Clean Water 2020 Program

Transmission System Operations and Maintenance Program (TSOMP)

May 2015

We Are Columbia

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List of Acronyms

ARV	Air Relief Valve
City	City of Columbia, SC
CD	Consent Decree
CM	Corrective Maintenance
CMMS	Computerized Maintenance Management System
CSAP	Continuing Sewer Assessment Program
ETM	Elapsed Time Meters
EPA	Environmental Protection Agency
CERP	Contingency and Emergency Response Plan
FTE	Full Time Equivalent
GIS	Geographic Information System
gpd	gallons per day
gpm	gallons per minute
H_2S	Hydrogen Sulfide
HOA	Hand/off/Auto pump switch
HVAC	Heating, Ventilation and Air Conditioning
KPIs	Key Performance Indicators
MCC	Motor Control Center
MOM	Management, Operations and Maintenance
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PLC	Programmable Logic Controller
PM	Preventive Maintenance
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
RFP	Request for Proposal
ROW	Right-of-Way
R/R	Refurbishment and Replacement
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SCDHEC	South Carolina Department of Health and Environmental Control
SOP	Standard Operating Procedure
SSO	Sanitary Sewer Overflow
TSOMP	Transmission System Operations and Maintenance Program
VFD	Variable Frequency Drive
WCTS	Wastewater Collection and Transmission System

Program Summary and Intent

The City of Columbia (City) has designed this Transmission System Operations and Maintenance Program (TSOMP) program to facilitate proper operations and maintenance (O&M) activities associated with pump stations and force mains within the City's Wastewater Collection and Transmission System (WCTS). The TSOMP addresses the specific requirements of the Consent Decree (CD) as outlined in Summary Table 1, and was developed based on the specific needs of the City's WCTS.

Summary Table 1 Consent Decree Compliance Matrix for TSOMP

CD Section	CD Requirement	TSOMP Section
V.12. Main paragraph	"Management, Operations and Maintenance (MOM) Programs. Columbia shall develop and implement the specific MOM Programs set forth below and ensure each MOM Program has a written, defined purpose; a written, defined goal; is documented in writing with specific detail required herein; is implemented by trained personnel; has established performance measures; and has written procedures for periodic review."	Section 1. TSOMP Overview
V. 12. h. i	"Means and modes of communications between pump stations, field crews, and supervising staff."	Section 2.2. Means and Mode of Communication
V. 12. h. ii	"Technical specifications of each pump station within the WCTS"	Section 1.2. Description of the Transmission System Appendix A, TSOMP Volume II
V. 12. h. iii	"Columbia currently has a pump station monitoring system which continuously monitors, reports, and transmits information for each pump station. The TSOMP shall provide that Columbia will continue to operate and maintain SCADA systems at pump all stations with a rated capacity of greater than 1,000 gpm. In addition, with the goal of eliminating SSOs due to pump station failure(s), Columbia shall evaluate the need for installation of SCADA systems at all other pump stations, and install them where necessary in accordance with the approved TSOMP implementation schedule required under paragraph 12(h)(x)."	Section 2.2. Pump Station SCADA Enhancements
V. 12. h. iv	"Written preventive operations and maintenance schedules and procedures for the following routine activities: (A) Service and calibration of instruments such as flow meters, liquid level sensors, alarm systems, elapsed time meters, and remote monitoring equipment	Section 2.3. Pump Station Routine O&M Procedures and Schedules Appendix B. Pump Station Operations and Maintenance Procedures. *PS SOP 2, PS SOP 5, PS SOP 9, PS SOP 11*
	B) Inspection and service for air release valves	*PS SOP 3*
	(C) Predictive (non-physical) and/or physical inspection and service for all pump stations including:	*PS SOP 1, PS SOP 7, PS SOP 8, PS SOP 10*

Summary Table 1 Consent Decree Compliance Matrix for TSOMP

CD Section	CD Requirement	TSOMP Section
	(1) reading, recording and maintaining records of information from the elapsed time meters and pump start counters	*PS SOP 1* Section 2.2. Pump Station SCADA Evaluation and Enhancements
	(2) observing and documenting wet will conditions including grease and/or debris accumulation	*PS SOP 1, PS SOP 6*
	(3) checking wet well pumping points and resetting as necessary to improve system performance	*PS SOP 9*
	(4) checking, recording and maintaining records of system pressure(s)	PS SOP 1
	(5) checking SCADA and/or alarm components	*PS SOP 9, PS SOP 10*
	(6) checking stand-by power sources	*PS SOP 4*
	(7) identifying maintenance and emergency planning needs."	Sections 5.1 and 5.2
V. 12. h. iv (D)	"Engineering evaluation of Force Mains and Pump Stations for potential sulfide and corrosion control needs. The TSOMP shall require, and Columbia shall generate, a summary report of findings with sulfide and corrosion control method(s) and the schedule for implementation of selected measures, where applicable."	Section 4. Sulfide and Corrosion Control
V. 12. h. iv (E)	"Written preventive operations and maintenance schedules and procedures for the following routine activities: Inspection of Force Main Easements, including inspection of creek crossings, stream bank encroachment toward Force Mains, and easement accessibility (including the need to control vegetative growth or encroachment of man-made structures or activities that could threaten the integrity of affected Force Mains). Inspections shall include written reports, and where appropriate, representative photographs or videos of appurtenances being inspected (Force Mains, creek crossings, etc.). The TSOMP shall require inspectors to promptly report and observed SSOs, and any evidence of SSOs which may have occurred since the last inspection, to their supervisors and document findings. Columbia shall report any observed SSO in accordance with the SORP and NPDES Permit."	Section 3. Force Main and Easement Operation and Maintenance Appendix C. Force Main and Easement Operations and Maintenance Procedures.
V. 12. h. iv (F)	"A schedule for the maintenance of easements".	Section 3.2. Force Main and Easement O&M Procedures and Schedules
V. 12. h. iv (G)	"Resource commitments such as staffing, contractual support and equipment."	Section 2.4. Pump Station O&M Resources Section 3.2. Force Main and Easement O&M Resources Section 4. Sulfide and Corrosion Control
V. 12. h. v	"Data Attributes for the Sewer Mapping Program allowing data to be compared in Columbia's GIS system against other pertinent data such as the occurrence of SSOs, including repeat SSO location and permit violations."	Section 6.2. Information Management System

Summary Table 1 Consent Decree Compliance Matrix for TSOMP

CD Section	CD Requirement	TSOMP Section
V. 12. h. vi	"An inventory management system that requires Columbia to Maintain: (A) Lists of critical equipment and spare parts (B) An inventory of the critical spare parts and critical equipment stored at Columbia's facilities, and a list of where the remaining critical spare parts and equipment not stored at Columbia's facilities may be obtained to allow repairs in a reasonable amount of time (C) Written procedures for updating the critical spare parts and equipment inventories in the inventory management system."	Section 5. Inventory Management Appendix D. Procedures for Inventory Management of Critical Equipment and Parts
V. 12. h. vii	A common information system that Columbia can use to track implementation of the TSOMP, track maintenance activities (including Pump Station equipment histories), and track management, operations, and maintenance performance indicators."	Section 6. Data Management and Analysis
V. 12. h. viii	"The Key Performance Indicators (KPI) Columbia will track to measure performance of the WCTS using the information system referenced in Paragraph 12.h.(vii). These KPI shall include, but are not limited to, the number of SSOs related to Force Mains per mile of Force Main and/or the number of SSOs related to Pump Stations per number of pump stations; and maintenance activities tracked by type (corrective, preventive, and emergency)."	Section 6.3. Tracking Maintenance Activities by Type Section 6.5. Key Performance Indicator Analysis
V. 12. h. ix	"Reports which list the equipment problems and the status of work orders generated during the prior month."	Section 6.4. Monthly O&M Activity Reporting
V. 12. h. x	"An implementation schedule specifying dates and actions".	Section 7. TSOMP Implementation Schedule

Section 1 TSOMP Overview

The TSOMP Overview addresses the following specific requirements of the CD:

- **Section V.12. Main paragraph "*Management, Operations and Maintenance (MOM) Programs.*** Columbia shall develop and implement the specific MOM Programs set forth below and ensure each MOM Program has a written, defined purpose; a written, defined goal; is documented in writing with specific detail required herein; is implemented by trained personnel; has established performance measures; and has written procedures for periodic review."
- **Section V. 12. h. ii** "Technical specifications of each pump station within the WCTS"

1.1 TSOMP Goal

The goal of the Transmission System Operations and Maintenance Program (TSOMP) is to facilitate proper operations, maintenance and management of the City's pump stations, force mains and force main easements. The program is tailored to meet the specific needs of the City in consideration of the utility's organizational framework, the service area topography, and the infrastructure assets.

1.2 Description of the Transmission System

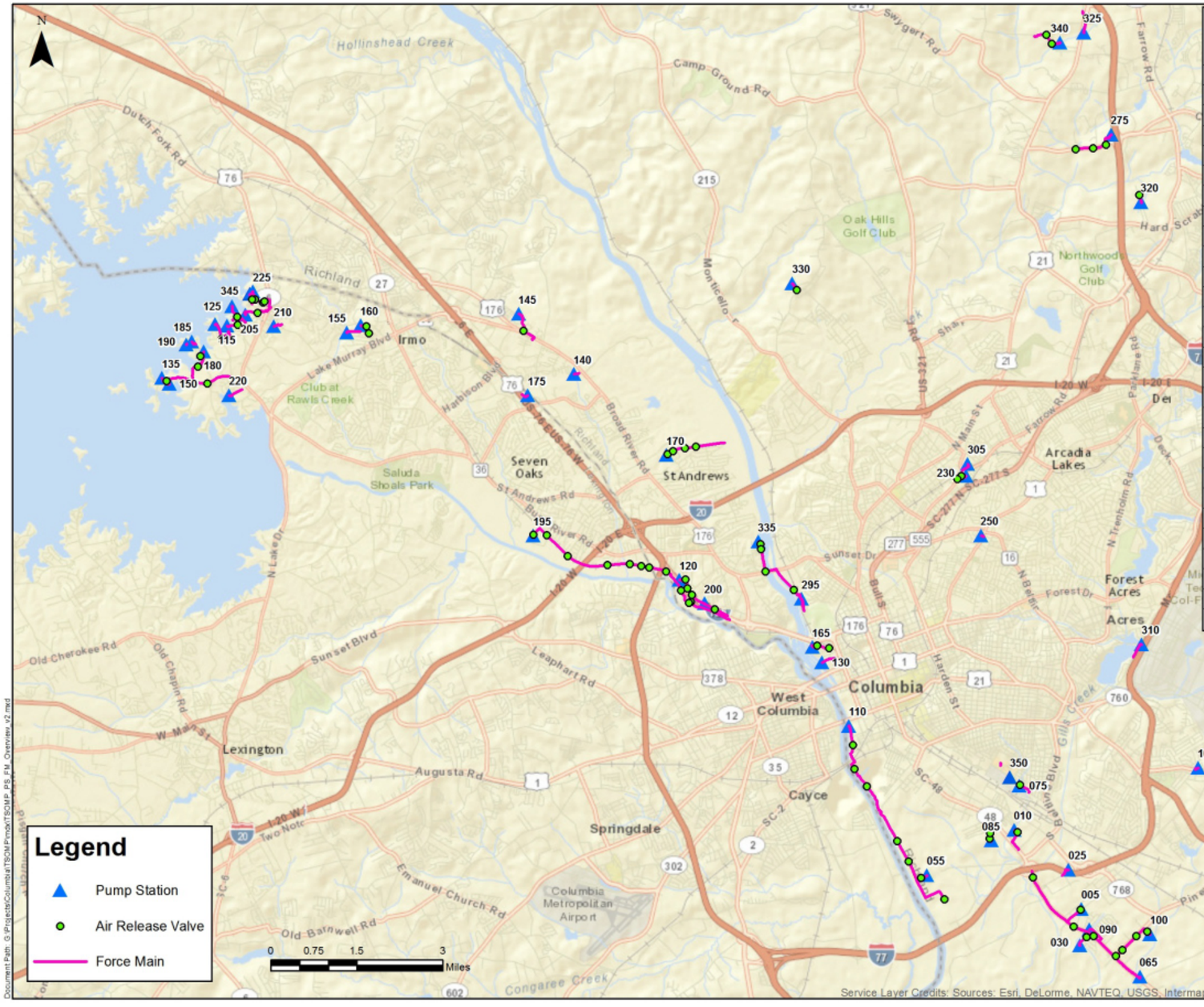
There are currently 56 pump stations and approximately 38 miles of force main owned by the City, and located both inside the City limits and in portions of both Richland and Lexington Counties. The wastewater transmission system conveys wastewater to the City's Metropolitan Wastewater Treatment Plant, located at 1200 Simon Tree Lane.

The pump stations have varying numbers of pumps with a mix of variable and constant speed drives and are configured as either wet-pit submersible, dry-pit submersible, or dry-pit suction lift pump style.

The City's pump stations discharge into force mains ranging in size from 4-inches to 42-inches in diameter. Each force main is located within a 15-foot-wide to 25-foot-wide permanent easement owned and maintained by the City. Approximately 66 air release valves (ARVs) are located at high points throughout the system.

An overview of the transmission system with pump stations and associated force main locations is provided in Figure 1-1.

Appendix A, provided as Volume II of the TSOMP, contains technical specifications for each of the City-Owned Pump Stations including a detailed glossary of terms describing the general content of the technical specifications. The pump station technical specifications are provided in a separate volume to facilitate ease of use. The City updates the pump station technical specifications when warranted and maintains this data in electronic format.



Pump Station Number	Pump Station Name	Pump Station Number	Pump Station Name
5	Atlas Road	155	Hillcreek #1
10	Woodlands	160	Hillcreek #2
25	Dog Pound	165	Homeless Shelter
30	East Bluff	170	Meadowlands
35	Emerald Lakes	175	Piney Grove
40	Garners Ferry Rd	180	Regatta Point #1
45	Galaxy	185	Regatta Point #2
50	Green Lakes	190	Regatta Point #3
55	Heathwood Hall	195	Saluda River
60	Mallard Pointe	200	Three Rivers
65	Mill Creek	205	Wexford
70	Myers Creek	210	Wexhurst
75	Owens Field	215	Windsong
80	Quail Creek	220	Yacht Cove
85	The Retreat	225	Lake Murray WTF
90	Starlite	230	Bendale
95	Swandale	250	Food Lion at Two Notch
100	Versch Lock	275	Killian Crossing
105	Village Pond	295	North Columbia
110	West Columbia	305	Prescott Manor
115	Clearwater	310	Shady Lane
120	Colonial Life	320	Farrow Pointe
125	Crockett Road	325	Blythewood Crossing
130	Edventure	330	Bookert Heights
135	Georgetown	335	Broad River
140	Harbison #2	340	Hawkins Creek
145	Harbison #4	345	The Palms
150	Harbour Pointe	350	Owens Field Park

Figure 1-1. Pump Station Force Main and ARV Locations

1.3 Organizational Structure

The WCTS is operated and maintained by the City's Department of Utilities and Engineering. The City maintains organizational charts depicting roles and responsibilities for management, operations and maintenance of the wastewater transmission system. The Sewer Overflow Response Plan (SORP) and Contingency and Emergency Reponses Plan (CERP) include relevant organizational charts.

Section 2 Pump Station Operations and Maintenance

The Pump Station Operation and Maintenance Section of the TSOMP addresses the following specific requirements of the Consent Decree:

- **Section V. 12. h. i.** "Means and modes of communications between pump stations, field crews, and supervising staff."
- **Section V. 12. h. iii.** "Columbia currently has a pump station monitoring system which continuously monitors, reports, and transmits information for each pump station. The TSOMP shall provide that Columbia will continue to operate and maintain SCADA systems at pump all stations with a rated capacity of greater than 1,000 gpm. In addition, with the goal of eliminating SSOs due to pump station failure(s), Columbia shall evaluate the need for installation of SCADA systems at all other pump stations, and install them where necessary in accordance with the approved TSOMP implementation schedule required under paragraph 12(h)(x)."
- **Section V. 12. h. iv (A), (B), (C**). "Written preventive operations and maintenance schedules and procedures for the following routine activities:

  A. Service and calibration of instruments such as flow meters, liquid level sensors, alarm systems, elapsed time meters, and remote monitoring equipment

  B. Inspection and service for air release valves

  C. Predictive (non-physical) and/or physical inspection and service for all pump stations including:

     1. reading, recording and maintaining records of information from the elapsed time meters and pump start counters
     2. observing and documenting wet will conditions including grease and/or debris accumulation
     3. checking wet well pumping points and resetting as necessary to improve system performance
     4. checking, recording and maintaining records of system pressure(s)
     5. checking SCADA and/or alarm components
     6. checking sand-by power sources
     7. identifying maintenance and emergency planning needs."
- **Section V. 12. h. iv. (G).** "Resource commitments such as staffing, contractual support and equipment."

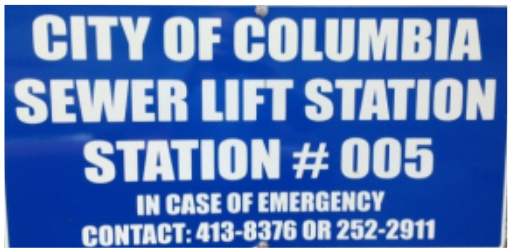
2.1 Means and Modes of Communication

Pump Station field crews and supervisory staff communicate daily through meetings held at the start and end of each shift, and as-needed through cell phones. Each day, supervisory staff assigns priorities to field crews and coordinates on the status of O&M efforts.

The City has installed a supervisory control and data acquisition (SCADA) system at most of their WCTS pump stations. The system provides for communication between Pump Station Section staff and the pump station, and is accessible for review from any SCADA terminal at the Metro Wastewater Treatment Plant and from mobile tablet devices given to each of the field crews. The SCADA system monitors a variety of parameters related to station operations and provides immediate notification to field crews of specified alarms at all connected stations.

Pump station field crews are responsible for regular monitoring of pump run times, responding to all SCADA alarms at their assigned stations during their shifts and for responding to all alarms if on-call during off-shift periods.

In the event of an emergency, signs are posted at all of the City's pump stations with a 24-hour contact number.



2.2 Pump Station SCADA Evaluation and Enhancements

The City has installed, and will continue to operate and maintain, SCADA systems at all pump stations with a rated capacity of greater than 1,000 gpm. In addition, the City has installed, and will continue to operate and maintain, SCADA systems at 48 of the remaining pump stations.

With the goal of eliminating SSOs due to pump station failure(s), the City evaluated the need for installation of SCADA systems at the three remaining stations that do not currently have SCADA, which include 070 – Myers Creek, 340 – Hawkins Creek, and 350 – Owens Field Park. The pump stations were evaluated based on the following criteria:

A. Monitoring via SCADA was considered a priority at pump stations located in remote or environmentally sensitive areas, including proximity to public water supplies. This assessment criteria is consistent with SCDHEC Standards for Wastewater Facility Construction (R.61-67).

    - Pump stations located within 400 feet of State waters, based on City of Columbia GIS, were identified as being in proximity to environmentally sensitive areas.

    - Pump stations were identified as remote and having difficult access based on historical knowledge of City staff.

B. Monitoring via SCADA was considered as a means to comply with the CD Section V.12.h.iv which requires the City to read, record and maintain records of information from elapsed time meters and pump start counters. The SCADA system will automate the City's ability to meet this requirement, reduce the labor for operations staff as opposed to manually managing these records, and facilitate ease of use of the pump operation data for decision-making.

The three remaining pumping station each satisfy at least one of the evaluation criteria. Therefore, it

was concluded that the City will install, operate, and maintain SCADA at all pump stations.

Each pump station will be provided with the following (note that many of these components are already in place at most pump stations):

- Providing the following to enhance notification of potential issues and support operations, maintenance and pump station reliability:
  - RTU Power Loss
  - Loss of Utility Power/Control Panel Power Loss
  - Wet-well High-high Level Alarm (flood)
  - Pump Run Status
  - Pump Fail (overload, moisture, temp) where applicable
  - Elapsed Time Meter and Pump Start Counter
  - Pump HOA switch in AUTO, where applicable
  - ATS status (where applicable)
  - Generator Run (where applicable)
  - Generator Fail (where applicable)
  - Loss of Float Control Power
- Installing antennas and radio telemetry components at stations that have no present connection to SCADA or which have been identified as having had communications problems in the past.
- Providing the following equipment and programming for each pump station for reading, recording, and maintaining records of information from the elapsed time meters and pump start counters:
  - Historical recording of pump starts and stops to SCADA
  - Elapse time meters (ETM) and historical recording of this data to SCADA
  - Pump Cycle per Hour Counter, pump starts and stops, and historical recording of this data to SCADA
  - Visual display on SCADA screens

In addition to the SCADA enhancements, analog pressure gauges will be added to all stations that do not currently have pressure gauges to enable recording of system pressures.

2.3 Pump Station Routine O&M Procedures and Schedules

O&M procedures implemented by the Pump Station Section are documented in a set of SOPs which are provided in Appendix B. Each activity and the planned maintenance schedule is documented herein.

PS SOP 1: Pump Station Inspections

The procedure includes performing a general inspection and assessment of the pump stations including the facility exterior, interior, and the pump station equipment. Inspections are also conducted of the elapse time meters/ pump start counters, wet well conditions, and system pressures. This procedure shall be conducted at least weekly for all pump stations. Pump stations with a capacity greater than 1,000 gpm and those with a history of operational issues are inspected more frequently.

PS SOP 2: Pump Station Wet Well Level Sensor Cleaning

The procedure includes inspecting and cleaning each of the pump station wet well level sensors. The pump stations are then tested for responsiveness to the level sensor. This procedure shall be conducted weekly for all pump stations.

PS SOP 3: Pump Station ARV Inspection and Maintenance

The procedure includes performing a general inspection and quarterly maintenance of the air release valves located at the pump stations. Note that due to the manner in which the City organizes O&M labor for the transmission system, this SOP is related only to those ARVs located at the pump stations and not the force main ARVs, which are addressed in Section 3 of the TSOMP. This procedure shall be conducted quarterly for all pump stations.

PS SOP 4: Standby Generator Check and Exercise

The procedure includes performing an inspection of and exercising the stationary and portable generators used at the City's pump stations. The stationary generator checks are conducted monthly and include verification that the generator and associated electrical equipment operate as expected. An annual test is conducted for portable backup generators. The test includes hooking up one of the City's existing portable generators, and running the pump station at full load for a minimum of 15 minutes.

PS SOP 5: Pump Station Level Sensor Calibration

The procedure includes performing service and calibration of the pump station level sensor equipment. It also includes verifying that the pump station responds appropriately to the wet well level sensor after calibration. This procedure shall be conducted quarterly for all pump stations.

PS SOP 6: Wet Well Condition Inspection

The procedure includes cleaning and performing an inspection of the pump station's wet well. This procedure shall be conducted quarterly for all pump stations. Contractor support may employed for the wet well cleaning aspects at large stations.

SOP 7: Pump Station Preventive Maintenance

The procedure includes performing the preventive maintenance activities for the various pieces of mechanical equipment for the pump stations. Specific activities include completing the manufacturer recommended 20-point inspection and maintenance on all Flygt pumps, the standard manufacturer's inspection and maintenance on non-Flygt pumps, servicing check valves and valve actuators, and conducting a wet well draw down test. For those stations with a grinder, the contracted outside vendors conduct any necessary grinder maintenance. For the small stations one of the two in-service pumps will be rotated out for the reserve pump. This procedure shall be conducted annually for all pump stations.

PS SOP 8: Annual Pump Station Inspections by the Lift Station Supervisor

The procedure includes the Lift Station Supervisor performing an audit/ inspection of the pump station, as well as meeting with operations and maintenance staff to discuss any deficiencies in both the upkeep

of the station and of proper documentation of activities being performed. Testing the wet well for structural corrosion is also conducted. This procedure shall be conducted annually, and forms the basis for continuous improvement in the pump station O&M program.

PS SOP 9: Pump Station SCADA Alarm Check

The procedure includes checking the alarms at each pump station by manually actuating the alarms where possible. Those alarms that cannot be actuated manually are to be simulated. Staff members are to verify that each alarm is received both at the Control Center and on the remote devices. The frequency at which each of the high level alarms sounds shall also be evaluated to determine if the levels are set properly. This procedure shall be conducted annually for all pump stations.

PS SOP 10: Infrared Inspections of Electrical Equipment

The procedure includes inspecting the electrical and controls equipment of each pump station via infrared scanning. This procedure shall be conducted once every three years for all pump stations. It is expected that the inspection work will be conducted by an outside contractor.

PS SOP 11: Flow Meter Calibration

The procedure includes having verifying the force main flow meter transmitter signal and steps for corrective action. It should be noted that currently only the large stations have flow meters installed. It is expected that this procedure will be conducted once every year for all pump stations with a flow meter installed.

2.4 Pump Station O&M Resources

The City of Columbia Pump Station staff are responsible for the operation and maintenance of the City's wastewater pump stations. The Lift Station Supervisor prioritizes and assigns operations and maintenance activities for field crews. The crews are responsible for visiting each of their assigned pump stations on either a daily or weekly basis. The frequency is determined by historical trend and the risk of a SSO occurring. A minimum weekly routine site check is conducted.

Table 2-1 summarizes the resource requirements to implement the O&M procedures documented in the TSOMP. The resource assessment assumed 1,800 hours per year per full-time equivalent can be dedicated to implementation of the pump station TSOMP SOPs.

