PART 1 LIFT PUMPS CONTROL NARRATIVE

1.1 OVERVIEW

.1 The contractor shall provide complete PLC and Operator Graphic Interface (HMI)programming, testing, commissioning, training and warranty support services for the pumping station.

.2 Contractor shall supply all software, hardware, and labour to provide a fully functional and commissioned control system.

.3 The pump station design is a separate wet well and dry well arrangement.

.4 Wastewater enters the wet well via two (2) influent pipes located in the comminutor rooms.

.5 The drywell contains two (2) wastewater pumps, manual control valves, and instrumentation.

1.2 GENERAL REQUIREMENTS

.1 Refer to all other Divisions of the Specifications to determine their effect upon the work of this Section. All Sections form part of the Contract Documents.

.2 The control system for the pumping station shall consist of Programmable Logic Controllers (PLCs), Operator Graphic Interfaces (HMIs), Remote Terminal Unit (RTU) Interface Cards, City operated Clearview SCADA system, and modem.

.3 Discrete input signals shall be processed using “de-bounce” logic.

.4 The PLC I/O list shall contain at a minimum the list contained in Appendix B “I/O List”.

.5 The instrumentation list shall be as per Appendix C “Instrumentation List”.

.6 PLC control logic shall be developed using function block programming language and custom function blocks.

1.3 SHOP DRAWING SUBMISSIONS

.1 Submit proposed HMI graphic screen layouts and variable declarations.

.2 Submit proposed DNP3 mapping list.

.3 Submit proposed PLC/HMI mapping list.

.4 Submit proposed PLC function blocks logic.

1.4 LIFT PUMP CONTROL

.1 The pump control configuration shall operate as Lead/Lag. The Station consists of two (2) pumps that may both operate at the same time depending on the Wet Well Level.

.2 The Lead/Lag Pump designations shall cycle through the two (2) pumps after each start/stop cycle. The Lead/Lag pump configuration should also be selectable through the HMI.

.3 The Lead/Lag Pump designations shall only select in-service, non-faulted available pumps in “Automatic” operation.

.4 Start/stop pump control shall be based on the wet well level as measured by level/pressure transmitters LIT-L500A and LIT-L500B.

.5 Pump Control Level Setpoints:

.1 Start Lead Pump: **TBD** m;

.2 Start Lag Pump: **TBD** m;

.3 Stop Lead Pump: **TBD** m;

.4 Stop Lead Pump: **TBD** m;

.5 Level control setpoints shall be adjustable via password protection. Final settings determined by the Contract Administrator during commissioning. The setpoints can be provided by E&I.

.6 Pumps are operated by Variable Frequency Drives (VFDs) programmed to run at a fixed speed. Ramp up/down time shall be set at 10 seconds and adjusted during commissioning.

.7 Manual and Automatic Modes of Operation:

.1 Manual Operation, Forward Run:

.1 Hand-Off-Auto selector switch in “Hand” position.

.2 Start forward when in “Hand”

.3 Stop when:

.1 Hand-Off-Auto selector switch changed from “Hand” position; or,

.2 Emergency Stop pushbutton activated.

.4 Adjust speed via VFD / speed potentiometer settings only.

.2 Automatic Operation, CP-A81 in PLC Auto Mode, Forward Run:

.1 Hand-Off-Auto selector switch in “Auto” position.

.2 PLC Auto/Manual Mode selection in “Auto”

.3 Pump is available as per “Pump Available” Below

.4 Start “Lead” pump when the first level setpoint in wet well reached.

.5 Start “Lag” pump when second level setpoint in wet well is reached.

.6 Run at a fixed speed adjustable from the HMI via password protection. Both pumps shall operate at the same speed.

.7 Stop Lag Pump when the Lag low level setpoint in wet well reached.

.8 Stop Lead Pump when Lead low level setpoint in wet well reached.

.3 Automatic Operation, CP-A81 in Local Mode, Forward Run:

.1 Hand-Off-Auto selector switch in “Auto” position.

