	PLC 23	LOCAL	1769-IA8I	0	6	1
LS1_YSR_SUMP_PUMP	LIFT STATION 1 SUMP PUMP RUNNING	DI	PLC 23	LOCAL	1769-IA8I	0	6	2
LS1_YSF_UPS	LIFT STATION 1 UPS BATTERY LEVEL LOW	DI	PLC 23	LOCAL	1769-IA8I	0	6	3
LS1_YSA_11001	LIFT STATION 1 PUMP 1 AUTO	DI	PLC 23	LOCAL	1769-IA8I	0	6	4
LS1_YSA_11002	LIFT STATION 1 PUMP 2 AUTO	DI	PLC 23	LOCAL	1769-IA8I	0	6	5
LS1_YSA_11003	LIFT STATION 1 PUMP 3 AUTO	DI	PLC 23	LOCAL	1769-IA8I	0	6	6
LS1_YSR_GEN	LIFT STATION 1 GENERATOR RUNNING	DI	PLC 23	LOCAL	1769-IA8I	0	6	7
LS1_YA_GEN	LIFT STATION 1 GENERATOR ALARM	DI	PLC 23	LOCAL	1769-IA8I	0	7	0
LS1_ZSO_11016	LIFT STATION 1 VALVE A OPEN LIMIT	DI	PLC 23	LOCAL	1769-IA8I	0	7	1
LS1_ZSO_11017	LIFT STATION 1 VALVE B OPEN LIMIT	DI	PLC 23	LOCAL	1769-IA8I	0	7	2
LS1_LSH_DRYWELL	LIFT STATION 1 DRYWELL FLOODED	DI	PLC 23	LOCAL	1769-IA8I	0	7	3
LS1_PSL_BUBBLER	LIFT STATION 1 BUBBLER LOW AIR PRESSURE	DI	PLC 23	LOCAL	1769-IA8I	0	7	4
LS1_LSH_WETWELL	LIFT STATION 1 WETWELL LEVEL HIGH	DI	PLC 23	LOCAL	1769-IA8I	0	7	5
LS1_YS_TRNS_SWITCH	LIFT STATION 1 TRANSFER SWITCH ON EMERGENCY	DI	PLC 23	LOCAL	1769-IA8I	0	7	6
LS1_PSLL_SAC	LIFT STATION 1 STATION AIR COMPRESSOR FAIL	DI	PLC 23	LOCAL	1769-IA8I	0	7	7
LS1_YL_11001	LIFT STATION 1 PUMP 1 RUNNING	DI	PLC 23	LOCAL	1769-IA8I	0	8	0
LS1_YA_11001	LIFT STATION 1 PUMP 1 FAIL	DI	PLC 23	LOCAL	1769-IA8I	0	8	1
LS1_YL_11002	LIFT STATION 1 PUMP 2 RUNNING	DI	PLC 23	LOCAL	1769-IA8I	0	8	2