Table 2-1. Summary of the Pump Station Staff Labor Estimated to Complete the SOPs

Procedure Number	Procedure Name	Estimated Hours per Occurrence	Estimated Annual Hours per SOP	FTEs per SOP
PS SOP 1	Station Checks	1	5,330	2.96
PS SOP 2	Level Sensor Cleaning	1	3,770	2.09
PS SOP 3	PS ARV Inspection & Maintenance	2	520	0.29
PS SOP 4	Generator Check/ Exercise	1 to 2	1,140	0.63
PS SOP 5	Level Sensor Cleaning & Calibration	2	520	0.29

Table 2-1. Summary of the Pump Station Staff Labor Estimated to Complete the SOPs

Procedure Number	Procedure Name	Estimated Hours per Occurrence	Estimated Annual Hours per SOP	FTEs per SOP
PS SOP 6	Wet Well Condition Inspection	8 to 12	740	0.41
PS SOP 7	PS Preventive Maintenance	Varies	1,230	0.68
PS SOP 8	Supervisor PS Inspection	2 to 4	140	0.08
PS SOP 9	Checking Alarms and SCADA	2	130	0.07
PS SOP 10	Infrared Inspections	2 to 4	50	0.03
PS SOP 11	Flow Meter Calibration	8	100	0.05
FM SOP 3*	Force Main ARV Inspection and Maintenance	2	130	0.07
Total			13,800	7.7

*See Section 3. Lift Station staff assist Wastewater Maintenance Division staff during change out of force main ARVs.

Currently, the City's Pump Station staff includes 8 full time maintenance personnel, which is believed to be adequate to implement the Pump Station Preventive Maintenance Program. These personnel must also conduct corrective and emergency maintenance at lift stations. The City will monitor the ability of the existing staff to implement the planned preventive maintenance, in addition to required corrective and emergency maintenance procedures. If staff are able to meet the KPI presented in Section 6 of the TSOMP, staffing levels will be assumed adequate.

A total of six (6) route vehicle are required to support implementation of the SOPs, which assumes that the majority of the procedures will be implemented by single-person crews. In addition to these vehicles, a boom truck and a combination sewer cleaning truck are also available; however, these vehicles are shared with WWTP staff and not solely allocated to pump station maintenance. In addition to these vehicles, various hand tools will also be used as needed.

In addition to in-house staff, the following contracted resources may be relied upon to supplement the in-house expertise of the City field crews:

- SCADA Checking (PS SOP 9)
- Infrared Scanning (PS SOP 10)
- Flow Meter Calibration (PS SOP 11).

Outsourcing decisions will be evaluated based on staff training and skill levels needed to execute these SOPs, which may vary of the course of the TSOMP implementation.

Section 3 Force Main and Easement Operation and Maintenance

The Force Main and Easement Operation and Maintenance Section of the TSOMP addresses the following specific requirements of the Consent Decree:

- **Section V. 12. h. iv (E).** "Inspection of Force Main Easements, including inspection of creek crossings, stream bank encroachment toward Force Mains, and easement accessibility (including the need to control vegetative growth or encroachment of man-made structures or activities that could threaten the integrity of affected Force Mains). Inspections shall include written reports, and where appropriate, representative photographs or videos of appurtenances being inspected (Force Mains, creek crossings, etc.). The TSOMP shall require inspectors to promptly report any observed SSOs, and any evidence of SSOs which may have occurred since the last inspection, to their supervisors and document findings. Columbia shall report any observed SSO in accordance with the SORP and NPDES Permit."
- **Section V. 12. h. iv. (G).** "Resource commitments such as staffing, contractual support and equipment."

3.1 Force Main and Easement O&M Procedures and Schedules

Activities, procedures, and the planned maintenance schedules for force main and easement O&M are documented in the following three SOPs, which are included in Appendix C:

- FM SOP 1: Easement and Force Main Inspection
- FM SOP 2: Force Main Easement Maintenance
- FM SOP 3: Air Release Valve Inspection and Maintenance

FM SOP 1: Easement and Force Main Inspection

Force mains and easements will be inspected annually. FM SOP 1 and the associated Easement and Force Main Inspection Field Checklist (included in Appendix C) will be used to identify and appropriately document any observed issues. The procedures conducted under FM SOP 1 shall include:

- Limited clearing to provide as-needed access for inspections
- Identification of significant access issues along the force main such as vegetation overgrowth and encroachments that may impede emergency access to force main assets or put the integrity of the assets at risk
- Inspection along the force main for evidence of SSOs, particularly at ARV locations and stream crossings
- Identification of erosion issues (rutting) that may put an asset at risk
- Issues at stream crossings (erosion, debris, structural pipe failure, etc.) that may put an asset at risk.

- Inspection of installed easement markers, where appropriate
- Inspection of ARVs for leaking, corrosion and issues that should be corrected sooner than the scheduled maintenance for the asset.

As part of this SOP, the Division may elect to have the force main located and permanently marked with fiberglass markers. This activity will be done for all large diameter force mains (over 12-inches), but will be undertaken on a case-by-case basis for smaller lines.

Issues identified during inspections will be appropriately documented using the Easement and Force Main Inspection Field Checklist. Work Orders for significant clearing activities or resolution of encroachment problems will be generated under FM SOP 1.

FM SOP 2: Force Main Easement Maintenance

FM SOP 2 includes vegetation clearing to provide unimpeded access to force mains and easements to facilitate inspections, ARV preventive maintenance, and emergency maintenance. The schedule will include both significant initial clearing activities and annual easement maintenance.

Significant, initial clearing needs will be identified through FM SOP 1 and may involve removal of large trees, obstructions or overgrowth. Annual easement maintenance will include vegetation clearing with bush hogs, mowers, small hand tools, and application of herbicide.

FM SOP 3: Semi-Annual ARV Replacement for Maintenance

FM SOP 3 activities consist of exchanging operating ARVs with serviced units and returning the removed unit to the maintenance location for servicing. ARVs will be rotated out for routine O&M every six months.

3.2 Force Main and Easement O&M Resources

The City's Wastewater Maintenance Division is charged with maintenance and operation of the City's wastewater gravity collection and force main transmission system. The Division is managed by the Superintendent, Assistant Superintendent and additional support from key staff members. There are currently 94 maintenance staff assigned to the Division and it is expected that a minimum of four staff will be utilized to carry out the force main ARV and easement maintenance procedures documented in the TSOMP.

Table 3-1 summarizes the City staff resources for easement, force main and ARV O&M procedures. In addition to City staff, the Division also currently works with the City's Engineering Department to contract outside vendors for various O&M tasks. Significant clearing of vegetation/overgrowth in easements will be conducted through contracted forces. Staff hours have been included in Table 3-1 for these activities to provide contractor coordination and oversight.

Table 3-1. Easement, Force Main and ARV O&M Labor Requirements

Procedure Number	Annual Activity Staff Hours	Crew Size	Percent of Crew's Available Time Dedicated to Task*
FM SOP 1. Force Main and Easement Inspection	650	3	12%
FM SOP 2. Force Main and Easement Maintenance	1,800	4	25%
FM SOP 3. ARV Inspection and Maintenance	940	3	17%

*Assumes 1,800 hours per year available time

Resources required for routine ARV and easement maintenance (FM SOP 3) will generally include three person crews familiar with ARV removal and replacement procedures. Given that crew sizes for these activities range from 2 to 4 persons, it is expected that the total resource commitment for the Force Main and Easement O&M Program is approximately 4 full time equivalents (FTEs). The City will balance workload needs of the TSOMP and other related programs. The City will monitor the ability of existing staff to implement the planned preventive maintenance in addition to the other commitments of the Wastewater Maintenance Division. If staff are able to meet the KPI presented in Section 6 of the TSOMP, staffing levels will be assumed adequate.

Equipment resources needed include:

- Three (3) route vehicles
- Three (3) utility terrain vehicles (UTVs) and trailers,
- Dump truck with trailer
- Tractor with trailer
- Excavator/Backhoe
- Various hand tools and equipment including chainsaws, large wood chippers, brush clearing vehicles (bush hogs), and manhole hooks.
- Appropriate equipment for documenting potential problems (i.e. cameras).

In addition to in-house staff, the following contracted resources will be relied upon to implement the Force Main and Easement O&M Program:

- Survey support for force main easement identification, surveying and marking
- Tree clearing services for initial clearing of force main easements which requires specialized equipment that the City does not maintain, and will not need consistently in the long-term.

Section 4 Sulfide and Corrosion Control

The Sulfide and Corrosion Control Section of the TSOMP addresses the following specific requirements of the Consent Decree:

- **Section V. 12. h. iv (D).** "Engineering evaluation of Force Mains and Pump Stations for potential sulfide and corrosion control needs. The TSOMP shall require, and Columbia shall generate, a summary report of findings with sulfide and corrosion control method(s) and the schedule for implementation of selected measures, where applicable."
- **Section V. 12. h. iv. (G).** "Resource commitments such as staffing, contractual support and equipment."

4.1 Engineering Evaluation Objectives

The Sulfide and Corrosion Control element of the TSOMP is established to address corrosion issues associated primarily with the formation of hydrogen sulfide (H2S) in the sanitary sewer system. The purpose of the corrosion control component of the program is to provide a systematic means for identifying and correcting corrosion problems before they cause a failure in critical pump station and force main assets. Depending upon conditions present, there are several types of corrosion that may need to be addressed:

- Degradation of concrete caused by the presence of H_2S and moisture in wet wells, manholes or concrete pipes
- Corrosion of ferrous metals (rust) resulting from improperly applied or maintained protective coating systems (paint). This can be accelerated in areas where the metal is exposed to H_2S
- Corrosion of a variety of metals caused by aggressive or corrosive soils.

Under the TSOMP, the City shall implement the following:

- Engineering evaluation of the WCTS to identifying sulfide-related corrosion risks and areas of concern
- Identification of corrosion control and mitigation alternatives, costs and an implementation schedule
- Monitoring of corrosion rates and mitigating corrosion through routine pumps station and force main inspections.

4.2 Sulfide Related Corrosion Risks

Odors and yellow deposits at pump stations, air relief valves (ARVs) and force main discharge points can be indicators of sulfide and corrosion. Pump stations that have been identified as having odor problems by City staff include: Broad River, Wexford, Crockett, Wexhurst, Bookert Heights, Harbor Pointe and Georgetown pump stations. City staff have also noted corrosion issues at the Bendale pump station. There have not been any notable force mains with corrosion concerns identified to date. The City has recently replaced a section of force main near Candi Lane, downstream of the Saluda River Pump

Station, due to corrosion issues. The existing concrete force main pipe was replaced with ductile iron and a new ARV was installed at the high point of the force main where it transitioned to flow downhill, via newly installed HOBAS pipe, to the force main discharge at the next manhole.

4.2.1 Force Main Corrosion Risk Factors

Force mains with high risk of failure due to corrosion will be identified. Risk factors will include materials of construction, physical geometry of pipes, wastewater characteristics, detention time, and lack of ventilation in non-filled sections. A Force Main Criticality Model will be developed, which will incorporate the following corrosion risk factors:

- Force Main (FM) Material
- High Points and Down-Sloping in FM
- Low Wastewater pH
- High Sulfide Concentration
- High Temperature
- Long Detention Time.

4.2.2 Pump Station Corrosion Risk Factors

Pump stations with high risk of failure due to corrosion will be identified. A Pump Station Criticality Model will be developed, which will incorporate the following corrosion risk factors:

- Low Wastewater pH
- High Sulfide Concentration
- Inadequate Ventilation
- Materials of Construction.

Concrete wet wells and metals such as steel and copper are susceptible to corrosion. When evaluating pump stations for sampling, the presence of lining or coating of assets exposed to sewage and gasses will be noted. Assets coated or lined with material appearing to be in good condition will not be considered for additional corrosion protection or sampling.

4.3 Engineering Evaluation Protocol

An overview of the protocols for the Engineering Corrosion Control Evaluation is provided in Figure 4-1. The Engineering Corrosion Control Evaluation will be coordinated with force main condition assessment activities as described in the Continuing Sewer Assessment Program (CSAP).

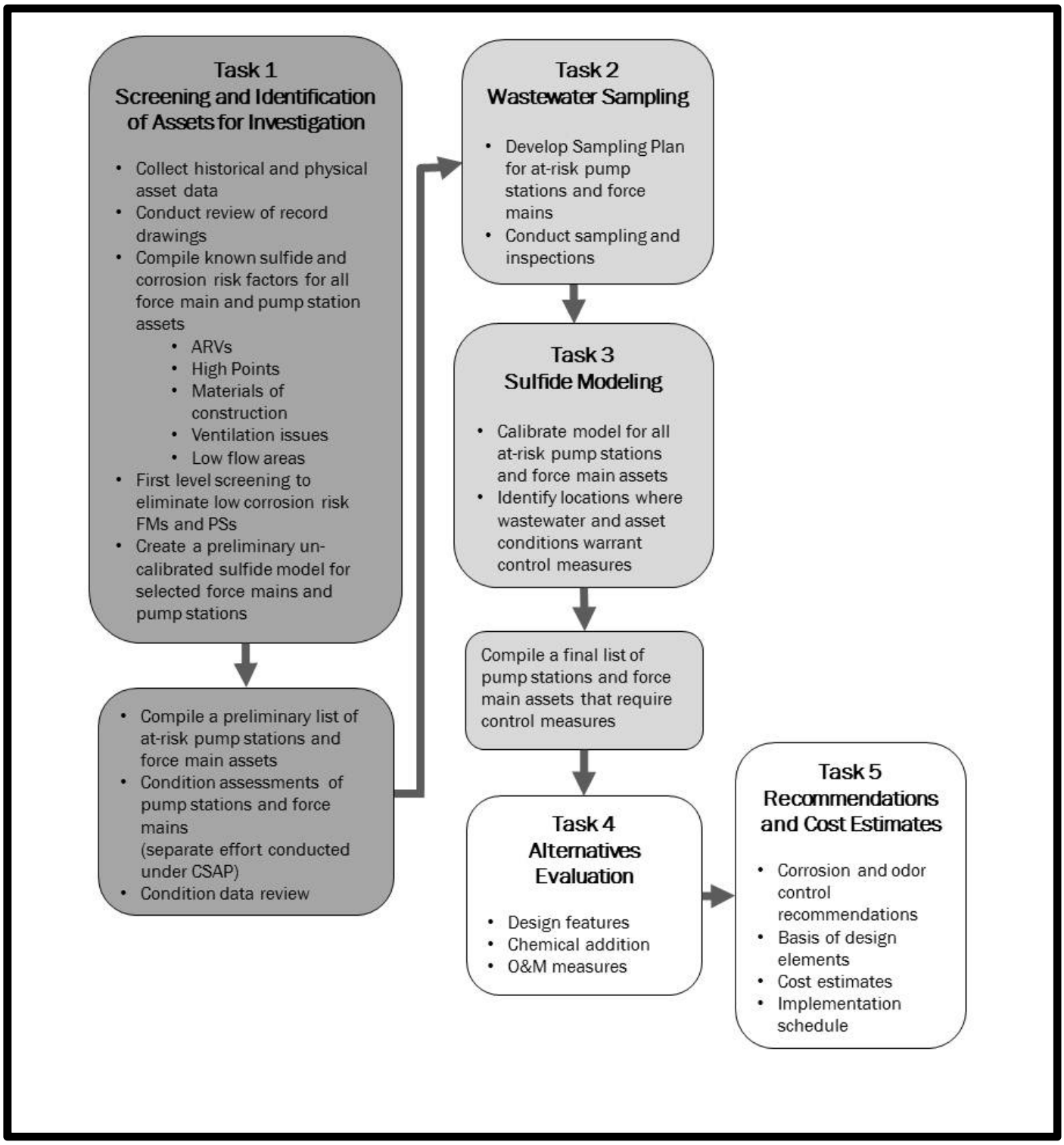


Figure 4-1. Overview of Engineering Corrosion Control Evaluation Protocol

Task 1: Screening and Identification of Assets for Investigation

Risk factors and criticality analysis as will be used to identify force mains and pump stations with the greatest likelihood of experiencing sulfide and corrosion issues. The asset screening will include:

1. **Collect historical and physical asset data**. This will largely be based on City staff knowledge regarding physical condition of structures and equipment, odor issues, and historical problems indicative of risk factors.
2. **Conduct a review of record drawings**. This will allow the analysis to flag areas downstream of high points (e.g., ARVs) where pipe sections flow partially full as at risk.
3. **Compile corrosion risk factors** and identify pump stations and force mains with the highest potential for corrosive environments.
4. **Create a preliminary sulfide model**. Develop a preliminary un-calibrated model for force mains with high corrosion environments. Use readily available data such as diameters and lengths of force mains and volumes of wet wells. Historical treatment plant values for parameters such as temperature, BOD, will be used. This preliminary modeling will allow further refinement of the focus areas for sampling and analysis.
5. **Compile a preliminary list of assets** for further evaluation based on risk factors and sulfide modeling. Pump stations will be assessed based on the upstream sulfide risk factors (e. g., force main upstream of pump station) and their own physical data and risk factors. Results of this effort will be used to inform force main and pump station condition assessment efforts. Condition assessment will be a separate effort from the engineering corrosion control evaluation; see Section 5 for implementation plan.
6. **Condition data review.** Obtain and review condition assessment data for pump stations and force mains once available and add or eliminate preliminary list of assets for corrosion control evaluation based on condition data.

Task 2: Wastewater Sampling

A Monitoring Plan will be developed that identifies sampling locations where preliminary modeling suggests problems may occur. Monitoring sites will be comprised of pump station wet wells, air release valves and force main discharges. These locations should be accessible to avoid hazardous conditions but selected to allow for the most relevant and valuable results. A listing of typical sampling sites and corresponding analyses is presented in Table 4-1. Note that Table 4-1 is a menu of potential sampling techniques; a specific sampling plan will be developed as part of the study.

Table 4-1. Typical Wastewater Sampling Schedule for Corrosion Control Analysis

Site	Sample Parameter	Analysis Method	Sample Size	Instrument Range	Frequency	Comments
Force main Discharge Manhole	H_2S-logged	Apptek Odalog	NA	0 – 200 ppm	One week at ten minute intervals	
	Total Sulfide	Hach Kit	500 ml grab	0 – 10 mg/L	Twice a day for two days	First sampling event at time of peak H_2S level as recorded on Odalog. Second sampling event within 2 hours of low flow time and at least 2 hours from first event.
	Dissolved Sulfides	Hach Kit	500 ml grab	0 – 10 mg/L		
	pH	pH Probe	500 ml grab	6 – 8 s.u.		
	Temp	pH Probe	500 ml grab	40 – 80 deg. F		
	Dissolved Oxygen	Dissolved Oxygen Meter	500 ml grab	0 – 5 mg/L		
	5-day BOD	Environmental Science Corporation		50 – 400 mg/L		
Pump Station	Wastewater Flowrate	In-situ Meter	NA	0 – 3 mgd	Continuous for duration of sampling program	Continuous data preferable
Wet Well Headspace	H_2S-logged	Apptek Odalog	NA	0 – 200 ppm	Four consecutive days at ten minute intervals	Include a weekend. Install close to influent pipe.
ARV Vault Headspace	H_2S-logged	Apptek Odalog	NA	0 – 200 ppm	Four consecutive days at ten minute intervals	
Wet Well Wastewater	Total Sulfide	Hach Kit	500 ml grab	0 – 10 mg/L	Once a day for two days	Sample near influent. One sampling event at time x hrs prior to first force main discharge sampling event where x = force main detention time.
	Dissolved Sulfides	Hach Kit	500 ml grab	0 – 10 mg/L		
	pH	pH Probe	500 ml grab	6 – 8 s.u.		
	Temp	pH Probe	500 ml grab	40 – 80 deg. F		
	Dissolved Oxygen	Dissolved Oxygen Meter	500 ml grab	0 – 5 mg/L		
	5-day BOD	Environmental Science Corporation		50 – 400 mg/L		

The preliminary sulfide model must be calibrated by collecting empirical data during a warm weather sampling period when wastewater temperatures are at their highest. All active corrosion and odor control measures may need to cease during the sampling period. A review will be made on a case by case basis to determine the necessity of ceasing odor control activities.

Odalogs will be deployed at the selected monitoring sites. These will record H_2S concentrations every 5 minutes for approximately one week. They will indicate peak and average H_2S concentrations and show diurnal variations. Following review of the Odalog data, grab samples will be collected at the high sulfide concentration periods. The grab samples will be analyzed for temperature, pH, total and dissolved liquid sulfide and composited for BOD analysis. Physical characteristics and observations of FM discharges will also be recorded to assess how turbulence is impacting the H_2S formation.

Task 3: Sulfide Modeling

Sulfide modeling will be conducted for the preliminary list of force mains and pump station combinations identified to be at risk under Task 1: Screening and Identification of Assets for Investigation. For those force mains having associated large wet wells with a liquid detention time greater than 40% of force main detention time, the wet well detention time will be taken into account.

The sulfide model will be developed to predict sulfide concentrations based on the following equation developed by Pomeroy and Parkhurst (United States Environmental Protection Agency, 1985):

$$S_2 = S_1 + (M)\ (t)\ [\text{EBOD}\ (4/d + 1.57]$$

Where:

S_2 = predicted sulfide concentration at time t_2, milligrams per liter (mg/L)

S_1= sulfide concentration at time t_1 (mg/L)

M = sulfide flux coefficient, meters per hour (m/h)

t = detention time in sewer reach with constant diameter and flow, hours (h)

EBOD = effective biochemical oxygen demand (BOD), EBOD = BOD x $1.07^{(T-20)}$ (mg/L)

d = pipe diameter, meters (m)

T = wastewater temperature, degrees Celsius (^oC)

Typical values for the experimentally determined sulfide flux coefficient (M) *are:*

0.5×10^{-3} to 1.0×10^{-3} m/h

We will assume a value of 0.75×10^{-3} for the purposes of this evaluation as it is the arithmetic mean between the typical values for the experimentally determined coefficient.

Physical Asset Data

The physical data required for the model consists of pipe diameter, pipe length and average daily flow rate. These parameters will be used to calculate the detention time of the wastewater in the specified force main or wet well. As-built drawings and the City's GIS will be the primary data source. No additional field data collection is anticipated for this effort.

Wastewater Properties

BOD and temperature will be used to calculate the EBOD. These properties, taken from treatment plant reports, will be assumed to be constant across the system for the preliminary model, and refined with wastewater sampling data collected under Task 2 for development of a final calibrated model.

Model Calibration

Data from the sampling will be used to calibrate the model, allowing more accurate prediction of sulfide concentrations in areas of concern.

Model Results

Model output will be reviewed to identify specific locations where sulfide concentrations are high enough to warrant control measures. These locations will be analyzed further utilizing a surface level cost-benefit analysis to determine which projects will be feasible.

Task 4: Development of Control Alternatives

The corrosion control evaluation will recommend improvements to protect assets based on the prediction of corrosive environments identified through the modeling and force main inspections conducted under the CSAP. These control alternatives will be comprised of design measures, engineering additions, and operations and maintenance measures as described in the following sections. The alternatives will be selected based on economic and non-economic factors and a cost to benefit analysis. City staff will provide input on selection criteria to be used based on experience and preferences.

Design Measures

When evaluating the construction of a new pump station or force main or when rehabilitating an existing pump station or force main, the design alternatives described in Table 4-2 are typically considered.

Table 4-2. Design Alternatives for Sulfide and Corrosion Control

Feature	Description	Applicability
Reduce Drops and Turbulence	Reducing the turbulence in a pump station or force main will reduce the stripping of hydrogen sulfide.	Force main discharges Pump Station influent pipes
Seal or unseal Selected Manholes	Prevent pressure accumulation and odors from entering or escaping manholes thus limiting complaints.	Manholes Pump Stations Force main discharge
Exhaust and Treat	Removal of gaseous sulfides for treatment and discharge.	Pump stations Force main discharge
Force Main Profile	Because high points are generally considered likely corrosion locations, leveling of force mains to include fewer high points is advantageous. Local vertical profile adjustments can be considered where failures have occurred or are imminent.	Force Mains

Table 4-2. Design Alternatives for Sulfide and Corrosion Control

Feature	Description	Applicability
Lining/Coating	Lining or coating of assets can prevent corrosion by installing an impenetrable layer between the corrosive gasses and adversely affected material.	Pump Stations Force main discharge
Addition of ARV	ARVs can release corrosive gasses to prevent their corroding force mains.	Force Mains

Chemical Addition

Chemical addition can be a relatively simple way to alter biological and chemical make-up of the waste water stream without having to make dramatic changes to the system. The safety aspects of handling hazardous material will be considered in the alternatives evaluation. Typical chemical addition alternatives are described in Table 4-3.

Table 4-3. Chemical Addition Alternatives for Sulfide and Corrosion Control

Feature	Description	Applicability
Chemicals (TOTALOX™)	TOTALOX™ odor eliminator is a nitrate product recommended for applications that may include a combined permanganate solution for immediate odor control and a nutrient source for long term odor control.	Pump Stations and Force Mains
Nitrate	Allows sulfate reducing bacteria to reduce NO_3 to N_2 rather than SO_4 to H_2S	Pump Stations and Force Mains
Iron Salts	Iron chlorides or sulfates precipitate sulfides as insoluble solids $FeCl_2 + S= \quad ---> \quad FeS$ (fine black solid) + 2Cl-	Pump Stations and Force Mains
Chlorination	(Sodium Hypochlorite - NaOCl) Oxidizes sulfide	Pump Stations and Force Mains
Hydrogen Peroxide	Oxidizes sulfide. Also used with iron salts as PRISC (peroxide regeneration, iron sulfide control)	Pump Stations and Force Mains
pH Adjustment	Adjusting wastewater pH to nine or higher, keeps H_2S in solution.	Pump Stations and Force Mains
Air	Addition of air into solution can increase DO and reduce the production of sulfide.	Force Mains
Oxygen	Used mostly for direct addition to force mains and is five times more soluble than air.	Force Mains
Ionization	Generate irons, ozone or free radicals which oxidize the sulfides. Also helpful in removing grease.	Pump Stations

O&M Measures

O&M Measures can be made without significant changes to the assets or make up of the wastewater. Measures as simple as adjusting float heights or more regular maintenance can make dramatic changes in the downstream presence of sulfides. Typical O&M alternatives are described in Table 4-4.