.2 PLC in Local mode by pressing Station Local Push button on CP-A81 or PLC fails and automatically switches to Local Mode.

.3 Start “Lead” pump when the first level setpoint in wet well reached via LIC-L500;

.4 Start “Lag” pump when second level setpoint in wet well is reached via LIC-L500;

.5 Run at a fixed speed, control via separate VFD digital input;

.6 Stop Lag Pump when the Lag low level setpoint in wet well reached.

.7 Stop Lead Pump when Lead low level setpoint in wet well reached.

.4 Automatic Operation, CP-A81 in PLC Manual Mode, Reverse Run:

.1 Hand-Off-Auto selector switch in “Auto” position.

.2 PLC Auto/Manual Mode selection in “Manual”

.3 Pump is available as per “Pump Available” below

.4 Start Reverse when either the HMI or SCADA system “RUN REV COMMAND”

.5 PLC activates Start Reverse PLC output;

.6 Stop after 20s of reverse run. Time can be adjusted in HMI that is password protected.

.7 Speed set to 10% and can be adjusted in HMI that is password protected.

.5 Automatic Operation, CP-A81 in PLC Manual Mode, Forward Run:

.1 Hand-Off-Auto selector switch in “Auto” position.

.2 PLC Auto/Manual Mode selection in “Manual”

.3 Pump is available as per “Pump Available” below

.4 Start Forward when either the HMI or SCADA system “RUN FWD COMMAND”

.5 PLC activates Start Forward PLC output.

.6 Stop after an HMI or SCADA system, “STOP COMMAND”

.8 Pump Available:

.1 Pump “Available” shall be determined by:

.1 Pump “Ready” status is available.

.2 Pump “Failed to Start” alarm not present.

.3 Pump “Low Flow” alarm not present. (Future and disabled in PLC Logic)

.4 Pump VFD alarm not present.

.5 Pump in “Automatic” operation.

.6 Emergency Stop push button not pressed; and,

.7 Pump motor starter breaker on.

.9 Pump In-Service:

.1 Pump “In Service” shall be determined by the SCADA system using the DNP3 communication to the pump station PLC and operate as follows:

.1 Out of Service - SCADA will send an “Out of Service” signal to the NOR card and the PLC will need to put the pump out of service. The PLC will also need to control a digital input “In Service Status” status signal to OFF that will signify that the pump is out of Service. Then the PLC will need to change the status of “Out of Service” signal from state 1 to 0.

.2 In Service - When the pump needs to be back in service, SCADA will send another signal “In Service” to the NOR card and then the PLC will need to put the pump back in service. The PLC will also need to control a digital input “In Service Status” status signal to ON that will signify that the pump is back in Service. Then the PLC will need to change the status of “In Service” signal from state 1 to 0.

.10 Level Control in Precision Digital Level Control Mode:

.1 Signal from SCADA to PLC to switch pump control from the PLC to the precision digital controller when maintenance is performed or defaults over in a PLC failure.

.11 Pump Backflush Cycle:

.1 The pump backflush cycle will be programmed as follows:

.1 The operator will set the desired backflush time by adjusting the backflush cycle timer on the HMI or SCADA system.

.2 The operator will then press the “Backflush Cycle Initiate” button and the pump will go through the following sequence:

.1 The pump is requested “out-of-service”;

.2 The pump is commanded to run in reverse for the amount of time as indicated by the backflush timer;

.3 The pump is commanded to stop;

.4 The pump is requested back “in-service”.

.3 During this sequence the “Backflush Cycle Initiate” button should be greyed out and the HMI or SCADA should indicate that the cycle is taking place. Following the cycle the “Backflush Cycle Initiate” button should be made available.

.4 Backflush cycle limited to low speeds and short periods of time. Adjusting these speeds and times is to be password protected via the HMI.

1.5 ALARMS

.1 The following alarm signals shall be programmed:

.1 Pump fail to start: PLC pump start forward or start reverse active for 5 seconds without VFD running status activated.