LS1_YA_11002	LIFT STATION 1 PUMP 2 FAIL	DI	PLC 23	LOCAL	1769-IA8I	0	8	3
LS1_YL_11003	LIFT STATION 1 PUMP 3 RUNNING	DI	PLC 23	LOCAL	1769-IA8I	0	8	4
LS1_YA_11003_FAIL	LIFT STATION 1 PUMP 3 FAIL	DI	PLC 23	LOCAL	1769-IA8I	0	8	5
LS1_YSR_SCRUBBER	LIFT STATION 1 SCRUBBER RUNNING	DI	PLC 23	LOCAL	1769-IA8I	0	8	6
SPARE	SPARE	DI	PLC 23	LOCAL	1769-IA8I	0	8	7
None	EtherNet	Other	PLC 23	REMOTE	1769-AENTR	1	0	
LS1_ZSA_11016	LIFT STATION 1 VALVE A AUTO	DI	PLC 23	REMOTE	1769-IA8I	1	1	0
LS1_ZSA_11017	LIFT STATION 1 VALVE B AUTO	DI	PLC 23	REMOTE	1769-IA8I	1	1	1
LS1_TA_11001	LIFT STATION 1 PUMP 1 TEMP FAIL	DI	PLC 23	REMOTE	1769-IA8I	1	1	2
LS1_FA_11001	LIFT STATION 1 PUMP 1 REVERSE FLOW	DI	PLC 23	REMOTE	1769-IA8I	1	1	3
LS1_TA_11002	LIFT STATION 1 PUMP 2 TEMP FAIL	DI	PLC 23	REMOTE	1769-IA8I	1	1	4
LS1_FA_11002	LIFT STATION 1 PUMP 2 REVERSE FLOW	DI	PLC 23	REMOTE	1769-IA8I	1	1	5
LS1_TA_11003	LIFT STATION 1 PUMP 3 TEMP FAIL	DI	PLC 23	REMOTE	1769-IA8I	1	1	6
LS1_FA_11003	LIFT STATION 1 PUMP 3 REVERSE FLOW	DI	PLC 23	REMOTE	1769-IA8I	1	1	7
LS1_COMMON_ALARM_OUTPUT	LIFT STATION 1 COMMON ALARM OUTPUT	DO	PLC 23	REMOTE	1769-OW8I	1	2	0
LS1_YZ_BUBBLER	LIFT STATION 1 BUBBLER PURGE	DO	PLC 23	REMOTE	1769-OW8I	1	2	1
LS1_HC_11001	LIFT STATION 1 PUMP 1 START/STOP	DO	PLC 23	REMOTE	1769-OW8I	1	2	2
LS1_HC_11002	LIFT STATION 1 PUMP 2 START/STOP	DO	PLC 23	REMOTE	1769-OW8I	1	2	3
LS1_HC_11003	LIFT STATION 1 PUMP 3 START/STOP	DO	PLC 23	REMOTE	1769-OW8I	1	2	4
LS1_ZI_11016	LIFT STATION 1 VALVE A OPEN	DO	PLC 23	REMOTE	1769-OW8I	1	2	5
LS1_ZI_11017	LIFT STATION 1 VALVE B OPEN	DO	PLC 23	REMOTE	1769-OW8I	1	2	6
SPARE	SPARE	DO	PLC 23	REMOTE	1769-OW8I	1	2	7
LS1_VIT_PUMP1	LIFT STATION 1 PUMP 1 VIBRATION READING	AI	PLC 23	REMOTE	1769-IF4I	1	3	0
LS1_VIT_PUMP2	LIFT STATION 1 PUMP 2 VIBRATION READING	AI	PLC 23	REMOTE	1769-IF4I	1	3	1
LS1_VIT_PUMP3	LIFT STATION 1 PUMP 3 VIBRATION READING	AI	PLC 23	REMOTE	1769-IF4I	1	3	2
Spare	SPARE	AI	PLC 23	REMOTE	1769-IF4I	1	3	3
SPARE MODULE	SPARE MODULE	ANY	PLC 23	REMOTE	ANY	1	4	
SPARE MODULE	SPARE MODULE	ANY	PLC 23	REMOTE	ANY	1	5	
SPARE MODULE	SPARE MODULE	ANY	PLC 23	REMOTE	ANY	1	6	
SPARE MODULE	SPARE MODULE	ANY	PLC 23	REMOTE	ANY	1	7	
SPARE MODULE	SPARE MODULE	ANY	PLC 23	REMOTE	ANY	1	8	