Table 4-4. O&M Alternatives for Sulfide and Corrosion Control

Feature	Description/Benefit	Applicability
Change Wet Well Levels	Raise the wet well levels to prevent turbulence in wet well.	Pump stations with free board available above top of influent pipe.
Change Pump Cycles	Adjust pump cycles to better manage force main and wet well levels.	Pump Stations with VFDs
Use VFDs	Decrease turbulence by reducing pump cycling.	Areas with poorly sized pumps requiring heavy cycling of pumps.
Avoid Air Entrainment	Less air = less oxygen to form sulfuric acid from hydrogen sulfide in the headspace	
Flush Force Mains with Water	Dilute waste water which will lower the BOD of the wastewater thereby lowering the sulfides generated. This can also help to scour the force mains removing sulfur containing sludge.	Low flow areas where pumps are poorly utilized.
Continuous Potable Water	By adding potable water to the waste water stream, the stream is diluted and detention time decreased which yields lower sulfide concentrations. This also allows the pumps to cycle more often clearing pump stations and force mains.	Pump stations
Remove Scum/Slime/Sludge	Sulfides produced in slime layer on the pipe/walls or in sludge deposits on the pipe invert.	Force mains and pump stations
Pigging	Prevents build-up of scum and solids preventing formation of sulfides.	Force mains

Task 5: Recommendations and Cost Estimates

A summary report of findings will be developed to include recommendations, budgetary cost estimates and an implementation schedule for selected measures. Recommendations will be made based on results of the study, cost-benefit analyses and City input.

4.4 Resource Requirements

The engineering evaluation of force mains and pump stations for potential sulfide and corrosion control needs will be conducted by contracted forces.

Section 5 Inventory Management

The Inventory Management Section of the TSOMP addresses the following specific requirements of the Consent Decree:

- **Section V. 12. h. vi (A).** "An inventory management system that requires Columbia to Maintain:
  A. Lists of critical equipment and spare parts
  B. An inventory of the critical spare parts and critical equipment stored at Columbia's facilities, and a list of where the remaining critical spare parts and equipment not stored at Columbia's facilities may be obtained to allow repairs in a reasonable amount of time
  C. Written procedures for updating the critical spare parts and equipment inventories in the inventory management system."

5.1 Identification Critical Spare Parts

The following definition was developed for determining if equipment or spare parts are critical to transmission system operations: "Critical equipment and parts are those which, when failure occurs, will result in a sanitary sewer overflow (SSO) or impede the response to an emergency."

5.2 Listing of Critical Equipment and Spare Parts

Based upon the above definition, the following spare parts and equipment are considered critical. The specific location and inventory list is Provided in Appendix D, Attachment A.

- Pumps
  - Submersible Pumps: In the event of a failure of a submersible pump, the City's first non-emergency response will be to install one of the reserve pumps maintained in the treatment plant warehouse. While the City does not currently own a reserve pump for every station, some reserve pumps can be used at multiple stations. It should be noted that it is now standard practice for the City to purchase a reserve pump with every station upgrade. This requirement does not apply to the five stations with capacity greater than 1,000 gpm, as these stations have a redundant pumps already installed. If failures require more extensive repairs, or a reserve pump is not available, a temporary diesel bypass pump will be installed at the station.
  - Non-Submersible: Spare rotating assemblies and drive belts will be stored in the treatment plant warehouse for all non-submersible stations. These parts are prone to failure, and can readily be reinstalled by City staff. Temporary diesel bypass pumping will be utilized to facilitate repairs that cannot be made quickly.
- Check valves
  - Spare check valves under 8-inches in diameter will be stored in the treatment plant warehouse.
  - Spare check valves 8-inches in diameter or larger will not be stored in the treatment plant warehouse. Instead, the City will store spare internal components for these valves in the treatment plant warehouse and identify a local supplier who can provide complete check

valve assembly within a reasonable amount of time.

- Level sensing equipment
  - Floats
  - Pressure transducers
  - Milltronics/ Ultrasonics
- Electrical and instrumentation equipment – Without the electrical and instrumentation equipment listed below, the pump stations will be unable to function properly, thereby increasing the potential of SSOs occurring.
- Motors
- Starters
- Relays
- Fuses
- Master switches
- Automatic transfer switches
- Motor control centers (MCCs)
- Control panels

  The city stores spare parts either in the treatment plant warehouse or can purchase them in a reasonable amount of time from a local supplier. Failures that require more extensive repairs, where the station cannot be operated manually, will utilize diesel driven bypass pumping until the repair is completed.

- Contingency and Emergency Response Plan (CERP) required items

  The CERP will contain a listing of the spare equipment and parts necessary to respond to various emergencies throughout the Transmission System. These are included to expedite the response to SSOs and other emergencies. Procedures for managing the CERP-required parts inventory are part of a separate process during periodic updates of the CERP.

- Backup generators (stationary and portable)

  The backup generators are the primary option for responding to a power outage at the pump stations, and are therefore critical to responding to events that may result in an SSO. The lift stations that do not have stationary generators have a standard plug for hooking up a portable generator, thus reducing the time to respond to a power outage.

The following items, while important for the operation of the transmission system are not considered to be critical spare parts and equipment in preventing occurrences of SSOs. The repair of these items is considered a high priority and will be addressed accordingly. These parts may be kept in stores at either the WWTP warehouse or the Columbia Public Works Utilities Facility.

- Bubbler system level sensing equipment

  The City has standardized on an alternate level sensing technology and plans to replace the

bubbler systems as they fail. It is expected that the system replacement can be completed within one week of initiation.

- Multitrode level sensing equipment

  There is currently only one Multitrode system installed as a pilot. Any failure of this system will be handled by the supply vendor. It is equipped with a float backup, with spares available for the backup system.

- Grinders

  The grinders have not been included in the critical equipment list as flow can still enter the station even when they fail and the downstream pumps are capable of bearing solids.

- ARVs/ Surge Valves

  Failure of these valves would not likely result in an SSO, however the failure is considered a high priority repair and will be addressed accordingly.

- Variable Frequency Drives (VFDs)

  City staff have the ability to run the VFD driven pumps in a constant-speed/ hand mode in the event of a VFD failure.

5.3 Location of Critical Equipment and Spare Parts

The critical equipment and spare parts are stored in one of three locations:

- WWTP Warehouse Inventory
  - A full listing of the critical equipment and spare parts kept by the City at the treatment plant warehouse can be found in Appendix D. The listing includes the following information for each asset:
  - Asset Name/ Number and Description
  - Sites where the asset can be utilized
- WWTP Yard or at Pump Stations

  The rolling assets utilized by the Division are located at various City facilities including the WWTP Yard, Columbia Public Works Utilities Facility, and the pump stations themselves. These assets include the various cleaning and maintenance trucks, the portable generators, and the diesel powered bypass pumps. A thorough list can be found in the Emergency Equipment and Vendors section of the City's CERP. It should be noted that some of the CERP items are kept in the WWTP Warehouse.

- Not Kept in Inventory but available through local Suppliers

The CERP includes a general listing of critical equipment and parts required to conduct the procedures outlined in that document. It also includes a listing of suppliers the City frequently employs to deliver equipment and spare parts not kept in Inventory.

Note that if equipment is obsolete or is no longer manufactured fails, the City will not repair the item,

but will replace the item with a currently available equivalent.

To ensure the critical equipment and parts can be procured in a reasonable amount of time, the following provisions have been made:

- The City manager may authorize a purchase of up to $50,000 in an emergency without approval from City Council. No single critical item is expected to exceed this amount.
- The suppliers on the list have noted that they can generally provide the identified critical equipment and spare parts in a timely fashion, which is assumed to be two weeks. However, it was noted that replacement or rebuilding entire pieces of equipment such as pumps or MCCs may take up to 4 weeks or longer for complicated systems and large equipment. In these events, it is expected that the City will institute bypass pumping in the interim.

5.4 Inventory Management of Critical Spare Equipment and Parts

Standard Operating Procedures were developed to govern the management of the Critical Spare Equipment and Parts Inventory maintained in the WWTP warehouse. The SOPs are documented in Appendix D, Attachment B. The City is currently migrating from a manual paper based system for inventory management to utilizing Cityworks CMMS computerized parts management. Copies of the paper forms currently used for inventory management are located in Appendix D, Attachment C. The procedure outlined below will be incorporated into the CMMS. The SOP, titled Warehouse Inventory Control for Critical Equipment/ Parts, includes subsections detailing how to conduct different aspects of inventory management. Each of the subsections has an accompanying form. Full documentation of these procedures can be found in Appendix D, which are summarized as follows:

- Initial Add to Stores: adding a new item to the warehouse inventory
- Checking out Items to Complete Maintenance Tasks: Tracking which items are removed to complete maintenance tasks
- Return/ Refill Stores: Tracking when an item is returned to stores after being used to complete a maintenance tasks, such as a reserve pump, or when consumable inventory stock is being refilled
- Annual Inventory Review: An annual stock review will be conducted. The review will include the following sub-tasks:
  - Dormant Stock: A review of those stock items which have not been used in the last two years to determine whether or not they should be kept in stores.
  - Managing Parts and Equipment Quantities: A review of the frequency of "stock out" or zero available stock event occurrences. If stock of an item is frequently running low, then it may be necessary to adjust the maximum and minimum set points for warehouse inventory.
- Permanently Removing Items from Stores: These are items which are no longer useful in completing maintenance tasks.

It is expected that the inventory management for critical equipment and spare parts which are required by the CERP but not maintained within the Metro WWTP warehouse will be governed by the SOP

developed for the annual CERP review process.

5.5 Additional Equipment to be Obtained

Pump station-specific likelihood of failure criteria were used to determine if appropriate backup equipment was in place to aid in response to emergencies at the pump stations. The evaluation determined which stations met criteria 1 and any two of criteria 2 through 4:

1. Site does not have backup power installed, or a reserve pump available
2. Site is located near State Waters or a Public Water Supply
3. Site is located such that it is difficult to access with large trucks/ trailers
4. Site is located such that the time to respond to an alarm is High

Two sites were identified that are at a higher risk of the City not being able to quickly respond to emergencies with mobile equipment. It was recommended that some form of permanent backup equipment, either backup generators or backup diesel pumps, be available for use at these stations. Table 5-1 notes which stations met the above criteria.

Table 5-1. Stations Recommended for Onsite Backup Equipment

Station ID #	Name	Criteria Met
080	Quail Creek	High Overflow response time and proximity to State Waters
115	Clearwater	High Overflow response time and proximity to both State Waters and a public water supply

Section 6 Data Management and Analysis

The Data Management and Analysis Section of the TSOMP addresses the following specific requirements of the Consent Decree:

- **Section V. 12. h. v.** "Data Attributes for the Sewer Mapping Program allowing data to be compared in Columbia's GIS system against other pertinent data such as the occurrence of SSOs, including repeat SSO location and permit violations."
- **Section V. 12. h. vii.** "A common information system that Columbia will use to track implementation of the TSOMP, track maintenance activities (including pump station equipment histories) and track management, operations, and maintenance performance indicators)."
- **Section V. 12. h. viii.** "The Key Performance Indicators (KPI) Columbia will track to measure performance of the WCTS using the information system referenced in paragraph 12.h.vii above. These KPI include, but are not limited to, the number of SSOs related to force mains per mile of Force Mains and/or the number of SSOs related to pump stations per number of pump stations; and maintenance activities tracked by type (corrective, preventive and emergency)"
- **Section V. 12. h. ix**. "Reports which list equipment problems and the status of work orders generated the previous month."

6.1 Information Management System

Cityworks will be the primary information management system that supports work and asset management functions of the TSOMP, including tracking of maintenance performance indicators. Preventive, corrective and emergency work orders will be managed through Cityworks, as well as asset condition data associated with force mains and pump stations. Work and asset data housed in Cityworks will be the primary source for O&M activity reporting and analysis of key performance indicators.

As the City's GIS is developed and additional force main condition assessment information is collected through the CSAP, the City will look for opportunities to track condition data and work order activities by pipe identification numbers, and incorporate this information into Cityworks for consistent documentation and easier retrieval.

The City will have data attributes that will allow TSOMP data to be compared spatially against other pertinent data such as the occurrence of SSOs, including repeat SSO locations and permit violations. Cityworks will use the City's GIS as its asset inventory, allowing for data resulting from TSOMP activities, such as work orders, to be spatially analyzed since the data will be associated with an asset in GIS.

6.2 Tracking Maintenance Activities by Type

Maintenance activities include preventive, corrective and emergency maintenance. Activities generally associated with each type of maintenance are described herein. Figure 1 provides an overview of the data sources for each type of maintenance. Tracking of maintenance activities by type will be accomplished from both the Cityworks work order system and Excel-based inspection forms. This

tracking process will facilitate O&M performance measurement in accordance with the Consent Decree.

Preventive Maintenance

Preventive work requests may be generated for assignment to field crews by the Assistant Metro WWTP Superintendent, the Lift Station Supervisor, and the Wastewater Maintenance Division Superintendent. Routine inspection and maintenance activities are completed by lift station crews, and tracked through inspection reports described in the SOPs in Appendices B and C. The routine inspection reports are submitted to the Lift Station Supervisor who reviews reports and confirms that any needed maintenance activities are being addressed.

Depending on the schedule of activities, preventive maintenance work orders may include the following activities:

- Pump Station Inspections
- Pump Station Wet Well Level Sensor Cleaning
- Pump Station ARV Inspection and Maintenance
- Standby Generator Check and Exercise
- Pump Station Level Sensor Calibration
- Wet Well Condition Inspection and Cleaning
- Pump Station Preventive Maintenance
- Annual Pump Station Inspections by the Lift Station Supervisor
- Infrared Inspections of Electrical Equipment
- Flow Meter Calibration
- Air Release Valve Inspection and Maintenance
- Force Main and Easement Inspection
- Force Main and Easement Maintenance.

Corrective Maintenance

Corrective maintenance work orders may be generated by the Lift Station Supervisor, Wastewater Maintenance Division Superintendent, or field crews. Corrective maintenance work orders are generated to address identified deficiencies discovered during the course of routine inspections or in response to equipment failures. SCADA monitoring of pump stations may be a primary source to identify potential equipment problems requiring corrective maintenance.

Emergency Maintenance

Emergency or reactive maintenance includes overflow response or activities conducted in order to mitigate the potential for a sanitary sewer overflow such as:

- Initiation/use of stand-by power (*e.g.*, portable generators or alternative power sources as deemed appropriate)
- Use portable pumps and/or bypass/pump-around operations
- Procedures associated with overflow response.

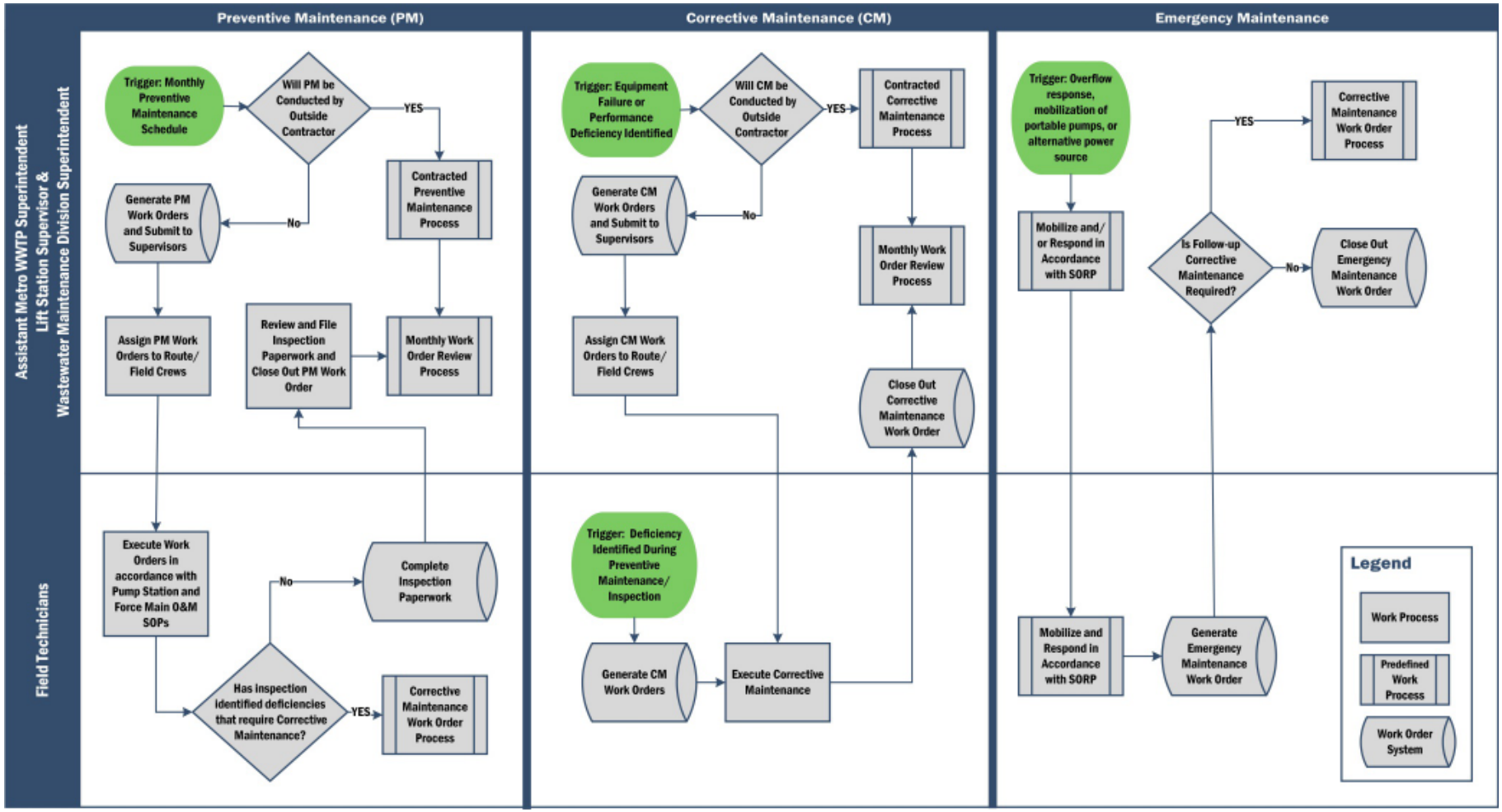


Figure 6-1. High Level Overview of TSOMP Data Sources by Maintenance Type

6.3 Monthly O&M Activity Reporting

All work orders are kept open until the work is completed. Work orders may be closed by the Assistant Metro WWTP Superintendent, Lift Station Supervisor, or Wastewater Maintenance Division Superintendent. Work order close out incudes pertinent information related to specific equipment.

A monthly report summarizing work orders, actions taken, equipment problems observed, and status of open work orders is reviewed by the Assistant Metro WWTP Superintendent, Lift Station Supervisor and Wastewater Maintenance Division Superintendent.

6.4 Key Performance Indicator Analysis

Key performance indicators (KPI) provide a means to monitor the effectiveness of the TSOMP in meeting the program goals. Table 6-1 defines the KPI for the TSOMP, including data sources. The City can track most of the TSOMP KPI by querying the maintenance records housed in Cityworks. KPI related to SCADA communications are evaluated via Wonderware InTouch software.

City staff will use the results of the KPI review to facilitate continuous improvement of the TSOMP programs. Additionally, the City can compare information from the work order system against other pertinent information, such as the location of SSOs, to identify issues in the WCTS that may require increased levels of O&M activities.

Necessary adjustments to pump station inspection frequencies or easement clearing activities are made following annual review by the Lift Station Supervisor and Wastewater Maintenance Division Superintendent.

Table 6-1. Transmission System Operations and Maintenance Program Key Performance Indicators

Activity	Goal	Performance Measure	Unit of Measurement	Data Source
Force Main SSO Reduction	Achieve a year over year reduction in reportable SSOs associated with force mains	1 - Reportable Number of SSOs per mile of force main 2 - [Reportable force main SSOs in past 12 months/Reportable force main SSOs in prior 12 months]	Number of SSOs/mile of force main	Cityworks CMMS and SSO Reports
Pump Station SSO Reduction	Minimize maintenance-related SSOs	[Number of Pump Station SSOs in past 12 months/ Pump Station SSOs in prior 12 months]	Number of SSOs	Cityworks CMMS and SSO Reports
Force Main ARV Maintenance	Proactively maintain force main ARVs by replacing units in operation with serviced units on a defined schedule	Complete ARV maintenance tasks as outlined in Force Main SOP #3	Percent of ARV and force main inspections, inspected annually	Cityworks Work Order Tracking
Force Main Easement Maintenance	Maintain access to force main system infrastructure, clearly locate and identify all force main easement boundaries, and improve ability to identify and correct potential issues	Perform Initial Easement Identification, Inspection and Clearing tasks outlined in FM SOPs 1 and 2 Complete easement and force main maintenance tasks as outlined in FM SOP 2 and FM SOP 3	Percentage of required easement marking, inspections, and maintenance performed	Cityworks Work Order Tracking
Force Main and Easement Inspections	Perform scheduled easement and force main asset inspections to identify potential access and operations issues	Complete all scheduled force main easement inspections per tasks outlined in FM SOP 1	Percentage of Inspections Performed	Cityworks Work Order Tracking
Pump Station/Emergency Generator Maintenance	Perform inspections and preventive maintenance on emergency generators to minimize potential for SSOs when electrical power to the pump motors has been disrupted	1 - Each back up generator is to receive annual preventive maintenance (1 PM/year) 2 - Emergency generators are inspected/tested under load weekly at large pump stations (52 tests/year/station) *North Columbia will be load tested at a minimum once a year as it cannot be separated from the utility source without the utility being onsite. 3 –Portable emergency generator tested yearly under load at each small pump station without stationary generators 4 - All small pump stations with stationary generators will be tested under load once a month	1 - Percentage of annual preventive maintenance activities complete 2 through 4 - Percentage of inspection/load tests completed	PS SOP 4 1 - Annual Maintenance Contract with (Caterpillar/Blanchard) 2 through 4 – Pump Station Log Book Cityworks Work Order Tracking
Pump Station Pump and Motor Preventive Maintenance	Perform preventive maintenance on the pumps and motors	Each pump and motor has scheduled PM routine performed in accordance with Preventive and Predictive Transmission System Maintenance Plan. [# of PMs accomplished/# of annual PMs required] * 100%	Percentage of PM Plan executed	Cityworks Work Order Tracking
Pump Station Electrical Equipment Preventive Maintenance	Performed infrared scan of electrical components to locate any loose electrical connections or other incipient electrical failures that produce a heat signature	Perform infrared scan every 3 years [# of Pump Stations Scans accomplished/ # of Pump Stations Scans required] X 100%]	Percentage of infrared scans of pump stations completed	Cityworks Work Order Tracking
Pump Station Inspections	Conduct inspections of each pump station in accordance with the inspection schedule, and using the weekly pump station checklist.	Each pump station is inspected once per week [# of inspections performed per month /# of pump stations) X 100%]	Percent of Pump Stations Inspected	Cityworks Work Order Tracking

Section 7 TSOMP Implementation Schedule

The Implementation Schedule Section of the TSOMP addresses the following specific requirements of the Consent Decree:

- **Section V. 12. h. x.** "An implementation schedule specifying dates and actions".

The City shall implement the activities described within this TSOMP in accordance with the schedule provided in Table 7-1.