.2 Pump VFD fault. Alarm after VFD fault signal received, 3s delay.

.3 Pump low flow: Pump running in “Local Automatic” mode and flow less than 80% for one pump running and less than 50% when two pumps running. (Future, reserve alarm points in PLC logic and disable)

.4 No pumps in “Local Automatic Mode”. Alarm with 3s delay.

.5 Only one pump in “Local Automatic Mode”. Alarm with 3s delay.

.6 Wet well high-level warning. Alarm at (**TBD** m) 3s delay

.7 Wet well high level. Alarm at (**TBD** m) 3s delay.

.8 Level transmitter variance: level transmitter signals differ by more than 15% of full range. (**TBD** m) Alarm 3s delay.

.9 Room low temperature. (Common Lift and Flood Station Alarm) Alarm at (**TBD**°C), 3s delay

.10 Room high temperature. (Common Lift and Flood Station Alarm) Alarm at (**TBD**°C), 3s delay

.11 Dry well room flood. Alarm via LSH-L501, 3s delay

.12 Comminutor 1 room flood. Alarm via LSH-L502, 3s delay

.13 UPS power fail. (Common Lift and Flood Station Alarm) Internal CP-A81 Signal. Alarm 3s delay.

.14 24VDC power fail. (Common Lift and Flood Station Alarm) Internal CP-A81 Signal. Alarm 3s delay.

.15 120VAC power fail, (Common Lift and Flood Station Alarm) Internal CP-A81 Signal. Alarm 3s delay.

.16 600VAC power fail (Common Lift and Flood Station Alarm) Internal CP-A81 Signal. Alarm 3s delay.

.17 PLC Running Status (Common Lift and Flood Station Alarm) Alarm 3s delay.

.2 Additional alarm signals shall be added during commissioning as identified by the Contract Administrator.

.3 All alarm logic shall be programmed in the PLC, not the HMI.

.4 Alarms shall be latched as specified in the I/O list. Check with operation prior to commissioning to confirm latched alarms.

.5 Alarm reset shall be available on the HMI and the SCADA system and operate as follows:

.1 To reset alarms from SCADA one DNP3 Digital output (Reset On Command) and two DNP3 Digital Inputs (Reset Status) and (Reset On Command Feedback) are needed.

.1 SCADA will send a “Reset On Command” signal to the NOR card, and the PLC will need to activate the reset. The PLC will also need to reset control a DNP3 digital input “Reset Status” status signal to ON that will signify that the Reset is activated. Then the PLC will need to change the status of “Reset On Command” signal from state 1 to 0 after a short time delay. After another short time delay, the PLC will then deactivate the reset and change the “Reset Status” status signal to OFF

.2 The DNP3 Digital Input “Reset On Command Feedback” is just mapped(mirrored) from the DNP3 Digital Output “Reset On Command”

.6 A heart best signal shall be implemented in the PLC so that the stations RTU can determine if the PLC is in Run mode (I.E. the PLC has not faulted). Create a 1 second timer that increments a register named “PLC_Heartbeat” every one second. Increment the register to a set value (preferably 32767), reset to 0, and continue incrementing. This register will be monitored by the City’s SCADA system.

.1 Only one heart beat is required for the combined lift and flood station.

1.6 LEVEL MONITORING

.1 The level in the wet well is measure by level/pressure hydrostatic transmitters LIT-L500A and LIT-L500B.

.2 The measured wet well level shall be determined by the following modes:

.1 The average of LIT-L500A and LIT-L500B;

.2 LIT-L500A; or,

.3 LIT-L500B.

.3 The three level measuring modes shall be selectable via the HMI and the SCADA system using “SELECT AVERAGE, SELECT LIT-L500A, or SELECT LIT-500B” commands.

1.7 OPERATOR GRAPHIC INTERFACE

.1 Standards:

.1 Pump running red;

.2 Pump stopped: green;

.3 Pump alarm: amber.

.2 Display of all instrumentation signals.