2.2 Lift Station #2 IO

Tag name	Description	IO Type	Current Cabinet	R/L	Card	R	S	C
None	PLC	Other	PLC 24	LOCAL	1769-L30ER	0	0	
LS2_TIT_11001	LIFT STATION 2 PUMP 1 RTD 100 OHM PLATINUM EXISTING	AI	PLC 24	LOCAL	1769-IR6	0	1	0
LS2_TIT_11002	LIFT STATION 2 PUMP 2 RTD 100 OHM PLATINUM THREE WIRE, BOLT ON, THERM X 830 B 36	AI	PLC 24	LOCAL	1769-IR6	0	1	1
LS2_TIT_11003	LIFT STATION 2 PUMP 3 RTD 100 OHM PLATINUM EXISTING	AI	PLC 24	LOCAL	1769-IR6	0	1	2
LS2_TIT_PS	LIFT STATION 2 PUMP STATION TEMO 100 OHM PLATINUM THREE WIRE, BOLT ON, THERM X 830 B 36	AI	PLC 24	LOCAL	1769-IR6	0	1	3
Spare	SPARE	AI	PLC 24	LOCAL	1769-IR6	0	1	4
Spare	SPARE	AI	PLC 24	LOCAL	1769-IR6	0	1	5
LS2_LIT_11005_ROS	LIFT STATION 2 WET WELL LEVEL ROSEMOUNT 2088 BUBBLER	AI	PLC 24	LOCAL	1769-IF4I	0	2	0
LS2_FIT_11001	LIFT STATION 2 PUMP 1 FLOW KROHNE 1FC 2020F	AI	PLC 24	LOCAL	1769-IF4I	0	2	1
LS2_FIT_11002	LIFT STATION 2 PUMP 2 FLOW KROHNE 1FC 2020F	AI	PLC 24	LOCAL	1769-IF4I	0	2	2
LS2_FIT_11003	LIFT STATION 2 PUMP 3 FLOW KROHNE 1FC 2020F	AI	PLC 24	LOCAL	1769-IF4I	0	2	3
LS2_FT_11001	LIFT STATION 2 PUMP 1 SPEED FEEDBACK CUTLER HAMMER SV9000	AI	PLC 24	LOCAL	1769-IF4I	0	3	0
LS2_FT_11002	LIFT STATION 2 PUMP 2 SPEED FEEDBACK CUTLER HAMMER SV9000	AI	PLC 24	LOCAL	1769-IF4I	0	3	1
LS2_FT_11003	LIFT STATION 2 PUMP 3 SPEED FEEDBACK CUTLER HAMMER SV9000	AI	PLC 24	LOCAL	1769-IF4I	0	3	2
LS2_LIT_11005_SIEM	LIFT STATION 2 WET WELL LEVEL SIEMENS MILLTRONICS, 7ML10341AA1, 7NL1106 1EA20 0 A, 7ML1830 2AM RANGE ULTRASONIC	AI	PLC 24	LOCAL	1769-IF4I	0	3	3
LS2_AIT_11009	LIFT STATION 2 OXYGEN LEVEL MSA A ULTX SENS 12 1 0-25%	AI	PLC 24	LOCAL	1769-IF4I	0	4	0
LS2_AIT_11010	LIFT STATION 2 COMBUSTIBLE GAS MSA A ULTX SENS 31 1	AI	PLC 24	LOCAL	1769-IF4I	0	4	1
LS2_AIT_11011	LIFT STATION 2 HYDROGEN SULFIDE MSA A ULTX SENS 16 1	AI	PLC 24	LOCAL	1769-IF4I	0	4	2
LS2_PT_AIR_COMPRESSOR	LIFT STATION 2 AIR COMPRESSOR PRESURE, ROSEMOUNT 3051TG 4A2B21A M5	AI	PLC 24	LOCAL	1769-IF4I	0	4	3