Table 7-1. TSOMP Implementation Schedule

Activity	Description	Implementation Schedule
Pump Station O&M Procedures	Procedures documented in TSOMP Section 2 and Appendix B	Fully implemented **within 6 months of EPA approval of the TSOMP**
SCADA Enhancements	SCADA system enhancements	Completed **within 36 months of EPA approval of the TSOMP**
Force Main and Easement Maintenance	Routine inspection and maintenance activities including Easement and Force Main Inspection (FM SOP 1) and Air Release Valve Inspection and Maintenance (FM SOP 3)	Begin **within six months of EPA approval of the TSOMP**
	Easement survey and marking (part of FM SOP 1) and initial clearing to the surveyed limits, where practical (part of FM SOP 2)	Completed **within 5 years of EPA approval of the TSOMP** A 5 year time frame is required to accommodate the complete survey/easement identification and clearing efforts such as compiling easement plats, property record research, survey/staking and addressing potential private infrastructure encroachments that could impact easement clearing efforts
Corrosion Control	Engineering evaluation and development of findings, recommendations, budgetary cost estimates and implementation schedule for selected measures	Completed **within 27 months of completion of the force main condition assessment activities described in the Continuing Sewer Assessment Program (CSAP).** Condition assessment activities for pump stations and force mains are a separate effort from the engineering corrosion control evaluation. However, the force main condition information will inform the corrosion control evaluations and validate the results of desktop engineering evaluations. Therefore the schedule for the corrosion control evaluation was set relative to the completion these activities as described in the CSAP.
Critical Spare Equipment and Parts	Provision of onsite back-up power or backup diesel pumps at Pump Station 080 (Quail Creek) and Pump Station 115 (Clearwater)	Completed **within 12 months of EPA approval of the TSOMP**

Table 7-1. TSOMP Implementation Schedule

Activity	Description	Implementation Schedule
	Inventory management procedures documented in TSOMP Section 5 and Appendix D	Implemented **within six months of EPA approval of the TSOMP**

Appendix A: Pump Station Technical Specifications

Pump Station Technical Specifications are provided in TSOMP Volume II

Appendix B:Pump Station Operations and Maintenance Procedures

Procedure Number	Procedure Name
PS SOP 1	Pump Station Checks
PS SOP 2	Level Sensor Cleaning
PS SOP 3	PS ARV Inspection & Maintenance
PS SOP 4	Generator Check/ Exercise
PS SOP 5	Level Sensor Cleaning & Calibration
PS SOP 6	Wet Well Condition Inspection
PS SOP 7	PS Preventive Maintenance
PS SOP 8	Supervisor Pump Station Inspection
PS SOP 9	Checking Alarms and SCADA
PS SOP 10	Infrared Inspections
PS SOP 11	Flow Meter Calibration

Standard Operating Procedure

City of Columbia
Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Large and Small Pump Station Inspection

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
1				
2				

Annual Reviewer (initials)								
Date								

The following Standard Operating Procedure (SOP) was developed for use by City of Columbia Metropolitan Wastewater System staff and contractors. This SOP template, prepared by the Clean Water 2020 Program (CW2020), was formatted in accordance with the U.S. Environmental Protection Agency's (EPA) standard document: *Guidance for Preparing Standard Operating Procedures (SOPs) EPA QA/G-6* (April 2007).

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for completing routine inspections at one of the City of Columbia pump stations.

SUMMARY OF THE METHOD

Station inspections are completed on a recurring schedule by a qualified City operations and maintenance staff. The inspection is documented on an inspection sheet that provides a list of items that require inspections and information that needs to be recorded. There are 2 types of inspections, large and small pump stations. Inspection frequency is determined by the Lift Station Supervisor.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials**:
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	

PROCEDURAL STEPS

1. Before starting the activity, the appropriate personnel should be notified of this activity so that the alarms generated during the service/calibration can be acknowledged appropriately.
2. Prior to leaving the shop to conduct the station inspection, ensure that vehicle is fully stocked according to the vehicle inventory sheet.
3. Set up traffic control if appropriate.
4. Perform site condition assessment for potential hazards.
5. Enter the pump station site and conduct the inspection using the associated inspection sheet.
6. Once the inspection has been completed secure the pump station.
7. Once the tasks have been completed notify the appropriate personnel that all alarms should be responded to in accordance with normal operating procedures.
8. At the end of the shift return the inspection sheet to your supervisor and complete the work order.
9. Generate work order to address any identified deficiencies.
10. Complete the paperwork to record the completion of the activities.
11. Supervisor to review and document that the work was completed.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Pump station inspection form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program

ATTACHMENTS / CHECKLISTS

1. Large/Small Pump Station Inspection Form

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Large and Small Pump Station Inspection

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Facility Exterior			
Grounds			
Fences/Gates			
Monthly Valve Actuator Maintenance Completed the 4th week of each month			
Doors/Windows			
Equipment / Station Readings			
Flow (MGD or gpm)/ Pressure (psi or ft)			
Wet well liquid elevation (ft)			
Generator Fuel reading			
Alarms/ level indicators			
Facility Interior - Equipment			
Wet well			
Screens			
Grinders			
Pump 1*			
Pump 2*			
Pump 3*			
Pump 4*			
Pump 5*			
Pump 6*			
Pump 7*			
Pump 8*			
Change the rotation of the pump and record the status when leaving the pump station			
Generator (Check for leaks)			

**Record elapsed time and/or pump start count in Comments for each pump (where available and not automatically recorded via SCADA)*

Facility Interior - Other			
Trash			
Floors			
Stairways			
Lights			
Emergency lighting			
Rest Rooms			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Pump Station Wet Well Level Sensor Cleaning

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
1				
2				

Annual Reviewer (initials)											
Date											

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for the weekly calibration of level sensors at the City of Columbia pump stations.

SUMMARY OF THE METHOD

Methods for the cleaning of the level sensors are in general accordance with manufacturer's recommendations. The procedures provided herein are intended as general guidelines for level sensors; operation and maintenance guidelines may vary depending on the manufacturer and should be consulted as needed.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	

PROCEDURAL STEPS

1. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
2. Before starting the activity, notify the appropriate personnel of this activity so that the alarms generated during the activity can be acknowledged appropriately.
3. Open the wet well cover or other means to access the level indicator.
4. Access/ Pull up each level sensor/ float and clean the debris off the device as necessary.
5. After cleaning the float(s)/ level sensors verify that the pump station responds appropriately to the level sensor(s) by testing for pump On/Off setpoint response and SCADA response.
6. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
7. Complete the paperwork to record the completion of the activities.
8. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. **Work order documentation**
2. Wet Well Level Sensor Cleaning Form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program

ATTACHMENTS / CHECKLISTS

1. Wet Well Level Sensor Cleaning Form

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Wet Well Level Sensor Cleaning

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Floats			
Clean and Inspect Float 1			
Test Float 1			
Clean and Inspect Float 2			
Test Float 2			
Clean and Inspect Float 3			
Test Float 3			
Clean and Inspect Float 4			
Test Float 4			
Clean and Inspect Float 5			
Test Float 5			
Ultrasonics			
Clean and inspect Ultrasonic Meter			
Test Meter for response			
Multitrode			
Clean and inspect Multitrode Sensor			
Test sensor for response			
Bubbler System			
Inspect readily visible system components			
Test System for response			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Division: Pump Station **Subdivision:** Maintenance

SOP Title: Pump Station Air Release Valve Inspection and Maintenance

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
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Annual Reviewer (initials)	
Date	

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for the quarterly maintenance of the air release valves (ARVs) for the City of Columbia pump stations.

SUMMARY OF THE METHOD

Methods for air release valve maintenance are in general accordance with manufacturer's recommendations. The procedures provided herein are intended as general guidelines for ARV maintenance; operation and maintenance guidelines may vary depending on the ARV manufacturer and should be consulted as needed.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	

PROCEDURAL STEPS

1. Before starting the activity, the appropriate personnel should be notified of this activity so that the alarms generated during the service/calibration can be acknowledged appropriately.
2. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
3. Close the riser shut off (isolation) valve.
4. Open the ARV pressure release valve (for combination ARVs) or ball valve (for automatic ARVs), typically located on the base of the unit.
5. Perform quarterly maintenance activities per manufactures recommendations.
6. Open the riser shut off (isolation) valve and inspect the reinstalled ARV for leakage. If any leakage is observed, close the riser shut off (isolation) valve and ensure that all seals are properly seated. Reopen the riser shut off (isolation) valve and re-inspect for leakage. If leakage is observed, repeat all procedural steps or consider replacement.
7. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
8. Complete the paperwork to record the completion of the activities.
9. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Appropriate work order documentation
2. Pump station ARV inspection and maintenance form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program
3. ARV Manufacturer's Installation and Maintenance Manuals

ATTACHMENTS / CHECKLISTS

1. Pump Station ARV Inspection and Maintenance Form

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Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Pump Station ARV Inspection and Maintenance

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
ARV - Inspection			
Close isolation valve between ARV and system			
Open the Pressure Release Valve at the base of the unit.			
Perform quarterly maintenance per the manufacturers recommendations.			
Re-install the ARV and open the isolation valve. Test for valve leakage.			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature: _____

Supervisor Signature: _____

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Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Standby Generator Check and Exercise

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
1				
2				

Annual Reviewer (initials)	
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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for checking and exercising portable and stationary standby generators at the City of Columbia pump stations.

SUMMARY OF THE METHOD

Methods for checking and exercising the generators are in general accordance with manufacturer's recommendations and the City's pump station operations guidelines. The procedures provided herein are intended as general guidelines and may vary depending on the generator manufacturer which should be consulted as needed along with the City's procedures for operating the pump station

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	

PROCEDURAL STEPS

1. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
2. Before starting any generator exercise activity, notify the appropriate personnel of this activity so that the alarms generated during the exercise can be acknowledged appropriately.

Stationary Generator –Monthly (0.5 hour estimated task duration)

1. Check the fluid levels on the generator including the diesel storage tank.
2. Verify that the main breaker has opened, that the automatic switch over works, and that the generator can assume the power load from the station.
3. Verify that generator has run for 15 minutes under full load, that the pump station operations work correctly, and that the generator shows no signs of leaks or other deterioration.
4. Verify that the main breaker closed and that power has been restored to the pump station following the generator shutdown.
5. Once the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
6. Complete the paperwork to record the completion of the activities.
7. Generate work order to address any identified deficiencies.

Portable Generator – Annually (1 hour estimated task duration)

1. Hook the portable generator up to the pump station.
2. Open the main power supply breaker.
3. Run portable generator for 15 minutes under full load to verify the pump station operations work correctly.
4. Shutdown the generator and return the station to normal operations
5. Once the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
6. Complete the paperwork to record the completion of the activities.
7. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Standby Generator Check and Exercise Form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program

ATTACHMENTS / CHECKLISTS

1. Standby Generator Check and Exercise Form

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Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Standby Generator Check and Exercise

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Stationary Generator			
Check the Fluid Levels on the generator including the diesel storage tank			
Verify that the main breaker has opened and that the automatic switch over works and that the generator can assume the power load from the station.			
Verify that generator has run for 15 minutes under full load and that the pump station operations work correctly and that the generator shows no signs of leaks.			
Verify that the main breaker closed and that power has been restored to the pump station following the generator shutdown.			
Portable Generator			
Hook the portable generator to the pump station.			
Open the main breaker power supply.			
Run portable generator for 15 minutes under full load to verify the pump station operations work correctly.			
Shutdown the generator and return the station to normal operations.			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Standard Operating Procedure

City of Columbia

Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Pump Station Level Sensor Calibration

APPROVED:

_____ _____

Author, Ashley Dove, Lift Station Supervisor Date

_____ _____

WWTP Superintendent, Gene House Date

_____ _____

Chief QA/QC Officer, David Wiman Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
1				
2				

Annual Reviewer (initials)	
Date	

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for the quarterly calibration of level sensors at the City of Columbia pump stations.

SUMMARY OF THE METHOD

Methods for the calibration of the level sensors are in general accordance with manufacturer's recommendations. The procedures provided herein are intended as general guidelines for level sensors. Operation and maintenance guidelines may vary depending on the sensor manufacturer and should be consulted.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	

PROCEDURAL STEPS

1. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
2. Before starting any calibration activity, the appropriate personnel should be notified of this activity so that the alarms generated during the service/calibration can be acknowledged appropriately.
3. Safely open the wet well cover or other means to safely access the level indicator.
4. Complete the service/calibration of the level sensor(s) in accordance with the manufacturer's recommendations.
5. After the calibration verify that the pump station responds appropriately to the level sensor(s).
6. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
7. Complete the paperwork to record the completion of the activities.
8. Generate work order as necessary to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Level Sensor Calibration and Setting Form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program
3. Manufactures equipment manual

ATTACHMENTS / CHECKLISTS

1. Level Sensor Calibration and Setting Form

Standard Operating Procedure

City of Columbia
Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Level Sensor Calibration and Setting

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Floats			
Complete the service/Calibration of the level sensor(s) in accordance with the manufacturer's recommendations.			
Verify the pump station responds appropriately to the level sensor(s)			
Ultrasonic			
Complete the service/Calibration of the level sensor(s) in accordance with the manufacturer's recommendations.			
Verify the pump station responds appropriately to the level sensor(s)			
Multitrode			
Complete the service/Calibration of the level sensor(s) in accordance with the manufacturer's recommendations.			
Verify the pump station responds appropriately to the level sensor(s)			
Bubbler System			
Complete the service/Calibration of the level sensor(s) in accordance with the manufacturer's recommendations.			
Verify the pump station responds appropriately to the level sensor(s)			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Standard Operating Procedure

City of Columbia

Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Wet Well Condition Inspection

APPROVED:

_____ _____

Author, Ashley Dove, Lift Station Supervisor Date

_____ _____

WWTP Superintendent, Gene House Date

_____ _____

Chief QA/QC Officer, David Wiman Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
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Annual Reviewer (initials)	
Date	

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for quarterly wet well condition inspection at the City of Columbia pump stations.

SUMMARY OF THE METHOD

Methods for conducting the inspection of the wet well involve cleaning the wet well using either City staff or a contractor and then completing an internal inspection. The procedures provided herein are intended as general guidelines.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	

PROCEDURAL STEPS

1. Before starting any activity, the appropriate personnel should be notified of this activity so that the alarms generated during the activity can be acknowledged.
2. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
3. Ensure the wet well has been pumped down prior to starting the cleaning activity.
4. Safely open the wet well cover.
5. Clean the wet well.
6. Complete the visual wet well inspection looking for the for build-up of grease or other debris
7. Return the pump station to normal operations.
8. Verify that all alarms respond appropriately.
9. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
10. Complete the paperwork to record the completion of the activities.
11. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Wet Well Condition Assessment Form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program

ATTACHMENTS / CHECKLISTS

1. Wet Well Condition Inspection Form

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Wet Well Condition Assesment

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Inspection and Cleaning			
Pump down the wet well level			
Clean the wet well			
Check for wall deterioration			
Check for grease buildup.			
Check for debris.			
Return the pump station to normal operations.			
Verify that all alarms respond appropriately.			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Standard Operating Procedure

City of Columbia

Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Pump Station Preventive Maintenance

APPROVED:

_____ _____

Author, Ashley Dove, Lift Station Supervisor Date

_____ _____

WWTP Superintendent, Gene House Date

_____ _____

Chief QA/QC Officer, David Wiman Date

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for annual preventive maintenance at the City of Columbia pump stations.

SUMMARY OF THE METHOD

Methods for completing the annual preventive maintenance are in general accordance with the applicable manufacturer's recommendations. The procedures provided herein are intended as general guidelines for pump station equipment preventive maintenance. Operation and maintenance guidelines may vary depending on the manufacturer and should be consulted as needed.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	
Replacement pump	

PROCEDURAL STEPS

1. Before starting the activity, notify the appropriate personnel so that any alarms generated during the activity can be acknowledged.
2. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
3. For Flygt pumps complete the manufactures 20 point check list.
4. For non-Flygt pumps complete the manufacturer's recommended annual service.
5. Complete the manufacturer's recommended service of the check valves.
6. Coordinate with grinder manufacturer to have service representative conduct appropriate preventative maintenance.
7. Complete the manufacturer's recommended service of the valve actuators.
8. For the small pump stations rotate one of the two existing pumps with a reserve pump kept in the maintenance warehouse. (odd number pump on odd years and even number pump on the even years.)
9. Complete a wet well draw down test following the wet well draw down test form.
10. Once the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
11. Complete the paperwork to record the completion of the activities.
12. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Pump Station Preventive Maintenance Form
3. Wet well draw down test form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program
3. Manufactures' Manuals for the equipment being serviced

ATTACHMENTS / CHECKLISTS

1. Pump Station Preventive Maintenance Form

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Standard Operating Procedure

City of Columbia
Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Pump Station Preventive Maintenance

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Facility Interior - Equipment			
Pump 1: Complete Flygt 20 point check list or manufacturer's recommended service			
Pump 2: Complete Flygt 20 point check list or manufacturer's recommended service			
Pump 3: Complete Flygt 20 point check list or manufacturer's recommended service			
Pump 4: Complete Flygt 20 point check list or manufacturer's recommended service			
Pump 5: Complete Flygt 20 point check list or manufacturer's recommended service			
Pump 6: Complete Flygt 20 point check list or manufacturer's recommended service			
Pump 7: Complete Flygt 20 point check list or manufacturer's recommended service			
Pump 8: Complete Flygt 20 point check list or manufacturer's recommended service			
Complete the manufacturer's recommended service of the check valves			
Coordinate with grinder manufacturer to conduct appropriate preventative maintenance			
Complete the manufacturer's recommended service of the valve actuators			
For the small pump stations rotate one of the two existing pumps with a reserve pump kept in the maintenance warehouse. (Odd number on odd years and even number on the even years.			
Complete a wet well drawdown test			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature: _____

Supervisor Signature: _____

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Lift Station: _____

Date:_____ Time:_____

Wetwell Diameter : _____

Influent Flow Calculation
Rise in feet: _____ Time in Minutes: 1.00 Influent Flow GPM = 0.00

Pump #1 Drop in feet: _____ Time in Minutes: _____ Total Flow GPM (including influent)= #DIV/0! Dicharge Pressure: _____ Amps: _____

Pump #2 Drop in feet: _____ Time in Minutes: _____ Total Flow GPM (including influent)= #DIV/0! Discharge Pressure: _____ Amps: _____

Difference in elevation between pressure guages and wetwell level: _____

Theoretical discharge pressure for Pump 1 : 0.00 TDH of Pump 1: 0.00

Theoretical discharge pressure for Pump 2: 0.00 TDH of Pump 2: 0.00

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Standard Operating Procedure

City of Columbia
Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Annual Pump Station Inspections by the Supervisor

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

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Annual Reviewer (initials)	
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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for the annual inspection at the City of Columbia pump stations.

SUMMARY OF THE METHOD

The Lift Station Supervisor completes an inspection of the pump station with the city staff that is/ are responsible for operating and maintenance the pumps station. This annual inspection is used as an audit to verify the require work is being completed and that is has been documented.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
pH test strips (litmus)	
Entry Keys to Pump Stations	

PROCEDURAL STEPS

1. Before starting the activity, notify the appropriate personnel so that any alarms generated during the activity can be acknowledged appropriately.
2. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
3. Perform pump station audit/inspection using the attached check sheet, and the Annual Pump Station Compliance Operation and Maintenance Evaluation Report.
4. Meet with pump station operations and maintenance staff to discuss any deficiencies in the operation and maintenance of the pump station or required maintenance documentation.
5. Discuss any noted deficiencies.
6. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
7. Complete the paperwork to record the completion of the activities.
8. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Supervisor Pump Station Inspection Form
3. Annual Pump Station Compliance Operations and Maintenance Evaluation Report

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program

ATTACHMENTS / CHECKLISTS

1. Annual Pump Station Supervisor Inspection Form
2. Annual Pump Station Compliance Operations and Maintenance Evaluation Report

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Supervisor Pump Station Inspections

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Supervisor Pump Station Checklist			
Perform annual audit/ inspection			
Meet with the staff to discuss any deficies in the upkeep of the pump station or required maintenance documentation.			
Verfiy that the annual generator maintenance has been completed			
Verfiy that the annual HVAC maintenance has been completed			
Overall Facility Comments:			
Recommendations (maintenance needs and emergency planning):			

Inspector Signature: _____

Supervisor Signature: _____

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ANNUAL PUMP STATION COMPLIANCE

OPERATION AND MAINTENANCE EVALUATION REPORT

Pump Station Name/Number:_____

Inspector **Date/time** Route Representative

1: □ Yes □ No	Pump station is fenced. If yes, condition of fence: _____
2: □ Yes □ No □ N/A	Fence is locked.
3: □ Yes □No □ N/A	If pump station is not fenced, it is secured in a locked building/enclosure.
4: □Yes □ No	A weather durable sign (or equal) with a 24 hour emergency telephone number is conspicuously located.
5: □Yes □No	Property landscape is being maintained.
6: □ Yes □ No □ N/A	Easement access to the property is being maintained.
7: □Yes □ No	Electrical junction boxes are located outside of the wet well (unless made of material Suitable for use in corrosive conditions).
8: □Yes □ No	All electrical junction boxes are weathered sealed properly.
9: □Yes □No	Wet and Dry well lids are accessible and secured.
10: □Yes □No`	Pump float switches work properly.
11: □Yes □No	Float switches are not coated with excessive grease.
12: □Yes □No	Excessive pump control wires and float switch wires are not under water.
13: □Yes □No	Wet well is clear of excessive grease buildup. Wet well was last cleaned completely out _____ Cleaned by _____
14: □Yes □No	Complete wet well visual inspection: Note the results of the following inspections:
	Structural Deterioration _____
	Yellow Precipitation _____
	Metal Probe Tap Test _____
	Wall pH Litmus Test _____
15: □Yes □No	Wet well is ventilated.

16: □ Yes □ No Dry well is ventilated.

17: □ Yes □ No Pump station has an alarm (audible □; visual □: SCADA □:).

18: □ Yes □ No □ N/A If automatic calling/SCADA system is used, on a separate, dedicated power source? Date UPS was Replaced _____

19: □ Yes □ No An emergency operation plan has been developed that includes this sewer pump station.

20: □ Yes □ No When high, wet well float switch is triggered, alarm system initiates or calls.

21: □ Yes □ No Auxiliary power (or equivalent) is available for the pump station.
Describe: _____

22: □ Yes □ No □ N/A When main power source is disengaged, backup power source activates properly.

23: □ Yes □ No When main power source is disengaged, alarm system initiates or calls properly.

24: □Yes □ No At least two (2) pumps are provided (unless pump station serves one residential lot or one business lot).

25: □ Yes □ No All pumps are operational. If no, ____ of ____ pumps are operational.

26: □ Yes □ No Pumps have same pumping capacity._____

27: □ Yes □ No Pumps appear to be properly maintained.

28: □ Yes □ No Preventative maintenance is documented. PM's were last performed on _____(attached)

29: □ Yes □ No Check Valve cleaning with "Re-class Forms" were last performed on _____(attached)

30: □ Yes □ No Draw Down test completed (attached) on _____ & comparison conducted

30: □ Yes □ No Routine visits are documented.
Describe: "Monthly Log Sheets" and log books.

Frequency of inspection visits:_____

Other Comments:

_____
_____
_____
_____

I acknowledge that this compliance inspection was conducted on _____ at _____.
(Date) (Lift station ID number)

Route representative signature: _____

Evaluation Report Rating: Satisfactory
Marginal
Needs Improvement

Follow-up inspection need and scheduled for _____

Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Pump Station SCADA Alarm Check

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for annual checking of the SCADA alarms at the City of Columbia pump stations.

SUMMARY OF THE METHOD

Methods for initiating and checking that the pump station alarms sound and transmit correctly. The procedures provided herein are intended as general guidelines for the alarms. Operation and maintenance guidelines may vary depending on the specific equipment manufacturer and should be consulted as needed.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First Aid Kit	
Entry keys to pump stations	

PROCEDURAL STEPS

1. Before starting the activity, notify the appropriate personnel of this activity so that the alarms generated during the procedure can be acknowledge appropriately.
2. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
3. Where possible activate each alarm manually.
4. For items such as motor over amp provide staff to operate the pump station as needed so the service provider can simulate alarms that cannot be activated manually.
5. Verify that all alarms are received both at the Control Center and on the operator's remote tablet.
6. Evaluate the frequency of high level alarms and determine if the operating control elevations of the station need to be adjusted to run more effectively.
7. After performing the SCADA alarm checks and changing operating parameters verify that the pump station responds appropriately to the level sensors signals.
8. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
9. Complete the paperwork to record the completion of the activities.
10. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. SCADA Alarms Check Form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program

ATTACHMENTS / CHECKLISTS

1. Pump Station SCADA Alarm Form

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: SCADA Alarms Check

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
SCADA Alarms Check - To be done in conjunction with an outside service provider			
Where possible activate each alarm manually, for items such as motor over amp simulate the alarm.			
Verify that all alarms are received both at the Control Center and on the remote devices			
Evaluate the frequency of high level alarms and determine if the operating levels of the station need to be adjusted.			
After performing the SCADA alarm checks and changing operating parameters verify that the pump station responds appropriately to the level sensors.			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Infrared Inspections

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for infrared inspections that will occur every three years at each of the City of Columbia pump station.

SUMMARY OF THE METHOD

Methods for performing the infrared inspections are in general accordance with inspection equipment manufacturer's recommendations and the City's safety protocols. The procedures provided herein are intended as general guidelines for the infrared inspections. Operation and maintenance guidelines for the infrared inspection equipment may vary depending on the manufacturer and should be consulted as needed.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First aid kit	
Entry keys to pump stations	
Infrared Inspection Tools	

PROCEDURAL STEPS

1. Before starting the activity the appropriate personnel should be notified of this activity so that the alarms generated during the inspection can be acknowledge appropriately.
2. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
3. Perform infrared inspections of the electrical equipment.
4. Complete the work order documentation to address any repair issues that are discovered during the activity.
5. Any matters which may result in an SSO or a health and safety incident should be addressed during the inspection and documented with a completed work order form.
6. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
7. Complete the paperwork to record the completion of the activities.
8. Generate work order to address any identified deficiencies.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Pump Station Electrical Equipment Infrared Inspection Form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program
3. Manufactures manual for the infrared equipment

ATTACHMENTS / CHECKLISTS

1. Pump Station Electrical and Instrumentation Infrared Inspection Form

Standard Operating Procedure

City of Columbia
Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Infared Inspections

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Infared Scanning of Equipment - To be done in conjunction with an outside service provider			
Perform infared inspections of the electrical equipment.			
Address and document issues needing urgent response			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Pump Station Flow Meter Calibration

APPROVED:

_____ _____
Author, Ashley Dove, Lift Station Supervisor Date

_____ _____
WWTP Superintendent, Gene House Date

_____ _____
Chief QA/QC Officer, David Wiman Date

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Date	

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for annual validation of flow meter calibration at the City of Columbia pump stations. The procedure also includes corrective action for flow meters that do not meet calibration standards.