.3 Pump Process flow diagram graphic screen for lift station with animated wet well and each pump’s amperage draw. Provide screens for individual pump status signals.

.4 Setpoint adjustment graphic screen.

.5 Instrumentation calibration graphic screen.

.6 Active alarm banner.

.7 Historical alarm screen.

.8 HVAC process status screen, showing status of dampers supply & exhaust fan statuses along with room temperature.

.9 Individual trend screens for all instrumentation and pump running signals. Trends shall be configurable to have multiple pens.

1.8 CITY SCADA INTERFACE

.1 Provide DNP mapping for integration into the City's SCADA system.

.2 DNP mapping list shall match the HMI/PLC mapping list.

.3 Duplicate all functionality available on the Local HMI for the SCADA system.

.4 SCADA system configuration by the City.

.5 DNP mapping shall include all PLC I/O points and alarm conditions.

.6 DNP mapping shall include the status of the emergency stop pushbuttons.

.7 DNP mapping shall include the pump start and stop level set points.

.8 DNP mapping shall include pump VFD speed set points.

.9 All DNP3 Out points need to be mapped to DNP3 Inputs points (while keeping the DNP3 Out points) in the DNP3 mapping list so Output Status can be monitored on SCADA.

.10 All analog points shall have deadband (in the NOR card configuration). Adjust deadbands as per the city request during testing/commissioning

.11 Unless otherwise indicated, digital outputs from SCADA shall follow a common general logic using DNP3 communication to the station's PLC as follows:

.1 Two internal DNP3 outputs from SCADA to the PLC are required; one to signal an "ON" command, one to signal an "OFF" command.

.2 Three internal DNP3 inputs from the PLC to SCADA are required; one to indicate the current "ON/OFF" status, one to indicate an "ON" signal feedback, and one to indicate an "OFF" signal feedback. The "ON" and "OFF" signal feedback are mapped (mirrored) from the two internal DNP3 outputs from SCADA in 1 above.

.3 Desired function "ON" - SCADA will send an "ON" signal to the NOR card and the PLC will need to perform the "ON" action. Then the PLC will need to change the status of "ON/OFF" status from "OFF" to "ON". The PLC will also need to change the "ON" signal from 1 to 0 after a short time delay.

.4 Desired function "OFF" - SCADA will send an "OFF" signal to the NOR card and the PLC will need to perform the "OFF" action. Then the PLC will need to change the status of "ON/OFF" signal from "ON" to "OFF". The PLC will also need to change the "OFF" signal from 1 to 0 after a short time delay.

.5 The above general logic shall apply to all DNP3 digital outputs "ON/OFF", "PLC Auto/Manual Mode", etc.

PART 2 FLOOD PUMPS CONTROL NARRATIVE

2.1 OVERVIEW

.1 The contractor shall provide complete PLC and Operator Graphic Interface (HMI)programming, testing, commissioning, training, and warranty support services for the pumping station.

.2 Contractor shall supply all software, hardware, and labour to provide a fully functional and commissioned control system.

.3 The pump station design is a separate wet well and dry well arrangement.

.4 Flood water enters the wet well via two (2) influent pipes.

.5 The drywell contains two (2) Flood water pumps, manual control valves, and instrumentation.

2.2 GENERAL REQUIREMENTS

.1 Refer to all other Divisions of the Specifications to determine their effect upon the work of this Section. All Sections form part of the Contract Documents.

.2 The control system for the pumping station shall consist of Programmable Logic Controllers (PLCs), Operator Graphic Interfaces (HMIs), City operated Clearview SCADA system, and modem.

.3 Discrete input signals shall be processed using “de-bounce” logic.

.4 The PLC I/O list shall contain at a minimum the list contained in Appendix B “I/O List”.

.5 The instrumentation list shall be as per Appendix C “Instrumentation List”.

.6 PLC control logic shall be developed using function block programming language and custom function blocks.