LS2_FC_11001	LIFT STATION 2 PUMP 1 SETPOINT CUTLER HAMMER SV9000	AO	PLC 24	LOCAL	1769-OF4VI	0	5	0
LS2_FC_11002	LIFT STATION 2 PUMP 2 SETPOINT CUTLER HAMMER SV9000	AO	PLC 24	LOCAL	1769-OF4VI	0	5	1
LS2_FC_11003	LIFT STATION 2 PUMP 3 SETPOINT CUTLER HAMMER SV9000	AO	PLC 24	LOCAL	1769-OF4VI	0	5	2
Spare	SPARE	AO	PLC 24	LOCAL	1769-OF4VI	0	5	3
LS2_PB_ALM_RESET	LIFT STATION 2 PLC ALARM RESET PB	DI	PLC 24	LOCAL	1769-IA8I	0	6	0
LS2_AC_POWER_FAIL	LIFT STATION 2 AC POWER FAIL	DI	PLC 24	LOCAL	1769-IA8I	0	6	1
LS2_YSR_SUMP_PUMP	LIFT STATION 2 SUMP PUMP RUNNING	DI	PLC 24	LOCAL	1769-IA8I	0	6	2
LS2_YSF_UPS	LIFT STATION 2 UPS BATTERY LEVEL LOW	DI	PLC 24	LOCAL	1769-IA8I	0	6	3
LS2_YSA_11001	LIFT STATION 2 PUMP 1 AUTO	DI	PLC 24	LOCAL	1769-IA8I	0	6	4
LS2_YSA_11002	LIFT STATION 2 PUMP 2 AUTO	DI	PLC 24	LOCAL	1769-IA8I	0	6	5
LS2_YSA_11003	LIFT STATION 2 PUMP 3 AUTO	DI	PLC 24	LOCAL	1769-IA8I	0	6	6
LS2_YSR_GEN	LIFT STATION 2 GENERATOR RUNNING	DI	PLC 24	LOCAL	1769-IA8I	0	6	7
LS2_YA_GEN	LIFT STATION 2 GENERATOR ALARM	DI	PLC 24	LOCAL	1769-IA8I	0	7	0
LS2_ZSO_11016	LIFT STATION 2 VALVE A OPEN LIMIT	DI	PLC 24	LOCAL	1769-IA8I	0	7	1
LS2_ZSO_11017	LIFT STATION 2 VALVE B OPEN LIMIT	DI	PLC 24	LOCAL	1769-IA8I	0	7	2
LS2_LSH_DRYWELL	LIFT STATION 2 DRYWELL FLOODED	DI	PLC 24	LOCAL	1769-IA8I	0	7	3
LS2_PSL_BUBBLER	LIFT STATION 2 BUBBLER LOW AIR PRESSURE	DI	PLC 24	LOCAL	1769-IA8I	0	7	4
LS2_LSH_WETWELL	LIFT STATION 2 WETWELL LEVEL HIGH	DI	PLC 24	LOCAL	1769-IA8I	0	7	5
LS2_YS_TRNS_SWITCH	LIFT STATION 2 TRANSFER SWITCH ON EMERGENCY	DI	PLC 24	LOCAL	1769-IA8I	0	7	6
LS2_PSLL_SAC	LIFT STATION 2 STATION AIR COMPRESSOR FAIL	DI	PLC 24	LOCAL	1769-IA8I	0	7	7
LS2_YL_11001	LIFT STATION 2 PUMP 1 RUNNING	DI	PLC 24	LOCAL	1769-IA8I	0	8	0
LS2_YA_11001	LIFT STATION 2 PUMP 1 FAIL	DI	PLC 24	LOCAL	1769-IA8I	0	8	1
LS2_YL_11002	LIFT STATION 2 PUMP 2 RUNNING	DI	PLC 24	LOCAL	1769-IA8I	0	8	2
LS2_YA_11002	LIFT STATION 2 PUMP 2 FAIL	DI	PLC 24	LOCAL	1769-IA8I	0	8	3
LS2_YL_11003	LIFT STATION 2 PUMP 3 RUNNING	DI	PLC 24	LOCAL	1769-IA8I	0	8	4
LS2_YA_11003_FAIL	LIFT STATION 2 PUMP 3 FAIL	DI	PLC 24	LOCAL	1769-IA8I	0	8	5
LS2_YSR_SCRUBBER	LIFT STATION 2 SCRUBBER RUNNING	DI	PLC 24	LOCAL	1769-IA8I	0	8	6
Spare	SPARE	DI	PLC 24	LOCAL	1769-IA8I	0	8	7