SUMMARY OF THE METHOD

Methods for the calibration of the flow meters are in general accordance with manufacturer's recommendations. The procedures provided herein are intended as general guidelines for validating and ensuring adequate flow meter calibration. Operation and maintenance guidelines may vary depending on the meter manufacturer and should be consulted as needed.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Testing of transmittal signal must be performed by personnel trained by the flow meter manufacturer. Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Truck	Rags
Appropriate PPE	Cleaning Supplies
Traffic control as needed	
Appropriate hand tools	
Flashlight	
First aid kit	
Entry keys to pump stations	
Bypass pumping piping and pumps if needed	

PROCEDURAL STEPS

1. Prior to leaving the shop to complete the station inspections ensure that vehicle is fully stocked according to the vehicle inventory sheet.
2. Before starting the validation activity notify the appropriate personnel of this activity so that the alarms generated during the procedure can be acknowledged appropriately.
3. Conduct field validation testing of the flow meter transmitter's signal to SCADA per the manufacturer's recommendations. Record the results.
4. After the tasks have been completed notify the appropriate personnel that all future alarms should be responded to in accordance with normal operating procedures.
5. Review the results of the transmitter signal validation test. If the meter transmitter is not operating within the manufacturer's acceptable operating range, a manufacturer-trained technician must determine proper corrective action. Corrective action may include in situ repair, factory repair, or replacement.
6. Review the pump draw-down test results against both historical results and the pump manufacturer's submitted Capacity/ Pressure/ Power curves to determine if the meter is operating properly. If the meter readings do not match the expected pump outputs, use the curves to determine if the pump capacity has changed, or if the meter is not reading properly. If the metered flow is more than +/-10 percent from the expected flow based upon historic readings and pump curves, the Lift Station Supervisor must determine the proper corrective action. Corrective actions may include factory or in situ calibration, flow meter repair, or flow meter replacement.
7. Generate work order to address any corrective actions.
8. Complete the paperwork to record the activities.

DATA AND RECORDS MANAGEMENT

1. Work order documentation
2. Flow Meter Calibration Form

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. City of Columbia Metro Wastewater Treatment Plant Written Safety Program
3. Manufacturer's equipment manual

ATTACHMENTS / CHECKLISTS

1. Pump Station Flow Meter Calibration Form

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Standard Operating Procedure

City of Columbia
Department of Utilities and Engineering – Metro Wastewater Treatment Plant

Division: Pump Stations **Subdivision:** Maintenance

SOP Title: Flow Meter Calibration

Facility Name:	Inspection Date:
Facility Address/Location:	Inspected by:

INSPECTION ITEMS

Item	Status	Comments	Initials
Flow Meter Calibration - To be done in conjunction with an outside service provider			
Conduct FM transmitter diagnostics per manufacturer's recommendations			
Review transmitter diagnostic results to historical values.			
Review pump draw-down tests to previous historical results.			
Determine if the meter is operating within the required accuracy range.			

Overall Facility Comments:

Recommendations (maintenance needs and emergency planning):

Inspector Signature:

Supervisor Signature:

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Appendix C: Force Main and Easement Operations and Maintenance Procures

Procedure Number	Procedure Name
FM SOP 1	Easement and Force Main Inspection
FM SOP 2	Force Main Easement Maintenance
FM SOP 3	Air Release Valve Inspection and Maintenance

Division: Wastewater Maintenance **Subdivision:** Maintenance

SOP Title: Force Main and Easement O&M, FM SOP #1 Easement and Force Main Inspection

APPROVED:

_____ _____
Author, Author Name/ Author Title Date

_____ _____
Assistant Superintendent, Jody Harley Date

_____ _____
Superintendent (QA/QC Officer), Robert Judy Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
1				
2				

Annual Reviewer (initials)				
Date				

The following Standard Operating Procedure (SOP) was developed for use by City of Columbia Metropolitan Wastewater System staff and contractors. This SOP template, prepared by the Clean Water 2020 Program (CW2020), was formatted in accordance with the U.S. Environmental Protection Agency's (EPA) standard document: *Guidance for Preparing Standard Operating Procedures (SOPs) EPA QA/G-6* (April 2007).

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PURPOSE AND APPLICABILITY

The purpose of this SOP is to provide guidance, steps and instructions for inspection of force main easements and exposed force main elements to ensure agents and equipment have unimpeded access to all force main assets. This will enhance the City's ability to provide uninterrupted and environmentally compliant wastewater transport service and support.

SUMMARY OF THE METHOD

Designated force main easements will be inspected by a 3 person crew on foot or utilizing an all-terrain vehicle depending on the easement. Digital cameras will be used as needed for photographic and video documentation.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and all Safety Procedures will be followed. Procedures in this SOP could result in dangerous conditions including personal exposure to sewer waste, poisonous vegetation, insects, thorny plants/brush, dead trees, snakes and other wildlife.

PERSONNEL QUALIFICATIONS

Wastewater Collection System Operator - Crew Leader
Wastewater Collection System Operator(s)

EQUIPMENT AND SUPPLIES

Equipment:	**PPE:**
• Truck • All-terrain vehicle (ATV) • Trailer for ATV • Manhole Hooks • Hatch Keys (as needed) • Metal Probe • Litmus Testing Kit • Appropriate Hand Tools • Digital Camera, W/Video capability • Flagging / Stakes / Caution Tape • Bush- axes or machetes	• Snake Protection • Insect Repellant • First Aid Kit • Cones and Signs • Life Vests for Stream Crossings **Materials**: • GIS Maps identifying rights-of-way • Inspection and Report Forms • Encroachment Policy • See "References" Section for specific forms needed

PROCEDURAL STEPS

1. If applicable, contact Engineering to survey/identify and flag the limits of easement and important structures, crossings, ARVs, etc. It is not intended for this step to be performed prior to every annual routine inspection. Use a separate work order to track easement survey/identification and flagging.

2. Wastewater Collection System Operator receives work order form Dispatch, Supervisor, Assistant Superintendent, or Superintendent for easement and force main inspection.

3. Seven days ahead of the activity, inform potentially impacted private property owners of the scheduled easement clearing, maintenance and routine inspection work. Use the City's protocols for property owner notification.

4. Perform a *Drivers Inspection Report* as per *Driver's Report and Key Check SOP,* before driving, and do a quick check of the truck's inventory to ensure that all required tools and equipment are on the truck.

5. Drive to job-site using seat belts as per SC law and City policy and put on PPE (Personal Protective Equipment), i.e., safety vest, steel-toe shoes, hard hat, safety glasses, and hearing protection, as required.

6. Park vehicles in a safe and level area.

7. As required, set-up lane closed signs, cones/ barricades, construction signs, etc. as per the SCDOT Work Zone Safety Guideline Handbook, ensuring the job-site and area is safe for workers, pedestrians and motorist.

8. Proceed to unload equipment as per Loading, Hauling, and Unloading Equipment SOP, and begin clearing ROW. Keeping in mind the location of fellow employees and their equipment.

9. Clear any brush or undergrowth as needed to perform inspection. General easement clearing will be performed per Force Main Easement Maintenance SOP, and will be tracked as a separate work order. If during the inspection, more extensive clearing is required, note areas requiring clearing in the Force Main and Easement Inspection Field Checklist for follow-up action.

10. Perform the inspection, utilizing the force main easement inspection form, applicable safety equipment, available electronic documentation equipment and electronic leak detection equipment. Inspection items that must be documented include:

    - Encroachment issues, (if any observed refer to the City's Easement attached Encroachment Policy for follow up action)
    - Evidence of current or prior SSOs if SSO is confirmed refer to Section 3.4.1; Item #1 of the City's Sewer Overflow response Plan (SORP)

- Erosion/washout of pipe
- Electronic leak detection
- Vegetative growth
- Evidence of force main issue, (sink hole, etc)
- Evidence of potential corrosion at ARV and discharge structures

11. Never leave material outside of easement.

12. Load and haul away any excess material (boulders, trees, tree limbs, stump(s) when necessary.

ARV and Discharge Structure Corrosion Inspection Procedures

1. Complete ARV and Discharge Structure Corrosion Inspection Procedures per the attached Inspection Form and record the results.

2. Do not enter any structures to complete inspections under any circumstances. All corrosion inspection procedures should be completed without requiring confined space entry protocols. If the structure cannot be inspected without entry, note this on the checklist, alert your Supervisor and move to the next location.

Documentation and Completion of Work Order

1. Generate photographic and video documentation of all issues observed during the inspection; label appropriately and attach to the Inspection Form. Flag locations in the field where issues are identified and encircle potential health and safety hazards with Caution Tape. If possible, record GPS coordinates of all issues and note on the Inspection Form.

2. Turn completed and signed Inspection Form into Assistant Superintendent or designee to generate a work order to perform any follow up activities.

3. Notify GIS support staff about any required updates.

DATA AND RECORDS MANAGEMENT

1. Complete the Inspection Form and generate a work order to include location, time spent at job site, work completed, equipment used, and personnel on job. Once the City has fully implemented its GIS and CMMS capabilities, electronic tablets will be programmed for use by inspection staff to electronically document field information for uploading into GIS and CMMS.

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs are reviewed by the applicable Division at least every year in order to maintain their relevancy.

2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.

3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form
2. Drivers Inspection Report / Driver's Report and Key Check SOP
3. Loading, Hauling, and Unloading Equipment SOP
4. Force Main and Easement Maintenance SOP
5. SC DOT Work Zone Safety Guidelines Handbook
6. Blood Borne Pathogen Program
7. City's Encroachment Policy

ATTACHMENTS / CHECKLISTS

1. Force Main and Easement Inspection Field Checklist

City of Columbia

Department of Utilities and Engineering – Wastewater Maintenance Division

FORCE MAIN AND EASEMENT INSPECTION FIELD CHECKLIST

Up Stream PS Profile FM Start Location	Upstream Pump Station ID / Name: **Force Main Start Location*	Inspection Date:
	PS Address / Location:	Inspected By:
Discharge Structure Asset ID:	Location:	Type:
# of ARVs	Location:	Asset IDs:

Inspection Items

Easement Condition

Items	Status / Location	Comments	Picture ID
Force Main Markers			
Easement Boundary Markers			
Evidence of SSO Location 1			
Evidence of SSO Location 2			
Vegetation Area 1			
Vegetation Area 2			
Evidence of FM Failure Location 1	☐ Sink Hole ☐ Bubbling ☐ Other		
Erosion Location 1			

Location 1	☐ Building ☐ Fence / Stone Wall ☐ Paved Area ☐ Vegitation		
Location 2	☐ Building ☐ Fence / Stone Wall ☐ Paved Area ☐ Vegitation		

Corrosion Inspection (Structure Type _____) Asset ID _____

Items	Status / Location	Comments	Picture ID
Initial Observations / Odors	☐ None ☐ Faint ☐ Strong		
Observations / Odor (Cover Removed)	☐ None ☐ Faint ☐ Strong		
Note Instances Of Yellow Precipitant On Structure Surface			
FM Discharge Structures Only - Metal Probe Test Observations	☐ No Flaking ☐ Spongy ☐ Minor Flaking ☐ Major Flaking		
FM Discharge Structures Only - pH Testing Results	☐ 1-4 ☐ 5-7 ☐ 8-10 ☐ Over 10		

Stream Crossing (Stream Type _____)

Aerial Crossing Pipe Condition			
Below-Grade Crossing Pipe Condition			
Debris In Stream (caught by aerial pipe)			
Bank Erosion			

Recommendations: Follow-up Actions/Activity *(Include Action Due Date if Applicable)*

Inspection Crew

Supervisor Signature

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Division: Wastewater Maintenance **Subdivision:** Maintenance

SOP Title: Force Main and Easement O&M, FM SOP #2
Force Main Easement Maintenance

APPROVED:

_____ _____
Author, Author Name / Author Title Date

_____ _____
Assistant Superintendent, Jody Harley Date

_____ _____
Superintendent (QA/QC Officer), Robert Judy Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change

Annual Reviewer (initials)	
Date	

The following Standard Operating Procedure (SOP) was developed for use by City of Columbia Metropolitan Wastewater System staff and contractors. This SOP template, prepared by the Clean Water 2020 Program (CW2020), was formatted in accordance with the U.S. Environmental Protection Agency's (EPA) standard document: *Guidance for Preparing Standard Operating Procedures (SOPs) EPA QA/G-6* (April 2007).

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PURPOSE AND APPLICABILITY

The purpose of this SOP is to provide the City with an efficient method for its staff to utilize to perform required maintenance of force main easements to ensure the City of Columbia staff, agents and equipment have unimpeded access to its force mains and respective easements for routine inspection and maintenance activities. This will enhance the City's ability to provide uninterrupted, efficient, environmentally compliant wastewater transport service and support compliance with the existing Consent Decree.

SUMMARY OF THE METHOD

This maintenance SOP involves clearing of the easement within the identified limits by designated staff (4 person crew) using applicable machinery, equipment and hand tools. Clearing shall be performed in manner that adheres to applicable safety criteria to establish a 15-25 foot wide easement based on the documented specified easement width.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and all Safety Procedures will be followed. Procedures in this SOP could result in dangerous conditions including personal exposure to sewer waste, poisonous vegetation, insects, thorny plants/brush, dead trees, snakes and other wildlife.

PERSONNEL QUALIFICATIONS

Wastewater Collection System Operator - Crew Foreman with "A" CDL
Wastewater Collection System Operator(s) (at least one with "A" CDL)

EQUIPMENT AND SUPPLIES

Equipment: • Four Wheel Drive Truck • Dump Truck/Trailer • Tractor/Lowboy Trailer • All-terrain vehicle (ATV) • Trailer for ATV • Digital Camera, W/Video capability • Flagging / Stakes / Caution Tape • Bush axe(s) / Machete(s) • Bush hog • Shin cutting machine (s) • Backhoe/Excavator • Chain saws • Shovel • Sledge Hammer • Roll Footage Counter • Two Way Radio	• System/Telephone • Various Hand Tools • Cones/Barricades/Signs • Green Paint • White Paint **PPE:** • Snake Protection • Insect Repellant • First Aid Kit • Ear Plugs • Cones and Signs • Life Vests for Stream Crossings **Materials:** • GIS Maps identifying rights-of-way • See "References" Section for specific forms needed

PROCEDURAL STEPS

1. If applicable, contact Engineering to conduct initial clearing of the force main easement. Alternately, this work may also be performed by Wastewater Maintenance Division Staff. This initial clearing should not be performed until the easement has been surveyed and flagged (refer to Easement and Force Main Inspection SOP). It is not intended that this step be performed prior to every force main easement maintenance activity; this is an initial clearing that will be maintained by more routine maintenance described in this SOP. Use a separate work order to track initial force main easement clearing.

2. Wastewater Collection System Operator will initiate or receive a Work Order, which includes easement location, work to be performed, and any other necessary information to locate the force main easement to be maintained.

3. Seven days ahead of the activity, inform potentially impacted private property owners of the scheduled easement clearing, maintenance and routine inspection work. Use the City's protocols for property owner notification.

4. Perform a Drivers Inspection Report as per Driver's Report and Key Check SOP, before driving, and do a check of the truck's inventory to ensure that all required tools and equipment are on the truck.

5. Drive to job-site using seat belts as per SC law and City policy, and put on PPE (Personal Protective Equipment), i.e., safety vest, steel-toe shoes, safety glasses, ear plugs, and hard hat as required.

6. Park vehicles in a safe and level area.

7. As required, set-up lane closed signs, cones/ barricades, construction signs, etc. as per the SCDOT Work Zone Safety Guideline Handbook, ensuring the job-site and area is safe for workers, pedestrians and motorist.

8. Proceed to unload equipment as per Loading, Hauling, and Unloading Equipment SOP, and begin clearing ROW. Keeping in mind the location of fellow employees and their equipment.

9. For routine maintenance, mow, bush hog and herbicide the identified easement for clearing of vegetation. Haul away all debris resulting from clearing activities. Coordinate herbicide treatments with Engineering, as needed. If more extensive clearing is required, add note for follow up in the work order for use in prioritizing initial clearing (see Procedural Step 1).

10. Repair major eroded areas using guidelines provided in the SC BMP Handbook for erosion and sedimentation control. Consult City Engineering and Construction Management Divisions prior to working within 100-feet of a stream bank as these areas may require additional permitting.

11. Do not conduct repair activities in streams as part of this SOP. Repairs at stream crossings (between stream banks) require specific permits. Consult City Engineering and Construction Management Divisions to determine the best course of action for repairs in stream zones.

12. Never leave material outside of easement.

13. Load and haul away any excess material (boulders, trees, tree limbs, stump(s)) when necessary.

14. Complete Work Order identifying all maintenance work performed, personnel involved, and hours required to complete the task. If maintenance work is outsourced, Construction Management should inspect the contractor's work and report that the maintenance activity was completed.

DATA AND RECORDS MANAGEMENT

1. Complete a work order to include location, time spent at job site, work done, equipment used, and personnel on job.

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs are reviewed by the applicable Division at least every year in order to maintain their relevancy.

2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.

3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the QA/QC Officer who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form

2. Drivers Inspection Report / Driver's Report and Key Check SOP

3. Loading, Hauling, and Unloading Equipment SOP

4. Easement and Force Main Inspection SOP

5. SC DOT Work Zone Safety Guidelines Handbook

6. Blood Borne Pathogen Program

7. City's Encroachment Policy

ATTACHMENTS / CHECKLISTS

1. None

Division: Wastewater Maintenance **Subdivision:** Maintenance

SOP Title: Force Main and Easement O&M, FM SOP #3

Air Release Valve Inspection and Maintenance

APPROVED:

_____ _____
Author, Author Name/ Author Title Date

_____ _____
Assistant Superintendent, Jody Harley Date

_____ _____
Superintendent (QA/QC Officer), Robert Judy Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
1				
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Date	

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PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for the maintenance of the air release valves (ARVs) for the City of Columbia force mains.

SUMMARY OF THE METHOD

Methods for air release valve maintenance are in general accordance with manufacturer's recommendations. The procedures provided herein are intended as general guidelines for ARV maintenance; operation and maintenance guidelines may vary depending on the ARV manufacturer and should be consulted as needed. This work will be performed by a 3 person crew.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment (PPE) will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed. This procedure may expose the employee to untreated sewage.

PERSONNEL QUALIFICATIONS

Wastewater Collection System Operator - Crew Leader
Wastewater Collection System Operator(s)

EQUIPMENT AND SUPPLIES

Equipment: • Truck • All-terrain vehicle (ATV) • Trailer for ATV • Manhole Hooks • Hatch Keys (as needed) • Appropriate Hand Tools • Digital Camera, W/Video capability • Flagging / Stakes / Caution Tape • Replacement ARV(s) • Manhole Hook • Air Monitor • Tripod and Harness • Roll Footage Counter • Tape Measure • Flashlight • Cones/Barricades • Metal Detector • Various Hand Tools • Sledge Hammer • Shovels • Crescent Wrench • Strap Wrench	• Pipe Wrench (24") • Buckets/Pails • Breakaway Spray • Mud Hog Pump (if needed) • Green Paint • White Paint • Pipe Thread Sealant **PPE:** • If needed, Blood Born Pathogen PPE Kit • Snake Protection • Insect Repellant • First Aid Kit • Cones and Signs • Life Vests for Stream Crossings **Materials:** • GIS Maps identifying rights-of-way • Inspection and Report Forms • See "References" Section for specific forms needed

PROCEDURAL STEPS

1. Wastewater Collection System Operator receives work order from Dispatch, Supervisor, Assistant Superintendent, or Superintendent.

2. Reference the as-built drawings and/or grid maps for information on the location of manhole containing the air release valve.

3. Perform a Driver's Inspection Report, as per Driver's Report and Key Check SOP, before driving, and do a quick check of the truck's inventory to ensure that all required tools and equipment are on the truck.

4. Drive to job-site using seat belts as per SC law and City policy and put on PPE (Personal Protective Equipment), i.e., safety vest, steel-toe shoes, and hard hat, as required.

5. Park vehicles in a safe and level area.

6. As required, set-up lane closed signs, cones/ barricades, construction signs, etc. as per the SCDOT Work Zone Safety Guideline Handbook, ensuring the job-site and area is safe for workers, pedestrians and motorist.

7. Proceed to unload equipment as per Loading, Hauling, and Unloading Equipment SOP, and begin clearing ROW. Keeping in mind the location of fellow employees and their equipment.

8. Notify pump station personnel of need to switch off involved pump station temporarily if needed.

9. Locate air release valve manhole.

10. Check vegetation around manhole and cut or trim as needed.

11. Inspect area for evidence of Sanitary Sewer Overflows (SSOs). If evidence of SSOs are noted, take appropriate actions outlined in the Force Main Collection System Emergency Response Guide #1 and document findings per the Sewer Overflow Response Plan (SORP).

12. Using the proper tools and technique, open the manhole. ***Be careful do not allow lid to drop on hand, fingers, legs or fee*t**.

13. Follow *Confined Space Entry SOP*, completing a confined space permit.

14. Visually inspect manhole for:

    - Vermin, snakes, spiders or other wildlife before entering manhole.
    - Check for cracks, debris, breaks, deterioration or any other noticeable defect.
    - Check for manhole wall deterioration.
    - Check for signs of leaks from seals or threads.
    - Inspect saddle and bands for corrosion, if saddle or bands need to be replaced, a work order will be requested and the valve will not be replaced at this time.

15. Close the ball (isolation) valve under ARV using crescent wrench or pipe wrench.

16. Open the ARV pressure release valve typically located on the base of the unit.

17. Place pipe wrench on ball valve body to prepare for loosening ARV.

18. Place strap wrench on ARV at the top in the direction to loosen.

19. Remove ARV from the line only after ensuring that internal pressure has been released.

20. Use pipe thread sealant on the threads of the replacement ARV.

21. Install replacement (serviced) ARV. If the valve being replaced is not an A.R.I. D-025 model valve, replace the existing valve permanently with an A.R.I. valve and document in maintenance report.

22. Ensure that the ARV pressure release valve is closed after releasing any air trapped in the valve following installation.

23. Open the ball (isolation) valve and inspect the reinstalled ARV for leakage. If any leakage is observed, close the ball (isolation) valve and ensure that all seals are properly seated. Reopen the ball (isolation) valve and re-inspect for leakage. If leakage is observed, repeat all procedural steps or consider replacement.

24. If there is any debris or sewerage left, it must be cleaned up and sanitized as per Sewer Overflow Response Plan (SORP) Training.

25. After completing the replacement of the ARV close the manhole.

26. Follow *Confined Space Entry SOP* for cancelling permit.

27. Transport ARV back to shop for maintenance.

28. Perform service on ARV according to manufacturer's maintenance guidelines.

29. Return serviced ARV to stock for use in future maintenance replacement procedures.

30. Close ARV maintenance work order and document service for ARV location.

DATA AND RECORDS MANAGEMENT

1. Complete a work order to include location, air release valve identification number, time spent at job site, work done, equipment used, and personnel on the job.

2. Complete and submit a SC-DHEC Spill sheet if any spills occur during ARV maintenance activities.

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs are reviewed by the applicable Division at least every year in order to maintain their relevancy.

2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.