.7 Key Operating Elevations

.1 Wet Well transducer head elevation (228.600 m Geofetic)
.2 Wet Well transducer zero elevation (224.028 m Geodetic)
.3 River Level Activation (225.480 m Gerodetic)

2.3 SHOP DRAWING SUBMISSIONS

.1 Submit proposed HMI graphic screen layouts and variable declarations.

.2 Submit proposed DNP3 mapping list.

.3 Submit proposed PLC/HMI mapping list.

.4 Submit proposed PLC function blocks logic.

2.4 PUMP CONTROL

.1 The pump control configuration shall operate as Lead/Lag. The station consists of two (2) pumps that may both operate at the same time depending on the Wet Well Level.

.2 The Lead/Lag Pump designations shall cycle through the two (2) pumps after each start/stop cycle. The Lead/Lag pump configuration should also be selectable through the HMI.

.3 The Lead/Lag Pump designations shall only select in-service, non-faulted available pumps in “Local Automatic” mode.

.4 Start/stop pump control shall be based on the wet well level as measured by ultrasonic level transmitter LIT-F500, and the level transducer LE-F500.

.5 Pump Control Level Setpoints:

- .1 Start Lead Pump: **224.940** m Geodetic.
- .2 Start Lag Pump: **225.250** m Geodetic.
- .3 Stop Lag Pump: **224.640** m Geodetic.
- .4 Stop Lead Pump: **224.330** m Geodetic.
- .5 Level control setpoints shall be adjustable and final settings determined by the Contract Administrator during commissioning.

.6 Pumps are operated by Soft Starter, with a bypass contactor. When the pump is at full speed, the pump is driven by electric motor only.

.7 Manual and Local Automatic Operation:

- .1 Manual Operation, Forward Run:
  - .1 Hand-Off-Auto selector switch in “Hand” position;
  - .2 Start forward when in “Hand” and start button is pressed;
  - .3 Stop when:
    - .1 Hand-Off-Auto selector switch changed from “Hand” position; or,
    - .2 Emergency Stop pushbutton activated.
    - .3 Stop push button is pressed.
- .2 Automatic Operation, CP-A81 in PLC mode:
  - .1 Hand-Off-Auto selector switch in “Auto” position;
  - .2 PLC Auto/Manual Mode selection in “Auto” or “Manual”
  - .3 Pump is available as per “Pump Available” below.
  - .4 Start “Lead” pump when the first level setpoint in wet well reached;
  - .5 Start “Lag” pump when second level setpoint in wet well is reached;
  - .6 Stop the Lag pump when the Lag low level setpoint in wet well reached.
  - .7 Stop the Lead pump when the Lead low level setpoint in wet well reached.

.3 Automatic Operation, CP-A81 in Local mode:

.1 Hand-Off-Auto selector switch in “Auto” position;

.2 PLC in Local mode by pressing Station Local Push button on CP-A81 or PLC fails and automatically switches to local mode;

.3 Start “Lead” pump when the first level setpoint in wet well reached via LIC-F500;

.4 Start “Lag” pump when second level setpoint in wet well is reached via LIC-F500;

.5 Stop Lag Pump when the Lag low level setpoint in wet well reached.

.6 Stop Lead Pump when the Lead low level setpoint in wet well reached.

.8 Pump Available:

.1 Pump “Available” shall be determined by:

.1 Pump “Ready” Status is available

.2 Pump “Failed to Start” alarm not present;

.3 Pump “FAULT” alarm not present;

.4 Pump in “Local Automatic” mode;

.5 Emergency Stop push button not pressed.

.9 Pump In-Service:

.1 Pump “In Service” shall be determined by the SCADA system using the DNP3 communication to the pump station PLC and operate as follows:

.1 Out of Service - SCADA will send an “Out of Service” signal to the NOR card and the PLC will need to put the pump out of service. The PLC will also need to control a digital input “In Service Status” status signal to OFF that will signify that the pump is out of Service. Then the PLC will need to change the status of “Out of Service” signal from state 1 to 0.