None	EtherNet	Other	PLC 24	REMOTE	1769-AENTR	1	0	
LS2_ZSA_11016	LIFT STATION 2 VALVE A AUTO	DI	PLC 24	REMOTE	1769-IA8I	1	1	0
LS2_ZSA_11017	LIFT STATION 2 VALVE B AUTO	DI	PLC 24	REMOTE	1769-IA8I	1	1	1
LS2_TA_11001	LIFT STATION 2 PUMP 1 TEMP FAIL	DI	PLC 24	REMOTE	1769-IA8I	1	1	2
LS2_FA_11001	LIFT STATION 2 PUMP 1 REVERSE FLOW	DI	PLC 24	REMOTE	1769-IA8I	1	1	3
LS2_TA_11002	LIFT STATION 2 PUMP 2 TEMP FAIL	DI	PLC 24	REMOTE	1769-IA8I	1	1	4
LS2_FA_11002	LIFT STATION 2 PUMP 2 REVERSE FLOW	DI	PLC 24	REMOTE	1769-IA8I	1	1	5
LS2_TA_11003	LIFT STATION 2 PUMP 3 TEMP FAIL	DI	PLC 24	REMOTE	1769-IA8I	1	1	6
LS2_FA_11003	LIFT STATION 2 PUMP 3 REVERSE FLOW	DI	PLC 24	REMOTE	1769-IA8I	1	1	7
LS2_COMMON_ALARM_OUTPUT	LIFT STATION 2 COMMON ALARM OUTPUT	DO	PLC 24	REMOTE	1769-OW8I	1	2	0
LS2_YZ_BUBBLER	LIFT STATION 2 BUBBLER PURGE	DO	PLC 24	REMOTE	1769-OW8I	1	2	1
LS2_HC_11001	LIFT STATION 2 PUMP 1 START/STOP	DO	PLC 24	REMOTE	1769-OW8I	1	2	2
LS2_HC_11002	LIFT STATION 2 PUMP 2 START/STOP	DO	PLC 24	REMOTE	1769-OW8I	1	2	3
LS2_HC_11003	LIFT STATION 2 PUMP 3 START/STOP	DO	PLC 24	REMOTE	1769-OW8I	1	2	4
LS2_ZI_11016	LIFT STATION 2 VALVE A OPEN	DO	PLC 24	REMOTE	1769-OW8I	1	2	5
LS2_ZI_11017	LIFT STATION 2 VALVE B OPEN	DO	PLC 24	REMOTE	1769-OW8I	1	2	6
Spare	SPARE	DO	PLC 24	REMOTE	1769-OW8I	1	2	7
LS2_VIT_PUMP1	LIFT STATION 2 PUMP 1 VIBRATION READING	AI	PLC 24	REMOTE	1769-IF4I	1	3	0
LS2_VIT_PUMP2	LIFT STATION 2 PUMP 2 VIBRATION READING	AI	PLC 24	REMOTE	1769-IF4I	1	3	1
LS2_VIT_PUMP3	LIFT STATION 2 PUMP 3 VIBRATION READING	AI	PLC 24	REMOTE	1769-IF4I	1	3	2
Spare	SPARE	AI	PLC 24	REMOTE	1769-IF4I	1	3	3
SPARE MODULE	SPARE MODULE	ANY	PLC 24	REMOTE	ANY	1	4	
SPARE MODULE	SPARE MODULE	ANY	PLC 24	REMOTE	ANY	1	5	
SPARE MODULE	SPARE MODULE	ANY	PLC 24	REMOTE	ANY	1	6	
SPARE MODULE	SPARE MODULE	ANY	PLC 24	REMOTE	ANY	1	7	
SPARE MODULE	SPARE MODULE	ANY	PLC 24	REMOTE	ANY	1	8	

3 Lift Stations BOM

3.1 Lift Station #1 BOM

Intouch Edge Panelview

Quantity	Part	Dimensions W x H x D (inches)	Cutout Dimensions W x H (inches)
1	PPC-321 1SW 21.5" Fanless Panel PC with Intel Core I Processor	21.9 x 13.7 x 2.4	21.66 x 13.45