3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Work Order Form

2. Driver's Inspection Report / Driver's Report and Key Check SOP

3. Loading, Hauling, and Unloading Equipment SOP

4. Confined Space Permit/Confined Space Entry SOPs

5. SC DOT Work Zone Safety Guidelines Handbook

6. DHEC Spill Report

7. Blood Borne Pathogen Program

8. ARV Manufacturer's Installation and Maintenance Manuals

ATTACHMENTS / CHECKLISTS

1. None

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Appendix D: Procedures for Inventory Management of Critical Equipment and Parts

- Attachment A: Warehouse Critical Equipment and Spare Parts
- Attachment B: Standard Operating Procedures for Warehouse Inventory Control of Critical Equipment and Spare Parts
- Attachment C: Existing Inventory Control Forms

Attachment A: Warehouse Located Critical Equipment and Spare Parts

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
A-15	Bearing	BRG 3310	BEARING (USED AT BURNSIDE # 1 LIFT STATION)	2	BEARING DIST.
A-15	Bearing	BRG 3311C3	BEARING (USED AT BURNSIDE # 1 LIFT STATION)	2	BEARING DIST.
A-17	Bearing	BRG 5311	BEARING (USED FOR BURNSIDE PUMP STATION # 1)	1	BEARING DIST.
A-20	Bearing	BRG 6208ZZE	BEARING USED ON HARBISON 4 STATION	0	BEARING DIST.
A-22	Bearing	BRG 6309	BEARING (PINEY GROVE PUMP #1)	2	BEARING DIST.
A-23	Bearing	NTN 7212BG	BEARING (STARLITE PUMP STATION)	0	BEARING DIST.
B-01	Bracket	82036171	UPPER GUIDE BRACKET/41680001	2	PETE DUTY
B-01	Bracket	14-9407	UPPER GUIDE BRACKET RUBBER GROMMETS WITH BLOT	2	ITT WATER.,INC.
B-01	Bearing	TAJE3024A	BEARING SCREW	2	EMORY L. WILSON
B-02	Spring	C-73 SPRING	CHECK VALVE SPRING (FOR 6" AND 8" CHECK VALVES)	6	MSC WATERWORKS
B-26	Ring	3092900	FLYGT 3127.180 STATIONARY WEAR RING	1	PUMPTEK
B-26	Ring	3093400	FLYGT WEAR RING P/N, 3093400	2	PUMPTEK
B-26	Ring	3797100	FLYGT WEAR RING P/N,3797100 (IVY SQUARE PUMPS)	1	ITT WATER.,INC.
B-26	Ring	3093600	FLYGT WEAR RING #3093600	4	ALLIS
B-26	Ring	454 SIZE	FLYGT WEAR RING SIZE IMPELLER (FOR A 20 HP PUMP)	2	ITT WATER.,INC.
B-28	Bolt	2919-002-1	HYDROMATIC IMPELLER BOLT #2919-002-1	2	GORMAN
B-29	Bolt	60A12	SMITH & LOVELESS IMPELLER BOLT (SWANDALE STATION)	2	PETE DUTY & ASSOC
B-29	Washer	60A20	SMITH & LOVELESS IMPELLER WASHER(SWANDALE STATION)	1	PETE DUTY & ASSOC
B-32	Nut	1140027	ABS IMPELLER NUT (NEW #11400089)	2	PETE DUTY & ASSOC
B-32	Bolt	4203500	ABS REPLACEMENT BOLTS	8	PETE DUTY & ASSOC
B-32	O-Ring	11120089	ABS O-RING	3	PETE DUTY & ASSOC
B-32	O-Ring	11120117	ABS O-RING	5	PETE DUTY & ASSOC
B-32	Screw	11560020	ABS PLUG SCREW	3	PETE DUTY & ASSOC
B-32	Cap	42160501	ABS IMPELLER CAP, PUMP MODEL AFP20 (WEXFORD #2)	5	PETE DUTY & ASSOC
B-33	Key	1163010	KEY (ABS)	1	PETE DUTY & ASSOC
B-33	Key	1163015	KEY (ABS)	1	PETE DUTY & ASSOC
B-33	Ring	42930005	ABS CUTTING RING	1	PETE DUTY & ASSOC
B-33	Rotor	42935004	ABS CUTTING ROTOR	1	PETE DUTY & ASSOC
B-33	Board	61130147	ABS TERMINAL BOARD	2	PETE DUTY & ASSOC
B-34	Cap	11408	BEARING CAP, GORMAN RUPP (USED FOR T-3 ,4)	0	EMORY L. WILSON
B-34	Spring	38571-610	SPRING, COMPRESSION (25-LB)(GRP.33-07)	3	EMORY L. WILSON
B-34	Spring	38571-715	SPRING, COMPRESSION (10-LB)-(GRP.3307-A)	4	EMORY L. WILSON
B-34	Spring	38571-717	SPRING, COMPRESSION (80-LB)-(GRP.33-07B)	4	EMORY L. WILSON
B-35	Plate	41060506	ABS BOTTOM PLATE (41060506)	1	PETE DUTY & ASSOC
B-35	Plate	106146	WEAR PLATE, ABS #971901	3	PETE DUTY & ASSOC
B-35	Bearing	115226	BEARING HOUSING ABS PUMP	0	EMORY L. WILSON
B-36	Plate	31060140	ABS BOTTOM PLATE (CLEARWATER STATION)	2	PETE DUTY & ASSOC
B-36	Bracket	41680001	ABS PUMP MODEL AFP20 UP-GUIDE RAIL BRACKET	0	PETE DUTY & ASSOC
B-36	Bracket	4142515M	ABS PUMP BRACKET (4142515M)	0	PETE DUTY & ASSOC
B-37	O-Ring	25154-273	O-RING, GORMAN-RUPP T-4 #25154-273 SEAL-PLATE	4	TENCARVA
B-37	O-Ring	S1674	O-RING KIT COVER BK T4/T8	3	TENCARVA
B-37	O-Ring	S1676	O-RING, T-8 #S-1676	9	TENCARVA
B-37	O-Ring	S1914	O-RING, #S-1914 BEARING HOUSE	5	TENCARVA
B-37	O-Ring	S1915	O-RING, #S-1915 DOOR COVER	8	TENCARVA
B-38	Pin	1235717010	PIN, CHECK VALVE (BURNSIDE I)	1	EMORY L. WILSON
B-38	O-Ring	25152- 026	O-RING GORMAN-RUPP P/N, 25152	12	TENCARVA
B-38	O-Ring	S1748	O-RING, GORMAN RUPP #S-1748 COVER PLATE	6	TENCARVA
B-38	O-Ring	S2088	O-RING GORMAN-RUPP P/N, S2088	21	EMORY L. WILSON
B-38	Ring	S244	SNAP RING GORMAN RUPP # S244	3	EMORY L. WILSON
B-39	Cap	10278-15030	IMPELLER CAP WASHER (GORMAN-RUPP @ BURNSIDE II)	7	TENCARVA
B-39	Cap	DM10045 15991	IMP. CAPSCREW (GORMAN-RUPP IMPELLER CAPSCREW)	6	TENCARVA
B-40	Sleeve	11876A 16000	SHAFT SLEEVE T4 ,T6, &,T3(WITH 12364A SEAL ASSY)	4	TENCARVA
B-40	Sleeve	12359-16000	G-RUPP T8 MECHANICAL SLEEVE	4	TENCARVA

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
B-41	Shaft	12353	GORMAN-RUPP T-8 SHAFT	0	EMORY L. WILSON
B-41	Impeller	11406-11010	GORMAN-RUPP SUPER T 3" IMPELLER (QUIAL CREEK)	1	TENCARVA
B-41	Plate	11837D	SEAL PLATE, GORMAN RUPP T-4 #11837-D	0	EMORY L. WILSON
B-41	Plate	11837E	SEAL PLATE, GORMAN RUPP T-6 #11837-E	0	EMORY L. WILSON
B-41	Nut	G-R	GORMAN RUPP HANDNUT	3	EMORY L. WILSON
B-42	Impeller	123491100	IMPELLER, GORMAN RUPP T-8 #12349	1	EMORY-WILSON
B-42	Impeller	1095811010	IMPELLER GORMAN RUPP T-6	2	A.O
B-42	Impeller	10528 11010	IMPELLER GORMAN RUPP T-4	0	TENCARVA
B-42	Plate	10532A 15990	G-RUPP WEAR PLATE T4A P/N, 10532A 15990	1	TENCARVA
B-42	Shaft	38514-81716040	G-RUPP T4 & T6 SHAFT (M921724)	1	TENCARVA
B-42	Plate	T3-11407A	WEAR PLATE, T-3 #11407A	4	EMORY L. WILSON
B-42	Plate	T6-10961A	WEAR PLATE, T-6 #10961A	1	EMORY L. WILSON
BB-17	Belt	VB 3V850	BELT (USED AT THREE RIVERS STAT. ETC.)	8	BEARING DIST.
BB-29	Belt	VB B68	BELT (QUAIL CREEK G-R PUMP)	4	BEARING DIST.
C-01	Pipe	PVC 80 4 90' E	SCH 80 4" 90' ELBOW	3	FERGUSON
C-04	Pipe	PVC 80 4 C	SCH 80 4" COUPLING, GLUE X THREAD	4	FERGUSON
C-23	Regulator	25AUB	1" WATTS REGULATOR (PRV FOR SWS @ BROAD RIVER)	1	GATEWAY
E-15	Motor	VM3538	BALDOR MOTOR (SPARE)	1	ELECTRIC MOTOR
E-17	Pump	AURORA	SEAL WATER PUMP 2HP(USED FOR SEAL WATER) 134BR	2	MECHANICAL EQUIP.
E-18	Pump	AURORA PUMP	SEAL WATER 3HP 200/208,MODEL 134BR (SEAL WATER)	2	W.P.LAW
E-22	Floats	ENM-10 095-1140	LIFT STATIONS (FLYGT P/N, ENM-10) P/N, 5828830	9	XYLEM WATER SOLU
E-23	Floats	ENM-10 095	LIFT STATIONS (FLYGT P/N, ENM-10) P/N, 5828830	13	XYLEM WATER SOLU
F-14	Spring	98296	STEEL SPRING PIN, 1/2" DIA, 3 1/2" LENGTH	39	MCMASTER-CARR
G-01	Pump	S/N,3127.181.0720844	FLYGT PUMP HP 10, RPM 1735 (HOMELESS SHELTER)	1	XYLEM WATER SOLU
G-01	Pump	S/N, G61970	ABS,AFP-20 GPM1300, RPM 1700, HP20 (SPARE PUMP)	0	PETE DUTY
G-01	Pump	S/N,0006906	ABS, XFP100C-CB1.2PE20 ,2.7 HP,(VILLAGE POND)	0	PETE DUTY
G-01	Pump	S/N,0032710	ABS,MODEL ME230/2,RPM 3400 HP, 230V(HARBOUR POINT)	1	PETE DUTY
G-01	Motor	S/N,10264 JKJ	PREMIUM EFFICIENCY HP 7.5, (THREE RIVERS STAT)	0	HOBGOOD ELE
G-01	Pump	S/N,2891 /AFP 1034.8	ABS, MODEL M230/,HP: 30.82 (HARBOUR POINTE)	1	PETE DUTY
G-01	Pump	S/N,3068.170-1111152	FLYGT HP 2.7 RPM, 3315 (SUMP, BROAD RIVER STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3085.183.0571256	FLYGT PUMP HP 3, RPM 1700, (USED PUMP)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3085.183-1230565	FLYGT HP 3,RPM 1700 (REGATTA POINT # 3 STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3085.183-0571256	FLYGT HP 3,RPM 1700 (REGATTA POINT # 3 STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3085.183-1240335	FLYGT HP 3,RPM 1700, (HEATHWOOD HALL)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3085.183-1240336	FLYGT HP 3,RPM 1700,IMP,434 (HEATHWOOD HALL)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3085.183-1320588	FLYGT HP 3,RPM 1700,IMP,434 (HEATHWOOD HALL)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3102.160-1250074	FLYGT PUMP HP 5, RPM1745, (OWENS FIELD)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3102.181.0680478	FLYGT HP 5 RPM 1745, (USED PUMP) (EMERALD LAKES)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3102.181-0830146	FLYGT HP 5 ,RPM1745, (SPARE PUMP)(EMERALD LAKES)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3102.160-1340142	FLYGT HP 5, RPM 1745, (PRESCOTT MANOR STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3102.185-1330033	FLYGT PUMP HP 5, RPM 1745,(OWENS FIELD SPARE)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3102.185-1330081	FLYGT PUMP HP 5, RPM 1745,(OWENS FIELD SPARE)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3102090-0820152	FLYGT HP 5,RPM 1745, 460/230V(OWENS FIELD SPARE)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3102090-0820154	FLYGT HP 5,RPM 1745, (EMERAL LAKES SPARE PUMP)	1	XYLEM WATER SOLU
G-01	Pump	S/N,763222-3	EBARA 20 HP, MODEL#150DLM6152 (BURNSIDE 2)	1	XYLEM WATER SOLU
G-01	Pump	S/N,311751111	EBARA 25 HP,MODEL # 100DLMF6182 (HILL CREEK # 1)	1	PUMPS, PARTS, SERV.
G-01	Pump	S/N,3127.090.0760054	FLYGT HP 10, RPM 1735, (BOOKER HEIGHTS)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.170-0180053	FLYGT HP 7.5,RPM 3495,(GEORGE TOWN STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.180.0350361	FLYGT HP 10, RPM 1735 (GARNERS FERRY RD.FOOD LION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.180.9920907	FLYGT HP 7.5 RPM 1740, (ATLAS ROAD STATION)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3127.180.9920908	FLYGT HP 7.5 RPM 1740,(ATLAS ROAD STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.181.0730880	FLYGT HP 10, RPM 1735, (KILLIAN CROSSING)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3127.181.0830309	FLYGT HP 10, RPM 1735, (PUMP GRIT CHAMBER)	1	XYLEM WATER SOLU

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
G-01	Pump	S/N,3127.181.1020095	FLYGT HP 10, RPM 1735, (RETREAT STATION UP GRADE)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.181-1220692	FLYGT HP 10,RPM 1720,IMP,438 (CLEARWATER RETROFIT)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3127.181-1230380	FLYGT HP 10,RPM 1720,IMP,485 (WINDSONG STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.181-1230381	FLYGT HP 10,RPM 1720,IMP,483 (BENDALE STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.181-1358504	FLYGT HP 10,RPM 1720,IMP,483(WEXHURST STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3127.181-1250211	FLYGT HP 11,RPM 3495, (HILL CREEK ll PS)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3127.185-1330042	FLYGT HP 11,RPM 3495, (HILL CREEK ll PS)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3152.181.0330172	FLYGT HP 20 RPM 1750 (MYERS CREEK STATION	0	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181.0640620	FLYGT HP 20, RPM 1755, (FARROW POINTE)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181.0640621	FLYGT HP 20, RPM 1755, (FARROW POINTE)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181.0920497	FLYGT HP 20, RPM 1755, (WOODLANDS)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181-1040124	FLYGT HP 12 RPM 1765 (HAWKING CREEK STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181-1230178	FLYGT HP 20,RPM 1755, (LONGCREEK # 1 STATION)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181-1230179	FLYGT HP 15,RPM 1755,(CRESCENT LAKE STATION)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181-1240171	FLYGT HP 20,RPM 1755, (BRADFORD PARK L/S)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3153.181-1240172	FLYGT HP 20,RPM 1755, (BRADFORD PARK L/S)	0	XYLEM WATER SOLU
G-01	Pump	S/N,317.180.0440037	FLYGT HP 30 RPM 1760 (BROOKHAVEN) REBUILT	0	XYLEM WATER SOLU
G-01	Pump	S/N,3171.181-1220161	FLYGT HP 30,RPM 1760 ,(HARBISON # 4 STATION)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3171.181-1230089	FLYGT HP 30,RPM 1760 (BLYTHEWOOD CROSSING)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3171.181-1240123	FLYGT PUMP HP 25,RPM 1755 (EAST BLUFF)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3171.181-1240124	FLYGT PUMP HP 25,RPM 1755 (EAST BLUFF)	1	XYLEM WATER SOLU
G-01	Pump	S/N,3171.185-1340037	FLYGT PUMP HP 25,RPM 1755 (EAST BLUFF)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3300.181.098004	FLYGT HP 75, RPM 1170 (IVY SQUARE)	0	XYLEM WATER SOLU
G-01	Pump	S/N,3301180.0960008	FLYGT HP 105, RPM 1775, (GREEN LAKES STAT)	1	XYLEM WATER SOLU
G-01	Pump	S/N,465/6/1	EBARA,MODEL # 100DFU6152, HP 20 (PUMP USED)	0	PUMPS, PARTS, SERV.
G-01	Pump	S/N,855271	KSB HP 15,RPM 1750, KRT E80-251/(HOLLY RIDGE)	0	CAROTEK,INC.
G-01	Pump	S/N,A791F878-1-2	GOULDS PUMP MODEL#3196. (PWP FOR TRAIN #1)	1	INTERSTATE UTILITY
G-01	Pump	S/N,B63135	ABS AFP-15 VOLTS 230/460 RPM,1750 (USED PUMP)	1	PETE DUTY
G-01	Pump	S/N,C5096/111	EBARA MODEL # 100DLMFU63.72 , HP5 (REGATTA STAT)	1	PUMPS, PARTS, SERV.
G-01	Pump	S/N,F04355	ABS AF40-4 5.4 HP, RPM, 1750 230 V,(OWENS FIELD)	1	ELECTRO-MECH,INC.
G-01	Pump	S/N:C4924811	GRINDER PUMP 32DGU1161 (SPARE FOOD LION)	1	WP LAW
G-01	Pump	S/N,G00139639	GRINDER PUMP WG30-21-35 3HP, (CROCKETT ROAD)	1	XYLEM WATER SOLU
G-01	Pump	S/N,HP20 NO TAG	ABS PUMP AFP-20 VOLTS 230/460 (USED PUMP NO TAG)	1	PETE DUTY
G-01	Pump	S/N,J50547	ABS AFP-10 GPM 500, RPM 500, HP 10 (USED PUMP)	1	PETE DUTY
G-01	Pump	S/N,J814950	ABS PUMP AFP-1032470/4-22, HP 9.4 RPM 1780 GPM 900	1	PETE DUTY
G-01	Pump	S/N,J92318	ABS PUMP AFP-20-4, GPM 460,RPM,1750,HP 20	1	PETE DUTY
G-01	Pump	S/N,K72146	ABS PUMP AFP-20 HP 20, GPM 560 RPM 1750	1	PETE DUTY
G-01	Pump	S/N,M63288	ABS ,GPM 360, RPM 1750,HP 15 (NORTH CROSS)	0	PETE DUTY
G-01	Pump	S/N,M921898	ABS AFP-1046/M704-22, HP 9.4, RPM 1780, GPM 900	1	PETE DUTY
G-01	Pump	T4A3-B/F	GORMAN RUPP (CENTRIFUGAL)	0	TENCARVA MACH CO
H-06	Impeller	60D21-92	SMITH & LOVELESS (SWANDALE STATION RIGHT HAND)	0	PETE DUTY & ASSOC
H-06	Impeller	M196369	SMITH & LOVELESS (SWANDALE STATION LEFT HAND)	0	PETE DUTY & ASSOC
TS-5	STARTER	150-C43NBD	MOTOR CONTROL STARTER 200/480 VOLT 3 PHASE	1	ALLEN BRADLEY/ENGLEWOOD
TS-4	MISC		FLYGT PUMP CONTROL PANEL SPARE PARTS (WITH FUSES)	1	MISC/XYLEM
TS-4	MISC		FLYGT PUMP CONTROL PANEL SPARE PARTS (WITH FUSES)	1	MISC/XYLEM
TS-4	MISC		FLYGT PUMP CONTROL PANEL SPARE PARTS (WITH FUSES)	1	MISC/XYLEM
TS-4	MISC		FLYGT PUMP VFD SPARE PARTS	1	MISC/XYLEM
TS-5	MISC		FLYGT PUMP CONTROL PANEL SPARE PARTS (WITH FUSES)	1	MISC/XYLEM
TS-3	ELEC	CD460P7W	4W 3PHASE EMERGENCY GENERATOR PLUG	1	COOPER/ECS
MS-1	ELEC	HC47AB10AF	ALTERNATOR SERIES A 110/120 VOLT 60HTZ	1	HUBBEL/ECS
MS-1	RELAY	CR324C360F	OVERLOAD RELAY NEMA SIZE 1 3PHASE 230/460VOLT	1	GE/ECS
MS-1	ELEC	XTCEXFBG22	AUXILLARY CONTACTS 2-NO 2-NC	2	EATON/ECS
MS-1	RELAY	CEP7-M32-12-10	OVERLOAD RELAY 3PHASE 230/460VOLT	1	SPRECHER-SHUH/ECS

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
MS-1	RELAY	B28.0 0733	THERMAL OVERLOAD RELAY	3	SQUARE D/ECS
MS-1	BREAKER	THQC32070WL	70AMP BREAKER	1	GE/ECS
MS-1	BREAKER	140M-D8E-C20	14-20AMP BREAKER	2	ALLEN BRADLEY/ENGLEWOOD
MS-1	ELEC	14-407129	MINI CONTROL AND STATUS 120 (MINICAS)	4	FLYGT/XYLEM
MS-1	ELEC	PSC-12500-F	FLOAT CHARGER	2	POWER SONIC/GRAINGER
MS-1	ELEC	PSC-12500-F-C	FLOAT CHARGER WITH LED INDICATOR	2	POWER SONIC/GRAINGER
MS-1	RELAY	4FE21	8 PIN 12VDC RELAY	4	OMRON/WHOLESALE ELECTRIC
MS-2	ELEC	PS5R-A24	7.5WATT POWER SUPPLY 24VOLT OUTPUT 120VOLT INPUT	1	IDEC/ECS
MS-3	ELEC	3BY63A	FLOAT SWITCH	2	DAYTON/GRAINGER
MS-3	ELEC	1606-XLSDNET4	DC POWER SUPPLY 100-240V INPUT 24 VDC OUTPUT	1	ALLEN BRADLEY/ENGLEWOOD
MS-3	ELEC	SDP 5-5-100T	SOLA HEVI-DTY DC PWR SPLY 115-230V INPT 5 VDC OUT	1	EGS/CARLTON BATES
MS-3	ELEC	SDP 2-12-100T	SOLA HEVI-DTY DC PWR SPLY 115-230V INPT 12 VDC OUT	1	EGS/CARLTON BATES
MS-3	ELEC	3BY63	FLOAT SWITCH WITH FLOAT BAIL	1	DAYTON/GRAINGER
MS-3	ELEC	9070T50D23	INDUSTRIAL CNTRL TRANSFRMR PRI 120-240V SEC 24V	3	SQUARE D/ECS
MS-3	ELEC	9070T50D2	INDUSTRIAL CNTRL TRANSFRMR PRI 240-480V SEC 24V	1	SQUARE D/ECS
MS-3	RELAY	9065SD08	THERMAL OVERLOAD RELAY	1	SQUARE D/ECS
MS-3	ELEC	PSG2408	240W 1PH PWR SPLY INPT 100-240V OUT 24V@10A	1	EATON/ECS
MS-3	RELAY	193-ED1EB	OVERLOAD RELAY (MANUAL RESET)	1	ALLEN BRADLEY/ENGLEWOOD
MS-3	ELEC	C320KGS31	AUXILLARY CONTACTS 2-NO SERIES A2	1	CUTLER HAMMER/ECS
MS-3	ELEC	C320KGS21	AUXILLARY CONTACTS 2-NC SERIES A2	1	CUTLER HAMMER/ECS
MS-3	ELEC	PSS1010A	DC POWER SUPPLY 115V INPUT 24 VDC OUTPUT	1	CUTLER HAMMER/ECS
MS-4	ELEC	7ML1118-0CA30	XPS-15 ULTRASONIC TRANSDUCER	3	SIEMENS/SHEELY'S
MS-4	ELEC	7ML50341AA01	HYDRORANGER 200, WALL, AC, 6 RELAY, SINGLE PT	4	SIEMENS/BECK SALES
MS-3	BREAKER	QO3100	PLUG ON CIRCUIT BREAKER 100AMP 3POLE 240VOLT	2	SQUARE D/ECS
B-5-3	ELEC	5AGC8	AREA FAN 606 CFM 11 115V 8-7/8IN SQUARE	1	EBM/GRAINGER
B-5	BATTERY	PS-670	SEALED RECHARGEALBE BATTERY 6V 7.0AMP	3	POWER SONIC/GRAINGER
B-5	BATTERY	CP6-10	SEALED LEAD-ACID RECHARGEABLE BATTERY 6V 10AMP HOURS	1	COO POWER/GRAINGER
B-4-6	RELAY	T0100734	RELAY	2	TYCO/WHOLESALE ELECTRIC
B-4-6	BREAKER	BAB3090H	90AMP CIRCUIT BREAKER 240V 3PHASE TYPE BA	1	CUTLER HAMMER/ECS
B-4-6	RELAY	5X830N	TIME DELAY RELAY 120V INPUT 2-300 SEC	1	DAYTON/GRAINGER
B-4-3	RELAY	211XBX207	120VAC RELAY	3	STRUTHERS-DUNN/WHOLESALE ELECTRIC
B-4-3	BATTERY	PS-1212	SEALED RECHARGEALBE BATTERY 12V 1.2AMP HR	3	POWER SONIC/GRAINGER
B-4-3	RELAY	A314XAX48P	120VAC RELAY 10AMP	1	STRUTHERS-DUNN/WHOLESALE ELECTRIC
B-4-3	ELEC	4YF69A	LEVER SWITCH AND COVER 110V	1	BELL OUTDOORS/ECS
B-4-4	ELEC	WR899-E	20A-125V RECEPTICLE BLACK	8	LEVITON/GRAINGER
B-4-10	ELEC	MV-600G	100VAC VACUUM/PRESSURE MINI PUMP	2	MINI PUMP/CARLTON BATES
B-4	ELEC	BE725BB	BATTERY BACKUP PLUS SURGE PROTECTION	1	APC/GRAINGER
B-4	ELEC	BE500R	BATTERY BACKUP SURGE PROTECTION	3	APC/GRAINGER
B-3	ELEC	8712DR12DA1N0M4D1	SERIES 8700 TRANSMITTER AND FLOWTUBE	1	ROSEMOUNT MEASUREMENT/INSTRUMENT AND VALVE SERVICES
B-3-1	ELEC	6-26-2	CONTACT KIT 3 POLE SIZE 4 CITATION	5	CUTLER HAMMER/ECS
B-3-1	ELEC	6-24-2	CONTACT KIT 3 POLE SIZE 2 CITATION	1	CUTLER HAMMER/ECS
B-3-1	ELEC	6-25-2	CONTACT KIT 3 POLE SIZE 3 CITATION	4	CUTLER HAMMER/ECS
B-3-1	ELEC	6-34-2	CONTACT KIT 3 POLE SIZE 2	4	CUTLER HAMMER/ECS
B-3-1	ELEC	6-22-2	CONTACT KIT 3 POLE SIZE 0 CITATION	2	CUTLER HAMMER/ECS
B-3-1	ELEC	6-23-2	CONTACT KIT 3 POLE SIZE 1 CITATION	1	CUTLER HAMMER/ECS
B-3-1	ELEC	6-21-2	CONTACT KIT 3 POLE SIZE 00 CITATION	2	CUTLER HAMMER/ECS
B-3-1	ELEC	6-36-2	CONTACT KIT 3 POLE SIZE 4	2	CUTLER HAMMER/ECS
B-3-1	ELEC	E22CW	OCTAGONAL WRENCH	1	CUTLER HAMMER/ECS
B-3-1	ELEC	C320KA3	N0 NC AUXILLARY CONTACT BLOCK	3	CUTLER HAMMER/ECS
B-3-1	ELEC	C320KB1	BASE AUX CONTACT 1NO	3	CUTLER HAMMER/ECS
B-3-1	ELEC	C320KB2	BASE AUX CONTACT 1NO 1NC	2	CUTLER HAMMER/ECS
B-3-1	ELEC	C320KB4	BASE AUX CONTACT 1NO	5	CUTLER HAMMER/ECS