.2 In Service - When the pump needs to be back in service, SCADA will send another signal “In Service” to the NOR card and then the PLC will need to put the pump back in service. The PLC will also need to control a digital input “In Service Status” status signal to ON that will signify that the pump is back in Service. Then the PLC will need to change the status of “In Service” signal from state 1 to 0.

.10 Level Control in Multiranger Level Control Mode:

.1 Signal from SCADA to PLC to switch pump control from the PLC to the precision digital controller when maintenance is performed or defaults over in a PLC failure. This is a common signal with the combined Lift station.

.11 CSO Instruments and the Floodwell level will require one-minute polling, which mean that the NOR card will send DNP3 events to SCADA every one minute regardless the change in the analog point value (DNP3 events will be sent even if the point value hasn't changed).

2.5 ALARMS

.1 The following alarm signals shall be programmed:

.1 Pump fail to start: PLC pump start forward active for 5 seconds without running status activated;

.2 Pump fault. Alarm 3s delay.

.3 No pumps in “Local Automatic Mode”. Alarm 3s delay.

.4 Only one Flood pump in “Local Automatic Mode”. Alarm 3s delay.

.5 Wet well high level warning. Alarm at (**TBD** m) 3s delay.

.6 Wet well high level. Alarm at (**TBD** m) 3s delay.

.7 Level Transmitter Loss of Echo Alarm at loss of Echo signal, 3s delay.

.8 Room low temperature. (Common Lift and Flood Station Alarm) Alarm at (**TBD** °C) 3s delay.

.9 Room high temperature. (Common Lift and Flood Station Alarm) Alarm at (**TBD** °C) 3s delay.

.10 Dry well room flood. Alarm at LSH-F501, 3s delay

.11 UPS power fail. (Common Lift and Flood Station Alarm) Alarm 3s delay.

.12 24VDC power fail. (Common Lift and Flood Station Alarm) Alarm 3s delay.

.13 120VAC power fail. (Common Lift and Flood Station Alarm) Alarm 3s delay.

.14 600VAC power fail (Common Lift and Flood Station Alarm) Alarm 3s delay.

.2 Additional alarm signals shall be added during commissioning as identified by the Contract Administrator.

.3 All alarm logic shall be programmed in the PLC, not the HMI.

.4 Alarms shall be latched as specified in the I/O list. Check with operation prior to commissioning to confirm latched alarms.

.5 Alarm reset shall be available on the HMI and the SCADA system and operate as follows:

.1 To reset alarms from SCADA, two DNP3 Digital output (Reset On and Reset Off) and one Digital Input (Reset Status) are needed:

.1 Reset On - SCADA will send a “Reset On” signal to the NOR card and the PLC will need to activate the reset. The PLC will also need to control a digital input “Reset Status” status signal to ON that will signify that the Reset is activated. Then the PLC will need to change the status of “Reset On” signal from state 1 to 0.

.2 Reset Off- SCADA will send another signal “Reset Off” to the NOR card and then PLC will need to deactivate the reset. The PLC will also need to control a digital input “Reset Status” status signal to OFF that will signify that the reset is

deactivated. Then PLC will need to change the status of "Reset Off" signal from state 1 to 0.

2.6 LEVEL MONITORING

.1 The level in the wet well is measure by ultrasonic level transmitter LIT-F500.

2.7 OPERATOR GRAPHIC INTERFACE

.1 Standards:

.1 Pump running red;

.2 Pump stopped: green;

.3 Pump alarm: amber.

.2 Display of all instrumentation signals.

.3 Pump Process flow diagram graphic screen for flood station with animated wet well and each pump amperage draw. Provide screens for individual pump status signals.

.4 Setpoint adjustment graphic screen.

.5 Instrumentation calibration graphic screen.

.6 Active alarm banner.

.7 Historical alarm screen.

.8 Individual trend screens for all instrumentation and pump running signals. Trends shall be configurable to have multiple pens.

.9 HVAC process status screen, showing status of dampers, supply & exhaust fan statuses along with room temperature. (Common to Lift and Flood pumping station)

.10 CSO instrument status monitoring screen.