PLC 23: PLC with Local CpLX I/O

IO Type	# of Points	Current Card	Quantity	# of spare points	New Card	New Quantity	New Spare %
AI	6	ADU 204	1	2	1769-IR6	1	33%
AI	12	ADU 205	4	0	1769-IF4I	3	0%
AO	4	DAU 204	1	1	1769-OF4VI	1	25%
DI	32	DEP 218	2	2	1769-IA8I	4	6.3%
DO	8	DAP 208	1	1	1769-OW8I	1	13%

PLC 42: Remote IO back to PLC 23

IO Type	# of Points	Current Card	Quantity	# of spare points	New Card	New Quantity	New Spare %
AI	4	170 AAI 140 00	1	1	1769-IF4I	1	25%
AO	4	170 AAI 140 00	1	1	1769-OF4VI	1	25%

Quantity	New Card	Enclosure with PLC & PLC I/O
2	1769-ECR	Right End Cap Terminator
1	1769-L30ER	CompactLogix 5370 L3 Controller, 2 EtherNet/IP ports, 1MB memory w/ supercap backup, up to 8 1769 I/O expansion modules, 16 EtherNet/IP and 120 TCP connections
2	1769-PA2	120/240V AC Power Supply (5V @ 2 Amp)

4	1769-IF4I	4 Channel Analog Current/Voltage Isolated Input Module
2	1769-OF4VI	4 Channel Analog Voltage Isolated Output Module
4	1769-IA8I	8 Point Individually Isolated 120 VAC Input Module
1	1769-OW8I	8 Point Individually Isolated AC/DC Relay Output Module
2	1606-XLE80E	Single-Phase Power Supply - 80W, 24DC, 3.3A
1	1769-AENTR	Compact I/O 1769-AENTR EtherNet Adapter
1	1769-IR6	6 Channel RTD/Resistance Input Module

3.2 Lift Station #2 BOM

Intouch Edge Panelview

Quantity	Part	Dimensions W x H x D (inches)	Cutout Dimensions W x H (inches)
1	PPC-321 1SW 21.5" Fanless Panel PC with Intel Core I Processor	21.9 x 13.7 x 2.4	21.66 x 13.45

PLC 24: PLC with Local CpLX I/O

IO Type	# of Points	Current Card	Quantity	Includes # of spares?	New Card	New Quantity	New Spare %
AI	6	ADU 204	1	2	1769-IR6	1	33%
AI	12	ADU 205	4	0	1769-IF4I	3	0%
AO	4	DAU 204	1	1	1769-OF4VI	1	25%
DI	32	DEP 218	2	2	1769-IA8I	4	6.3%
DO	8	DAP 208	1	1	1769-OW8I	1	13%