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
B-3-1	ELEC	C320KB5	BASE AUX CONTACT 1NO 1NC	8	CUTLER HAMMER/ECS
B-3-6	ELEC	MWS2 84 873 021	3X208 440V 50/60HZ CONTACT BLOCK	1	CROUZET/CARLTON BATES
B-3-6	FUSE	ABC-7	CERAMIC FUSE LISTED 448H MIN, IR 200A-250VAC IR 10kA 125VAC	3	BUSS FUSES/ECS
B-3-6	FUSE	TDC-11	GLASS SLOW BLOW FUSE 250MA	16	BUSS FUSES/HEYWARD
B-3-6	ELEC	800T-XD1	CONTACT BLOCK SHALLOW BLOCK 1NO	5	ALLEN BRADLEY/ENGLEWOOD
B-3-2	ELEC	10250T221	PRETEST LIGHT TRANS - 1 HOLE MOUNTING 120V 50/60HZ	2	CUTLER HAMMER/ECS
B-3-2	ELEC	E30KLA3	CONTACT BLOCK NC NO	6	CUTLER HAMMER/ECS
B-3-2	ELEC	E30KLA4	CONTACT BLOCK NO NO	4	CUTLER HAMMER/ECS
B-3-2	ELEC	E30KLA5	CONTACT BLOCK NC NC	4	CUTLER HAMMER/ECS
B-3-2	ELEC	10250T2	CONTACT BLOCK 2 NO	3	CUTLER HAMMER/ECS
B-3-2	ELEC	10250T3	CONTACT BLOCK 2 NC	3	CUTLER HAMMER/ECS
B-3-2	ELEC	E30KR1	COLLAR BLACK	2	CUTLER HAMMER/ECS
B-3-7	ELEC	BZ2RW82224A2	ROLLER ACTUATED NO NC SWITCH	4	MICRO SWITCH/ECS
B-3-7	ELEC	802T-W17	ROLLER LEVER ADJ NYLON 4 INCH RADIUS	2	ALLEN BRADLEY/ENGLEWOOD
B-3-7	ELEC	800T-XD2	CONTACT BLOCK SHALLOW BLOCK 1NC	2	ALLEN BRADLEY/ENGLEWOOD
B-3-7	FUSE		FUSE HOLDER 30A 250V	2	BUSS/GRAINGER
B-3-7	ELEC	150-CA10	AUXILLARY CONTACT BLOCKS SERIES A	4	ALLEN BRADLEY/ENGLEWOOD
B-3-3	ELEC	97F9631	MOTOR RUN CAPACITOR 20mF 440VAC 6X668E OVAL	1	GE/GRAHL
B-3-8	ELEC	4520-0010	REPLACEMENT FAN DELAY SWITCH	2	MARLEY/
B-4-10	ELEC		BELLOW DIAPHRAGM ASSEMBLY FOR MV-600G VACUUM PRESSURE PUMP	8	MINI PUMP/CARLTON BATES
B-3-4	ELEC	193-EPB	PANEL OR DIN RAIL ADAPTER	1	ALLEN BRADLEY/ENGLEWOOD
B-3-4	ELEC	LSF7L	HEAVY DUTY LIMIT SWITCH ROLLER HEAD SIDE ACTUATED (HEAD LSZ1F)	4	MICRO SWITCH/CARLTON BATES
B-3-9	ELEC	97F9633	MOTOR RUN CAPACITOR 25mF 440VAC 6X669E OVAL	1	GE/GRAHL
B-3-9	ELEC	C306KAL1-3B	LUG ADAPTER ASSEMBLY	1	CUTLER HAMMER/ECS
B-3-5	ELEC	C320KA2	AUX CONTACTS NC	4	CUTLER HAMMER/ECS
B-3-5	ELEC	10250T231	PRETEST LIGHT RES - 1 HOLE MOUNTING 120V 50/60HZ	6	CUTLER HAMMER/ECS
B-3-5	ELEC	E30KLA2	CONTACT BLOCK 1NC	16	CUTLER HAMMER/ECS
B-3-5	ELEC	E30KLA1	CONTACT BLOCK 1NO	8	CUTLER HAMMER/ECS
B-3-5	ELEC	10250T20KB	SELECTOR SWITCH 2 POS MAINT W/CONTACT BLOCK 1NO 1NC	4	CUTLER HAMMER/ECS
B-2-6	ELEC	25L6502RC	CAPACITOR 30mF 330VAC OVAL	1	GE/GRAHL
B-2-6	ELEC	61B4D110400NCGR	START CAPACITOR 400-480mF 110/125VAC ROUND	2	DAYTON/GRAINGER
B-2-6	ELEC	61B6D220161NCGR	START CAPACITOR 161-193mF 220/250VAC ROUND	6	DAYTON/GRAINGER
B-2-6	ELEC	2MEU1	START CAPACITOR 270-324mF 220/250VAC ROUND	2	DAYTON/GRAINGER
B-2-6	ELEC	2MEC9	MOTOR RUN CAPACITOR 30mF 370VAC ROUND	2	DAYTON/GRAINGER
B-2-6	RELAY	LJRS2	ALTERNATING RELAY 110VAC OUTPUT DPDT 220VAC 10AMP	2	SYRELEC/WHOLESALE ELECTRIC
B-2-6	RELAY	ARB-120-ABA	ALTERNATING RELAY 120VAC OUTPUT DPDT 240VAC 10AMP	1	DIVERSIFIED ELECTRONICS/ECS
B-2-6	RELAY	SLA-230-ALA	PHASE MONITOR 208-240VAC 3 PHASE SUPPLY CONTACTS 240VAC@10A	6	DIVERSIFIED ELECTRONICS/ECS
B-2-2	RELAY	CMC-120-ASE-10	AC OVER CURRENT MONITOR/RELAY 120VAC 10AMPS	2	DIVERSIFIED ELECTRONICS/ECS
B-2-2	RELAY	SLA-440-ALE	PHASE SEQUENCE AND LOSS MONITOR SUPPLY 3 PHASE 430-480 VAC	3	DIVERSIFIED ELECTRONICS/ECS
B-2-2	RELAY	TBC-120-AEA	TIME DELAY RELAY 120VAC/DC INPUT 1-1023 MIN CONTACTS 120VAC@10A	2	DIVERSIFIED ELECTRONICS/ECS
B-2-2	RELAY	TDH-120-ALA-010/060	TIME DELAY RELAY 120VAC/DC INPUT T1: 1-10 T:2 6-60 CONT 120VAC@10A	1	DIVERSIFIED ELECTRONICS/ECS
B-2-2	RELAY	TUD-120-ALA-010	TIME DELAY RELAY DELAY ON RELEASE 120VAC/DC 0.1-10 SECONDS CONT 1220VAC@10A	1	DIVERSIFIED ELECTRONICS/ECS
B-2-2	RELAY	SLA-230-ASA	PHASE SEQUENCE AND LOSS MONITOR SUPPLY 3 PHASE 190-270 VAC	3	DIVERSIFIED ELECTRONICS/ECS
B-2-2	RELAY	SLA-440-ASA	PHASE SEQUENCE AND LOSS MONITOR SUPPLY 3 PHASE 430-480 VAC	2	DIVERSIFIED ELECTRONICS/ECS
B-2-7	RELAY	001-480-1212	PHASE MONITOR 480V OUTPUT 10A@240VAC	1	MPE/ECS
B-2-7	RELAY	ARA-24-ABA	ALTERNATING RELAY CONTACTS 10A@240VAC RESISTIVE PILOT DUTY B300	1	DIVERSIFIED ELECTRONICS/ECS
B-2-7	RELAY	ARA-120-ACA	ALTERNATING RELAY SAME POLARITY ONLY 10A@240VAC PILOT DUTY B300	1	DIVERSIFIED ELECTRONICS/ECS
B-2-7	RELAY	ARA-120-ADA	ALTERNATING RELAY CONTACTS 10A@240VAC RESISTIVE PILOT DUTY B300	4	DIVERSIFIED ELECTRONICS/ECS
B-2-7	RELAY	TUC-120-AKA	TIME DELAY RELAY DELAY ON OPERATE SUPPLY 120VAC/DC 10A@250VAC	1	DIVERSIFIED ELECTRONICS/ECS
B-2-7	RELAY	SLA-230-ALE	PHASE SEQUENCE AND LOSS MONITOR 3 PHASE SUPPLY 208-240VAC	2	DIVERSIFIED ELECTRONICS/ECS
B-2-7	RELAY	FBA-120-ALA-060	FREQUENCY BAND MONITOR 120VAC 10A@120VAC	1	DIVERSIFIED ELECTRONICS/ECS
B-2-7	RELAY	5X852M	DIN MOUNT RELAY BASE 300V 15A 600V 10A	1	DAYTON/GRAINGER

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
B-2-3	RELAY	3ARR3FJ4EM2	POTENTIAL RELAY 6X557	5	GE/GRAINGER
B-2-3	ELEC	CA7-23-10	CONTACTOR 1 NO AUXILLARY 24V 50/60HZ COIL	2	SPRECHER SCHUH/WHOLESALE ELECTRIC
B-2-8	RELAY	CEP7-ED1EB	OVERLOAD RELAY CLASS 10 SERIES B	1	SPRECHER SCHUH/WHOLESALE ELECTRIC
B-2-8	ELEC	2GU20	MOTOR RUN CAPACITOR 45mF 440VAC OVAL	2	DAYTON/GRAINGER
B-2-8	RELAY	3ARR3FJ4EN3	POTENTIAL RELAY 6X559	1	GE/GRAINGER
B-2-8	ELEC	DIL0M	110/120VAC 50/60 HZ CONTACTOR (COIL 110/120VAC)	1	MOELLER/ECS
B-2-8	ELEC	DILA-31	24V 50/60HZ CONTACTOR (COIL 24VAC)	1	MOELLER/ECS
B-2-8	ELEC	5XDILA-XH122	AUXILLARY CONTACT BLOCKS	4	MOELLER/ECS
B-2-8	RELAY	A311XBXPR	LATCHING RELAY (COIL 120VAC 50/60HZ)	2	STRUTHERS-DUNN/WHOLESALE ELECTRIC
B-2-8	ELEC	3RH1921-1HA22	AUXILLARY CONTACT BLOCK 2NO 2NC	1	SIEMENS/WHOLESALE ELECTRIC
B-2-4	ELEC	4WT47	AC AXIAL FAN 115VAC 2900RPM 0.18AMP	1	DAYTON/GRAINGER
B-2-4	RELAY	C263	3 PHASE MONITOR 10A@240VAC	1	TIME MARK/CARLTON BATES
B-2-4	RELAY	3RP1511-1AQ30	ZEITRELAIS TIME RELAY 100-127VAC 50/60HZ 24 VAC/DC	2	SIEMENS/WHOLESALE ELECTRIC
B-2-9	RELAY	48GC38AA3	THERMAL OVERLOAD RELAY	1	SIEMENS/WHOLESALE ELECTRIC
B-2-9	RELAY	193-ED1DB	OVERLOAD RELAY CLASS 10 SERIES C	1	ALLEN BRADLEY/ENGLEWOOD
B-2-10	RELAY	48BSK3M20	SOLID STATE OVERLOAD RELAY WITH PHASE LOSS PROT CLASS 20 SERIES C	1	SIEMENS/WHOLESALE ELECTRIC
B-2-10	RELAY	JCK57V20	ELECTRICAL TIMING RELAY 0.3-30MINUTES 110/120VAC 50/60HZ	1	SQUARE D/ECS
B-1-1	ELEC	ISO-120-AAE-US	ISOLATED SWITCH TWO-CHANNEL 120VAC	1	DIVERSIFIED ELECTRONICS/ECS
B-1-1	FUSE	Y213944	690V 32A DIN MOUNT FUSE HOLDER	3	FERRAZ SHAWMUT/
B-1-1	ELEC	PS5R-C24	POWER SUPPLY 100-240VAC INPUT 24VDC OUTPUT @ 1.3A 30W	2	TUV/ECS
B-1-1	ELEC	PS5R-E24	POWER SUPPLY 100-120VAC 200-240VAC INPUT 24VDC OUTPUT @ 4.2A 100W	1	TUV/ECS
B-1-1	RELAY	8533640000	24VDC INPUT 250V OUTPUT DIN MOUNT MICROSERIES RELAY	10	WEIDMULLER/ECS
B-1-6	ELEC	TDU-120-AKA	UNI-TIMER SUPPLY 120VAC 110VDC CONTACTS 10A@120VAC	3	DIVERSIFIED ELECTRONICS/ECS
B-1-6	RELAY	SUA-440-ASA	PHASE SEQUENCE AND LOSS MONITOR 430-480VAC 3PHASE 50/60HZ	1	DIVERSIFIED ELECTRONICS/ECS
B-1-6	RELAY	RTE-PN1	ELECTRONIC TIMER 120VAC 50/60HX 10A@120VAC	2	IDEC S&C CORP/ECS
B-1-6	RELAY	SJ1S-07L	250VAC 12A RELAY HOLDER WITH RJ1S-CL-A120 RELAY	8	IDEC S&C CORP/ECS
B-1-6	RELAY	5Z456	12VDC RELAY	3	DAYTON/GRAINGER
B-1-6	RELAY	5X841N	120VAC RELAY	2	DAYTON/GRAINGER
B-1-6	RELAY	25835	120/240VAC 30VDC MINI RELAY	1	TUV/ECS
B-1-2	RELAY	SR3P-05	DIN MOUNT RELAY BASE 300V	17	IDEC S&C CORP/ECS
B-1-2	RELAY	4L408	CONTROL RELAY 120VAC MODE DIRECT SENSITIVITY 26K 00HIGH 02 LOW	3	SMITH AND LOVELESS/CARLTON BATES
B-1-3	ELEC	NEMA SIZE 2	NEMA SIZE 2 CLASS 853S TYPE SD0 1 FORM S SERIES A 600VAC MAX CONTACTOR	1	SQUARE D/ECS
B-1-3	ELEC	8536SBO2S	NEMA SIZE 0 SER. A 600VAC MAX CONTACTOR (COIL 110/120VAC 50/60HZ)	1	SQUARE D/ECS
B-1-3	ELEC	8536SCO3S	NEMA SIZE 1 SER. A 600VAC MAX CONTACTOR (COIL 110/120VAC 50/60HZ)	1	SQUARE D/ECS
B-1-3	ELEC	9999SX6	AUXILLARY CONTACT BLOCKS SERIES B 1NO NEMA A600	6	SQUARE D/ECS
B-1-3	ELEC	9999SX7	AUXILLARY CONTACT BLOCKS SERIES B 1NC NEMA A600	6	SQUARE D/ECS
B-1-3	BREAKER	IEC 60 947-2	15AMP CIRCUIT BREAKER 120VAC 50/60HZ	1	SQUARE D/ECS
B-1-4	BREAKER	EHD2015L	15AMP CIRCUIT BREAKER 480VAC 250VDC 50/60HZ STYLE 6638C93G34	1	CUTLER HAMMER/ECS
B-1-4	ELEC	75BD42	CLASS 42 30AMP 1POLE CONTACTOR CONTACT KIT	6	FURNAS/ECS
B-1-4	ELEC	75JB14	CONTACT KIT SIZE 4 STARTER SERIES A	3	FURNAS/ECS
B-1-4	ELEC	40430-300-51	CONTACT KIT SIZE 3 STARTER	2	ALLEN BRADLEY/ENGLEWOOD
B-1-5	FUSE	BC6032P	DOUBLE FUSE HOLDER 30AMP 600VAC CLASS CC	1	BUSS/WHOLESALE ELECTRIC
B-1-5	ELEC	4715FS-12T-B50	FAN 115VAC 1 PHASE 50/60HZ 0.21/0.19AMPS	1	NMB/GRAINGER
B-1-10	RELAY	8501XL	LATCHING RELAY (COIL 120VAC 50/60HZ)	1	SQUARE D/ECS
B-1-10	ELEC	9070EL2D9	TRANSFORMER 440/480V PRI 110/120V SEC	1	SQUARE D/ECS
B-1-10	FUSE	9070T75D23S12	TRANSFORMER 120/240V PRI 24V SEC W/FUSE TERM	1	SQUARE D/ECS
B-1-10	RELAY	PRD-5AYO-120	250V MAX RELAY	1	POTTER & BRUMFIELD/WHOLESALE ELECTRIC
B-1-10	RELAY	8D12	12 PIN RELAY BASE	1	CUSTOM CONNECTOR CORP/WHOLESALE ELECTRIC
B-2-7	RELAY	5X852N	8 PIN DIN MOUNT RELAY BASE 300V 15A 300V@15A	6	DAYTON/GRAINGER
BS-3	ELEC	836 C6	BULLETIN 836 PRSR CNTRL RANGE 30IN.HG VACM-300PSI W/ENCLSR, VALVE	3	ALLEN BRADLEY/ENGLEWOOD
MS-4	ELEC	7ML1034-1AA11	HYDRORANGER 200 100/230V 50/60HZ 36VA (ONE BOARD W/O CASE)	4	MILLTRONICS/BECK SALES
BS-3	ELEC	BE550G	BATTERY BACKUP 330W 8 OUTLETS	2	APC/GRAINGER

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
BS-2	BREAKER		CIRCUIT BREAKER SER 3 10A 120/240VAC	2	SQUARE D/ECS
BS-2	BREAKER		CIRCUIT BREAKER SER 3 20A 120/240VAC	1	SQUARE D/ECS
BS-2	ELEC	PS-100-240AC/240C/C21PS	MINI POWER SUPPLY 100/240VAC 50/60HZ RANGE 85-264V 1.8-0.7A	1	PHOENIX CONTACT/ECS
BS-2	RELAY	700-HA33A1-3	MINI RELAY SER D 120VAC 10A@250VAC 11 PIN	11	ALLEN BRADLEY/ENGLEWOOD
BS-2	RELAY	700-HA32Z24	MINI RELAY SER D 120VAC 10A@250VAC 8 PIN	1	ALLEN BRADLEY/ENGLEWOOD
BS-2	ELEC	FAS-120AC	SURGE PROTECTION TYPE 2SPD 120V SPLIT PHASE 50/60HZ	1	ALLEN BRADLEY/ENGLEWOOD
BS-2	BREAKER	1489-A1C050	277V 5A SER A MINI CIRCUIT BREAKER	5	ALLEN BRADLEY/ENGLEWOOD
F-2	ELEC	H750-0030	CONTROL TRANSFORMER 750VA 60HZ PRIM 4200HV SEC 120LV	1	MICRON/GRAINGER
LW PALLETT 1	ELEC	CN-UB280DC-BD	SURGE SUPPRESSOR 280VDC 20KA	1	PHOENIX CONTACT/ECS
LW PALLETT 1	ELEC	MINI-PS-100-240AC/24DC/C2LPS	POWER SUPPLY 240VAC 24VDC	1	PHOENIX CONTACT/ECS
LW PALLETT 1	FUSE	539-983	FUSE 250MA GLASS SLOW BLOW (ROTORK)	10	FARNELL/WHOLESALE ELECTRIC
LW PALLETT 1	ELEC	SPD250480Y1K	SURGE PROTECTIVE DEVICE 277/480V 60HZ SCCR 200KA	1	EATON/HEYWARD
LW PALLETT 1	ELEC	TFP101	FAN 115VAC 1 PHASE 50/60HZ 0.7A WITH FILTER	1	HOFFMAN/HEYWARD
LW PALLETT 1	ELEC	1747-M13	MEMORY MODULE SERIES A SLC500EEPROM	1	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	ELEC	1746-0A16	OUTPUT MODULE SERIES D OUTPUT 85-265VAC	1	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	ELEC	1746-IA16	INPUT MODULE SERIES D INPUT 85-132VAC	1	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	ELEC	1746-NO41	ANALOG OUTPUT MODULE SERIES A	1	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	ELEC	1746-N14	ANALOG INPUT MODULE SERIES B	1	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	ELEC	1746-N18	ANALOG INPUT MODULE SERIES A	1	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	ELEC	1747-L553	PROCESSING UNIT SERIES C	1	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	FUSE	AJT500	FUSE KNIFE BLADE 500A 600VAC	3	FERRAZ SHAWMUT/HEYWARD
LW PALLETT 1	FUSE	AJT350	FUSE KNIFE BLADE 350A 600VAC	3	MERSEN/HEYWARD
BS-2	RELAY	700-HA32Z24	MINI RELAY SER D 120VAC 10A@24VDC 8 PIN	4	ALLEN BRADLEY/HEYWARD
LW PALLETT 1	FUSE	ADTR1	FUSE 1AMP TIME DELAY CLASS CC METAL CAPS	3	AMP-TRAP/HEYWARD
LW PALLETT 1	FUSE	ADTR3	FUSE 3AMP TIME DELAY CLASS CC METAL CAPS	3	AMP-TRAP/HEYWARD
LW PALLETT 1	FUSE	GGC1	FUSE 1AMP 250V FAST ACTING	10	FERRAZ SHAWMUT/HEYWARD
LW PALLETT 1	ELEC	ENM10	FLOAT SWITCH L115	1	FLYGT/HEYWARD
LW PALLETT 1	ELEC	ENM10	FLOAT SWITCH	1	FLYGT/HEYWARD
LW PALLETT 2	ELEC	ST5491E-021-110-00	SEISMIC INDICATING TRANSMITTERS	1	METRIX/HEYWARD
LW PALLETT 2	MISC	601 89 51	BASIC REPAIR KIT FOR 3068.170	1	FLYGT/HEYWARD
LW PALLETT 2	ELEC	MA41MA24	SURGE PROTECTIVE DEVICE 277/480V 60HZ 240KA SERIES 002	1	SQUARE D/HEYWARD
LW PALLETT 2	ELEC	MDS9710	HIGH PERFORMANCE DATA TRANSCEIVER 13.8VDC 2.5A MAX	1	MDS/HEYWARD
EJ-01	ELEC	W70	HEATER COIL	4	ALLEN BRADLEY/ENGLEWOOD
EJ-02	ELEC	FH31	HEATER COIL	1	WESTINGHOUSE/ECS
EJ-03	ELEC	FH40	HEATER COIL	6	WESTINGHOUSE/ECS
EJ-04	ELEC	W69	HEATER COIL	2	ALLEN BRADLEY/ENGLEWOOD
EJ-06	ELEC	W74	HEATER COIL	3	ALLEN BRADLEY/ENGLEWOOD
EJ-07	ELEC	H1112	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-08	ELEC	H1116	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-10	ELEC	H1018	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-11	ELEC	H1022	HEATER COIL	0	CUTLER HAMMER/ECS
EJ-12	ELEC	H1023	HEATER COIL	4	CUTLER HAMMER/ECS
EJ-13	ELEC	B12.8	HEATER COIL	6	SQUARE D/ECS
EJ-14	ELEC	H1026/F12	HEATER COIL	0/3	CUTLER HAMMER/ECS
EJ-15	ELEC	H1027	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-16	ELEC	H1028	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-17	ELEC	H1029	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-18	ELEC	H1030	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-19	ELEC	H1031	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-20	ELEC	H1032	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-21	ELEC	H1033	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-22	ELEC	H1034	HEATER COIL	10	CUTLER HAMMER/ECS