2.8 CITY SCADA INTERFACE

.1 Provide DNP mapping for integration into the City's SCADA system.

.2 DNP mapping list shall match the HMI/PLC mapping list.

.3 Duplicate all functionality available on the Local HMI for the SCADA system.

.4 SCADA system configuration by the City.

.5 DNP mapping shall include all PLC I/O points and alarm conditions.

.6 DNP mapping shall include the status of the emergency stop pushbuttons.

.7 DNP mapping shall include the pump start and stop level set points.

.8 All DNP3 Out points need to be mapped to DNP3 Inputs points (while keeping the DNP3 Out points) in the DNP3 mapping list so Output Status can be monitored on SCADA.

PART 3 TESTING

3.1 FACTORY ACCEPTANCE TESTING

.1 Factory acceptance test (FAT) shall be in accordance with Section 25 01 10.

.2 Factory acceptance testing (FAT) shall be conducted off site at the control manufacturing facility in Winnipeg, Manitoba.

.3 Notify Contract Administrator two (2) days prior to testing.

.4 Witnessing of FAT shall be available to the Contract Administrator and City personnel.

.5 FAT shall include:

.1 Testing of Ethernet network;
.2 Testing of all alarm conditions;
.3 Testing of pump control logic;
.4 Confirmation of HMI graphics;
.5 Confirmation of instrumentation trending;
.6 Testing and confirmation of the DNP3 mapping to the City's Clearview SCADA system; and,
.7 Testing of both cellular and telephone communications to City's Clearview SCADA system.

3.2 SITE ACCEPTANCE TESTING

.1 Site acceptance testing shall be in accordance with Section 25 01 11.

.2 Notification of the start site acceptance testing shall be provided to the Contract Administrator two (2) days prior to testing.

.3 Site acceptance testing shall be conducted prior to commissioning.

.4 Confirm measure and display of correct field instrumentation reading.

.5 Testing of all control logic and alarm conditions.

.6 Force input signals to generate alarm conditions and verify correct PLC logic.

.7 Confirmation of connection to the City SCADA system and verification of instrumentation readings and DNP mapping index. This includes deadband, events timestamp, clock synchronization, etc.

.1 Functional testing to be completed with City SCADA staff. Functional check will be for individual points and interlock control functions.

.8 Document all testing procedures and results. Submit documentation to Contract administrator two (2) days prior to commissioning.

3.3 COMMISSIONING

.1 Commissioning shall be in accordance with Section 25 01 11.

.2 Submit commissioning plan to the Contract Administrator five (5) days prior to proposed start date.

.3 Commissioning plan to include at a minimum:

.1 Contractor staff contact list;

.2 Emergency conditions and response plan;

.3 Detailed schedule of activities including start/stop times and dates for each activity;

.4 Support required from Contract Administrator and City personnel; and,

.5 Additional actions as identified by the Contract Administrator.

.4 Control logic shall be modified at the request of the Contract Administrator to achieve desired operation of the pump station.

.5 Commissioning shall be considered complete after facility operation without alarm conditions for a period of seven (7) consecutive days.

.6 Substantial Performance will not be granted until after successful completion of the commissioning and training.

PART 4 PROJECT CLOSEOUT

4.1 TRAINING

.1 Training of City personnel shall be performed during and after the seven-day (7) commissioning period.

.2 The Contractor shall provide a minimum of three (3) 2-hour training sessions, each on a separate day.

.3 Training schedule shall be provided to the Contract Administrator three (3) days prior to training sessions.

4.2 WARRANTY SUPPORT

.1 The Contractor shall provide onsite technical support for the facility’s control system for one year after Total Performance.

.2 Support personnel shall be available within 24 hours of notification by the Contract Administrator or City.

4.3 DOCUMENTATION

.1 All PLC and HMI programming shall be fully documented to the satisfaction of the Contract Administrator and City personnel.

.2 PLC and HMI programs shall be provided to the Contract Administrator at successful completion of commissioning on USB memory sticks.

END OF SECTION