PLC 43: Remote IO back to PLC 24

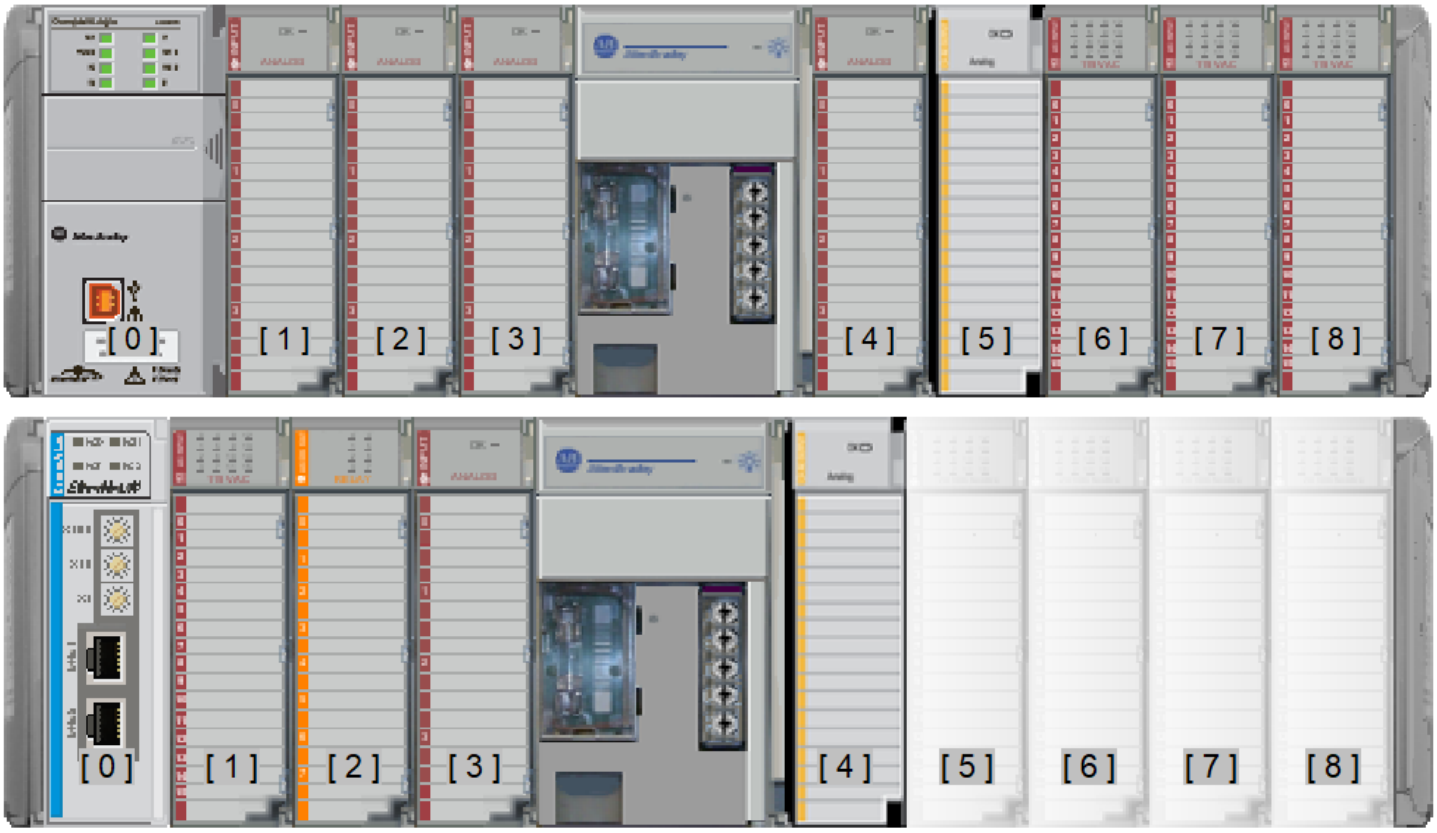
IO Type	# of Points	Current Card	Quantity	Includes # of spares?	New Card	New Quantity	New Spare %
AI	4	170 AAI 140 00	1	1	1769-IF4I	1	25%
AO	4	170 AAI 140 00	1	1	1769-OF4VI	1	25%

Quantity	New Card	Enclosure with PLC & PLC I/O
2	1769-ECR	Right End Cap Terminator
1	1769-L30ER	CompactLogix 5370 L3 Controller, 2 EtherNet/IP ports, 1MB memory w/ supercap backup, up to 8 1769 I/O expansion modules, 16 EtherNet/IP and 120 TCP connections
2	1769-PA2	120/240V AC Power Supply (5V @ 2 Amp)
4	1769-IF4I	4 Channel Analog Current/Voltage Isolated Input Module
2	1769-OF4VI	4 Channel Analog Voltage Isolated Output Module
4	1769-IA8I	8 Point Individually Isolated 120 VAC Input Module
1	1769-OW8I	8 Point Individually Isolated AC/DC Relay Output Module
2	1606-XLE80E	Single-Phase Power Supply - 80W, 24DC, 3.3A
1	1769-AENTR	Compact I/O 1769-AENTR EtherNet Adapter
1	1769-IR6	6 Channel RTD/Resistance Input Module

4 Proposed New PLC

Both Lift Station 1 and Lift Station 2 will have the same configuration. The following graphic represents the configuration for both Lift Stations.

4.1 PLC 23 & 42 (PLC 24 & PLC 43 will have the same config)



5 New HMI Screen Mockup