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
EJ-23	ELEC	H1035	HEATER COIL	20	CUTLER HAMMER/ECS
EJ-24	ELEC	H1036	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-25	ELEC	H1037	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-26	ELEC	H1038	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-27	ELEC	H1039	HEATER COIL	6	CUTLER HAMMER/ECS
EJ-28	ELEC	H1040	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-29	ELEC	H1041	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-30	ELEC	H1042	HEATER COIL	6	CUTLER HAMMER/ECS
EJ-31	ELEC	H1044	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-32	ELEC	H1045	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-33	ELEC	H1046	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-34	ELEC	H1047	HEATER COIL	20	CUTLER HAMMER/ECS
EJ-35	ELEC	H1048	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-36	ELEC	H1049	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-37	ELEC	H1050	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-38	ELEC	H1051	HEATER COIL	15	CUTLER HAMMER/ECS
EJ-39	ELEC	H1057	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-40	ELEC	H1058	HEATER COIL	6	CUTLER HAMMER/ECS
EJ-41	ELEC	H1217	HEATER COIL	5	CUTLER HAMMER/ECS
EJ-42	ELEC	H1218/C356A	HEATER COIL	0/9	GE/ECS
EJ-43	ELEC	H1222	HEATER COIL	10	CUTLER HAMMER/ECS
EJ-44	ELEC	H1232	HEATER COIL	11	CUTLER HAMMER/ECS
EJ-45	ELEC	H1235	HEATER COIL	6	CUTLER HAMMER/ECS
EJ-46	ELEC	H9	HEATER COIL	3	FURNAS/ECS
EJ-47	ELEC	H17/H18	HEATER COIL	18/3	CUTLER HAMMER/ECS
EJ-48	ELEC	FH29	HEATER COIL	0	
EJ-49	ELEC	FH46	HEATER COIL	10	WESTINGHOUSE/ECS
EJ-50	ELEC	FH53	HEATER COIL	17	WESTINGHOUSE/ECS
EJ-51	ELEC	FH87	HEATER COIL	15	WESTINGHOUSE/ECS
EJ-52	ELEC	FH94	HEATER COIL	20	WESTINGHOUSE/ECS
EJ-53	RELAY	B10.2	OVERLOAD RELAY THERMAL UNIT	4	SQUARE D/ECS
EJ-54	ELEC	H2006B/C184A/C214B	HEATER COIL	3/3/3	GE/ECS
EJ-55	ELEC	FH30	HEATER COIL	13	WESTINGHOUSE/ECS
EJ-56	ELEC	FH21	HEATER COIL	4	WESTINGHOUSE/ECS
EJ-57	ELEC	FH23	HEATER COIL	3	WESTINGHOUSE/ECS
EJ-58	ELEC	FH50	HEATER COIL	22	WESTINGHOUSE/ECS
EJ-59	ELEC	FH57	HEATER COIL	12	WESTINGHOUSE/ECS
EJ-60	ELEC	FH88	HEATER COIL	16	WESTINGHOUSE/ECS
EJ-61	RELAY	B2.65	OVERLOAD RELAY THERMAL UNIT	3	SQUARE D/ECS
EJ-62	RELAY	B6.90	OVERLOAD RELAY THERMAL UNIT	3	SQUARE D/ECS
EJ-63	RELAY	B14	OVERLOAD RELAY THERMAL UNIT	3	SQUARE D/ECS
EJ-64	ELEC	FH37	HEATER COIL	5	WESTINGHOUSE/ECS
EJ-65	ELEC	FH25	HEATER COIL	1	WESTINGHOUSE/ECS
EJ-66	ELEC	FH35	HEATER COIL	21	WESTINGHOUSE/ECS
EJ-67	ELEC	FH51	HEATER COIL	25	WESTINGHOUSE/ECS
EJ-68	ELEC	FH68	HEATER COIL	22	WESTINGHOUSE/ECS
EJ-69	ELEC	FH93	HEATER COIL	9	WESTINGHOUSE/ECS
EJ-70	RELAY	B3.00	OVERLOAD RELAY THERMAL UNIT	5	SQUARE D/ECS
EJ-71	RELAY	B4.86	OVERLOAD RELAY THERMAL UNIT	5	SQUARE D/ECS
EJ-72	RELAY	B22/B9.10	OVERLOAD RELAY THERMAL UNIT	3/1	SQUARE D/ECS
EE-213	ELEC	058-52-35037	45mF 330VAC MOTOR RUN CAPACITOR OVAL	1	MAGNETEK/GRAINGER
EE-214	ELEC	058-52-14790	40mF 240VAC MOTOR RUN CAPACITOR ROUND	1	MAGNETEK/GRAINGER

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
EE-255	FUSE	M943	FUSE CLIPS FOR CLASS RK5 FUSES	4	ILSC
EK-73	FUSE	MEN 6/10	TIME DELAY FUSE 6/10A	7	RELIANCE/ECS
EK-74	FUSE	FNM-6/10	DUAL ELEMENT FUSE 6/10A	22	FUSETRON/ECS
EK-75	FUSE	FNQ-R-1/2	TIME DELAY FUSE 1/2A	16	BUSS/ECS
EK-75	FUSE	ATQ2-1/2	TIME DELAY FUSE 2-1/2A	10	AMPTRAP/ECS
EK-76	FUSE	FNQ-R-15	TIME DELAY FUSE 15A	8	BUSS/ECS
EK-76	FUSE	FNQ-R-1	TIME DELAY FUSE 1A	15	BUSS/ECS
EK-76	FUSE	FNM-1	DUAL ELEMENT FUSE 1A	10	BUSS/ECS
EK-77	FUSE	BAF	STANDARD FUSE 1A	30	BUSS/ECS
EK-79	FUSE	LP-CC-8/10	TIME DELAY FUSE 8/10A	6	BUSS/ECS
EK-79	FUSE	GDC-1A	GLASS FUSE 1A	3	BUSS/ECS
EK-79	FUSE	MDL-10	GLASS FUSE 10A	2	BUSS/ECS
EK-79	FUSE	GMA 1A	GLASS FUSE 1A	2	BUSS/ECS
EK-80	FUSE	MEN 1	TIME DELAY FUSE 1A	8	RELIANCE/ECS
EK-81	FUSE	KTK-R-1	STANDARD FUSE 1A	5	BUSS/ECS
EK-82	FUSE	ATQR12	TIME DELAY FUSE 12A	3	FERRAZ SHAWMUT/ECS
EK-82	FUSE	ATMR1-1/2	STANDARD FUSE 1-1/2A	16	FERRAZ SHAWMUT/ECS
EK-83	FUSE	TRM3-2/10	TIME DELAY FUSE 2/10A	18	FERRAZ SHAWMUT/ECS
EK-83	FUSE	ATQR1-1/2	TIME DELAY FUSE 1-1/2A	2	FERRAZ SHAWMUT/ECS
EK-83	FUSE	LPN-RK-1-1/4SP	DUAL ELEMENT TIME DELAY FUSE 1-1/4A	18	BUSS/ECS
EK-83	FUSE	FRN-R-1-1/2	DUAL ELEMENT TIME DELAY FUSE 1-1/2A	8	BUSS/ECS
EK-83	FUSE	AGX-2	GLASS FUSE 2A	40	BUSS/ECS
EK-83	FUSE	FNQ-1-1/4	TIME DELAY FUSE 1-1/4A	5	BUSS/ECS
EK-83	FUSE	FNQ-1-1/2	TIME DELAY FUSE 1-1/2A	8	BUSS/ECS
EK-84	FUSE	FNQ-2-1/2	TIME DELAY FUSE 2-1/2A	9	BUSS/ECS
EK-85	FUSE	ATMR2	STANDARD FUSE 2A	6	FERRAZ SHAWMUT/ECS
EK-85	FUSE	GDC-2A	GLASS FUSE 2A	33	BUSS/ECS
EK-86	FUSE	MEN 2-8/10	TIME DELAY FUSE 2-8/10A	27	RELIANCE/ECS
EK-87	FUSE	FNM-3	DUAL ELEMENT FUSE 3A	5	BUSS/ECS
EK-88	FUSE	ATMR10	STANDARD FUSE 10A	4	FERRAZ SHAWMUT/ECS
EK-89	FUSE	FNM-2-1/2	DUAL ELEMENT FUSE 2-1/2A	3	BUSS/ECS
EK-91	FUSE	FNQ-7	TIME DELAY FUSE 7A	13	BUSS/ECS
EK-92	FUSE	BAF-3	STANDARD FUSE 3A	9	BUSS/ECS
EK-93	FUSE	AGC-1/16	GLASS FUSE 1/16A	5	BUSS/ECS
EK-93	FUSE	SFE 7-1/2	GLASS FUSE 7-1/2A	3	LITTLE FUSE/ECS
EK-93	FUSE	DC11	GLASS FUSE 250MA	4	FARNELL/HEYWARD
EK-94	FUSE	MDL-1/4	GLASS FUSE 1/4A	3	BUSS/ECS
EK-94	FUSE	AGX-1/4	GLASS FUSE 1/4A	5	BUSS/ECS
EK-94	FUSE	AGC-1/4	GLASS FUSE 1/4A	54	BUSS/ECS
EK-123	FUSE	FRN-R-1/2	DUAL ELEMENT TIME DELAY 1/2A	43	BUSS/ECS
EK-95	FUSE	GMC-5	GLASS FUSE 5A	8	BUSS/ECS
EK-95	FUSE	GDC-5A	GLASS FUSE 5A	5	BUSS/ECS
EK-95	FUSE	MDL-3/8	GLASS FUSE 3/8A	5	BUSS/ECS
EK-95	FUSE	ATM-3	BLADE FUSE 3A	10	BUSS/ECS
EK-95	FUSE	ABC-5	CERAMIC FUSE 5A	40	BUSS/ECS
EK-96	FUSE	AGX-1/8	GLASS FUSE 1/8A	7	BUSS/ECS
EK-97	FUSE	AGU-5	GLASS FUSE 5A	45	BUSS/ECS
EK-98	FUSE	BAF-5	STANDARD FUSE 5A	3	BUSS/ECS
EK-98	FUSE	KTK-R-5	STANDARD FUSE 5A	2	BUSS/ECS
EK-99	FUSE	FNQ-R-5	TIME DELAYFUSE 5A	4	BUSS/ECS
EK-100	FUSE	FNM-6-1/4	DUAL ELEMENT FUSE 6-1/4A	10	BUSS/ECS
EK-100	FUSE	KTK-R-12	STANDARD FUSE 12A	6	BUSS/ECS

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
EK-100	FUSE	LP-CC-7	TIME DELAY 7A	8	BUSS/ECS
EK-102	FUSE	FNQ-R-10	TIME DELAY FUSE 10A	10	BUSS/ECS
EK-102	FUSE	ATMR12	STANDARD FUSE 12A	3	GOULD SHAWMUT/ECS
EK-102	FUSE	FLM2	TIME DELAY FUSE 2A	19	LITTLE FUSE/ECS
EK-102	FUSE	MDA-10	CERAMIC FUSE 10A	4	BUSS/ECS
EK-104	FUSE	FNM-12	DUAL ELEMENT FUSE 12A	20	BUSS/ECS
EK-105	FUSE	MEN 12	DUAL ELEMENT TIME DELAY FUSE 12A	15	RELIANCE/ECS
EK-105	FUSE	AGC-1/2	GLASS FUSE 1/2A	2	BUSS/ECS
EK-117	FUSE	KTK15	STANDARD FUSE 15A	38	BUSS/ECS
EK-117	FUSE	KTK-R-15	STANDARD FUSE 15A	6	BUSS/ECS
EK-108	FUSE	BAF-15	STANDARD FUSE 15A	34	BUSS/ECS
EK-109	FUSE	BLF-15	STANDARD FUSE 15A	20	BUSS/ECS
EK-110	FUSE	FNM-15	DUAL ELEMENT FUSE 15A	17	BUSS/ECS
EK-110	FUSE	FNQ-15	TIME DELAY FUSE 15A	8	BUSS/ECS
EK-111	FUSE	MDL-1/2	GLASS FUSE 1/2A	31	BUSS/CARLTON BATES
EK-112	FUSE	AJT10	DUAL ELEMENT TIME DELAY 10A	8	FERRAZ SHAWMUT/ECS
EK-113	FUSE	FNM-30	DUAL ELEMENT FUSE 30A	25	BUSS/ECS
EK-114	FUSE	MEN 30	DUAL ELEMENT TIME DELAY FUSE 30A	39	RELIANCE/ECS
EK-115	FUSE	GLR-2	GLASS FUSE WITH PLASTIC HOLDER KNOB 2A	48	BUSS/ECS
EK-116	FUSE	JLLS 100	BLADE FUSE 100A	9	BUSS/ECS
EK-118	FUSE	GMQ-3-2/10	GLASS FUSE WITH PLASTIC HOLDER KNOB 3-2/10A	27	BUSS/ECS
EK-119	FUSE	NON-20	ONE TIME FUSE 20A	20	BUSS/ECS
EK-122	FUSE	MDA-25	CERAMIC FUSE 25A	1	BUSS/ECS
EK-122	FUSE	LP-CC-3	TIME DELAY FUSE 3A	10	BUSS/ECS
EK-124	FUSE	ECNR 1/2	TIME DELAY FUSE 1/2A	28	RELIANCE/ECS
EK-125	FUSE	FRN-R-6/10	DUAL ELEMENT TIME DELAY 16/10A	28	BUSS/ECS
EK-126	FUSE	TR 6/10 R	TIME DELAY FUSE 6/10A	20	GOULD SHAWMUT/ECS
EK-127	FUSE	ECNR 6/10	TIME DELAY FUSE 6/10A	19	RELIANCE/ECS
EK-128	FUSE	FRN-R-8/10	DUAL ELEMENT TIME DELAY 8/10A	8	RELIANCE/ECS
EK-129	FUSE	TR6R	DUAL ELEMENT TIME DELAY FUSE 6A	10	GOULD SHAWMUT/ECS
EK-129	FUSE	ECNR 8/10	TIME DELAY FUSE 8/10A	13	RELIANCE/ECS
EK-130	FUSE	AJT35	DUAL ELEMENT TIME DELAY 35A	2	FERRAZ SHAWMUT/ECS
EK-131	FUSE	LPJ-15SP	DUAL ELEMENT TIME DELAY 15A	4	BUSS/ECS
EK-131	FUSE	LPJ-3SP	DUAL ELEMENT TIME DELAY 3A	4	BUSS/ECS
EK-131	FUSE	LP-CC-10	TIME DELAY FUSE 10A	4	BUSS/ECS
EK-131	FUSE	KTK-2	FAST ACTING FUSE 2A	4	BUSS/ECS
EK-132	FUSE	FRN-R-2	DUAL ELEMENT TIME DELAY 2A	13	BUSS/ECS
EK-133	FUSE	FRN-R-1	DUAL ELEMENT TIME DELAY 1A	6	RELIANCE/ECS
EK-133	FUSE	ECNR2	TIME DELAY FUSE 2A	7	BUSS/ECS
EK-134	FUSE	FRN-R-2-1/4	DUAL ELEMENT TIME DELAY 2-1/4A	10	BUSS/ECS
EK-135	FUSE	ECNR 2-1/4	TIME DELAY FUSE 2-1/4A	14	RELIANCE/ECS
EK-136	FUSE	FRN-R-2-1/2	DUAL ELEMENT TIME DELAY 2-1/2A	6	BUSS/ECS
EK-137	FUSE	FLN-R-2-1/2	DUAL ELEMENT TIME DELAY FUSE 2-1/2A	10	LITTLE FUSE/ECS
EK-138	FUSE	TR 2-8/10 R	DUAL ELEMENT TIME DELAY FUSE 2-8/10A	17	GOULD SHAWMUT/ECS
EK-139	FUSE	FRN-R-3	DUAL ELEMENT TIME DELAY FUSE 3A	43	BUSS/ECS
EK-140	FUSE	NON-3	ONE TIME FUSE 3A	7	BUSS/ECS
EK-141	FUSE	OT3	ONE TIME FUSE 3A	33	SHAWMUT/ECS
EK-142	FUSE	FRN-R-3-2/10	DUAL ELEMENT TIME DELAY FUSE 3-2/10A	2	BUSS/ECS
EK-143	FUSE	S-3-2/10	DUAL ELEMENT TIME DELAY SCREW IN FUSE 3-2/10A	5	BUSS/ECS
EK-145	FUSE	ECNR 5	TIME DELAY FUSE 2-1/4A	29	RELIANCE/ECS
EK-146	FUSE	KON 4	ONE TIME FUSE 4A	29	RELIANCE/ECS
EK-148	FUSE	FRN-R-5	DUAL ELEMENT TIME DELAY FUSE 5A	10	BUSS/ECS

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
EK-149	FUSE	FLN-R-5	DUAL ELEMENT TIME DELAY FUSE 5A	17	LITTLE FUSE/ECS
EK-150	FUSE	TR 5 R	DUAL ELEMENT TIME DELAY FUSE 5A	14	SHAWMUT/ECS
EK-151	FUSE	NON-6	ONE TIME FUSE 6A	2	BUSS/ECS
EK-152	FUSE	TR 6 R	DUAL ELEMENT TIME DELAY FUSE 6A	23	FERRAZ SHAWMUT/ECS
EK-153	FUSE	ECNR 10	TIME DELAY FUSE 10A	10	RELIANCE/ECS
EK-154	FUSE	OT10	ONE TIME FUSE 10A	4	SHAWMUT/ECS
EK-155	FUSE	FRN-R-10	DUAL ELEMENT TIME DELAY FUSE 10A	17	BUSS/ECS
EK-156	FUSE	TR 10 R	DUAL ELEMENT TIME DELAY FUSE 10A	15	SHAWMUT/ECS
EK-157	FUSE	ECNR 15	TIME DELAY FUSE 15A	5	RELIANCE/ECS
EK-160	FUSE	ECNR 20	TIME DELAY FUSE 20A	4	RELIANCE/ECS
EK-161	FUSE	NON-10	ONE TIME FUSE 10A	2	BUSS/ECS
EK-163	FUSE	TR 30 R	DUAL ELEMENT TIME DELAY FUSE 30A	31	GOULD SHAWMUT/ECS
EK-164	FUSE	ECNR 30	TIME DELAY FUSE 30A	20	RELIANCE/ECS
EK-165	FUSE	FRN-R30	DUAL ELEMENT TIME DELAY FUSE 30A	1	BUSS/ECS
EK-165	FUSE	FRN-30	DUAL ELEMENT TIME DELAY FUSE 30A	2	BUSS/ECS
EK-166	FUSE	FRN-10	DUAL ELEMENT TIME DELAY FUSE 10A	3	BUSS/ECS
EK-168	FUSE	NON-40	ONE TIME FUSE 40A	5	BUSS/ECS
EK-169	FUSE	TR 60R	DUAL ELEMENT TIME DELAY FUSE 60A	7	SHAWMUT/ECS
EK-170	FUSE	FRS-R-1-6/10	DUAL ELEMENT TIME DELAY FUSE 1-6/10A	13	BUSS/ECS
EK-172	FUSE	TR 7R	DUAL ELEMENT TIME DELAY FUSE 7A	10	GOULD SHAWMUT/ECS
EK-173	FUSE	FRS-R-2	DUAL ELEMENT TIME DELAY FUSE 2A	5	BUSS/ECS
EK-174	FUSE	ECSR 2-1/4	DUAL ELEMENT TIME DELAY FUSE 2-1/4A	4	RELIANCE/ECS
EK-175	FUSE	FRS-2-1/4	DUAL ELEMENT TIME DELAY FUSE 2-1/4A	3	BUSS/ECS
EK-176	FUSE	FRS-R-3	DUAL ELEMENT TIME DELAY FUSE 3A	16	BUSS/ECS
EK-176	FUSE	JJS-90	FAST ACTING BLADE TYPE BOLT ON FUSE 90A	14	BUSS/ECS
EK-176	FUSE	JLLS 90	FAST ACTING BLADE TYPE BOLT ON FUSE 90A	2	LITTLE FUSE/ECS
EK-177	FUSE	FRS-R-8	DUAL ELEMENT TIME DELAY FUSE 8A	20	BUSS/ECS
EK-177	FUSE	NOS-30	ONE TIME FAST ACTING FUSE 30A	3	BUSS/ECS
EK-178	FUSE	FRS-R-10	DUAL ELEMENT TIME DELAY FUSE 10A	7	BUSS/ECS
EK-178	FUSE	FRS-10	DUAL ELEMENT TIME DELAY FUSE 10A	1	BUSS/ECS
EK-179	FUSE	TRS-10R	DUAL ELEMENT TIME DELAY FUSE 10A	5	GOULD SHAWMUT/ECS
EK-180	FUSE	FRS-15	DUAL ELEMENT TIME DELAY FUSE 15A	5	BUSS/ECS
EK-181	FUSE	TRS-15R	DUAL ELEMENT TIME DELAY FUSE 15A	10	FERRAZ SHAWMUT/ECS
EK-182	FUSE	FRS-R-20	DUAL ELEMENT TIME DELAY FUSE 20A	27	BUSS/ECS
EK-183	FUSE	FLSR 20	DUAL ELEMENT TIME DELAY FUSE 20A	11	LITTLE FUSE/ECS
EK-184	FUSE	TRS-45R	DUAL ELEMENT TIME DELAY FUSE 45A	2	GOULD SHAWMUT/ECS
EK-186	FUSE	ECSR-40	DUAL ELEMENT TIME DELAY FUSE 40A	15	RELIANCE/ECS
EK-186	FUSE	TRS-40R	DUAL ELEMENT TIME DELAY FUSE 40A	19	FERRAZ SHAWMUT/ECS
EK-187	FUSE	ECSR-50	DUAL ELEMENT TIME DELAY FUSE 50A	17	RELIANCE/ECS
EK-187	FUSE	FLSR 40 ID	DUAL ELEMENT TIME DELAY FUSE 40A	1	FERRAZ SHAWMUT/ECS
EK-188	FUSE	NOS-60	ONE TIME FAST ACTING FUSE 60A	5	BUSS/ECS
EK-188	FUSE	EOS-60	ONE TIME FUSE 60A	2	BUSS/ECS
EK-189	FUSE	ECSR-60	DUAL ELEMENT TIME DELAY FUSE 60A	6	RELIANCE/ECS
EK-189	FUSE	FRS-R-60	DUAL ELEMENT TIME DELAY FUSE 60A	30	BUSS/ECS
EK-190	FUSE	TRS-60R	DUAL ELEMENT TIME DELAY FUSE 60A	20	GOULD SHAWMUT/ECS
EK-191	FUSE	A6Y25	TYPE 2S6 FUSE 25A	10	SHAWMUT/ECS
EK-191	FUSE	A6Y4	TYPE 2S6 FUSE 4A	4	SHAWMUT/ECS
EK-191	FUSE	A6Y15	TYPE 2S6 FUSE 15A	2	SHAWMUT/ECS
EK-193	FUSE	A6Y20	TYPE 2S6 FUSE 20A	1	SHAWMUT/ECS
EK-193	FUSE	KGX-A-20	FAST BLOW CAPACITOR FUSE 20A	2	BUSS/ECS
EK-194	FUSE	NLN-40	ONE TIME FUSE 40A	20	LITTLE FUSE/ECS
EK-195	FUSE	FLN-R-7-1/2	DUAL ELEMENT TIME DELAY FUSE 5A	20	LITTLE FUSE/ECS

LOCATION:	TYPE:	PART NO:	DESCRIPTION	QTY:	VENDOR:
EK-196	FUSE	AJT400	DUAL ELEMENT TIME DELAY 400A	3	FERRAZ SHAWMUT/ECS
EK-185	FUSE	FRS-R-45	DUAL ELEMENT TIME DELAY FUSE 45A	12	BUSS/ECS
EK-184	FUSE	TRS-70R	DUAL ELEMENT TIME DELAY FUSE 70A	1	FERRAZ SHAWMUT/ECS
EK-191	FUSE	FRS-R-175	DUAL ELEMENT TIME DELAY FUSE 175A	1	BUSS/ECS
EK-106	FUSE	LPJ-35SP	DUAL ELEMENT TIME DELAY 35A	7	BUSS/ECS
EK-107	FUSE	A6T90	TYPE 2S6 FUSE 90A	7	FERRAZ SHAWMUT/ECS
EK-103	FUSE	AJT 30	DUAL ELEMENT TIME DELAY 30A	4	FERRAZ SHAWMUT/ECS
EK-103	FUSE	LPJ-30SP	DUAL ELEMENT TIME DELAY 30A	10	BUSS/ECS
EK-122	FUSE	A4J45	FAST ACTING FUSE 45A	3	FERRAZ SHAWMUT/ECS
EK-166	FUSE	OT150	ONE TIME FUSE 150A	2	FERRAZ SHAWMUT/ECS
EK-TOP SHELF	FUSE	A70QS200-4	EXTREMELY FAST ACTING SEMICONDUCTOR FUSE 200A	11	FERRAZ SHAWMUT/ECS
EK-TOP SHELF	FUSE	A50QS200-4	HIGH SPEED SEMICONDUCTOR FUSE 200A	8	FERRAZ SHAWMUT/ECS
EK-TOP SHELF	FUSE	TRS-30R	DUAL ELEMENT TIME DELAY FUSE 30A	13	FERRAZ SHAWMUT/ECS
EK-TOP SHELF	FUSE	FRS-R-5	DUAL ELEMENT TIME DELAY FUSE 5A	6	BUSS/ECS

ELECTRICAL ROOM LAYOUT PAGE 1

TOP SHELF - TS-1

TOP SHELF - TS-2

MIDDLE SHELF - MS-1

MIDDLE SHELF - MS-2

BINS ON BENCH - B -1-BIN #

1	2	3	4	5	
6	7	8	9	10	BENCH - B-1

BINS ON BENCH - B -2-BIN #

1	2	3	4	5	
6	7	8	9	10	BENCH - B-2

BOTTOM SHELF - BS-1

BOTTOM SHELF - BS-2

FLOOR - F-1

FLOOR - F-2

DIAGRAM OF SHELVES ALONG THE BACK WALL FACING THEM STANDING IN THE MAIN DOOR WAY.

ELECTRICAL ROOM LAYOUT PAGE 2

TOP SHELF - TS-3

TOP SHELF - TS-4

MIDDLE SHELF - MS-3

MIDDLE SHELF - MS-4

BINS ON BENCH - B -3-BIN #

1	2	3	4	5	
6	7	8	9	10	BENCH - B-3

BINS ON BENCH - B -4-BIN #

1	2	3	4	5	
6	7	8	9	10	BENCH - B-4

BOTTOM SHELF - BS-3

BOTTOM SHELF - BS-4

FLOOR - F-3

FLOOR - F-4

ELECTRICAL ROOM LAYOUT PAGE3

TOP SHELF - TS-5

TOP SHELF - TS-6

MIDDLE SHELF - MS-5

BINS ON MIDDLE SHELF - MS-6-BIN#

1	2		
3	4	5	MIDDLE SHELF - MS-6

BINS ON BENCH - B -5-BIN #

1	2	3	4	5	
6	7	8	9	10	BENCH - B-5

BINS ON BENCH - B -6-BIN #

1	2	3	4	5	
6	7	8	9	10	BENCH - B-6

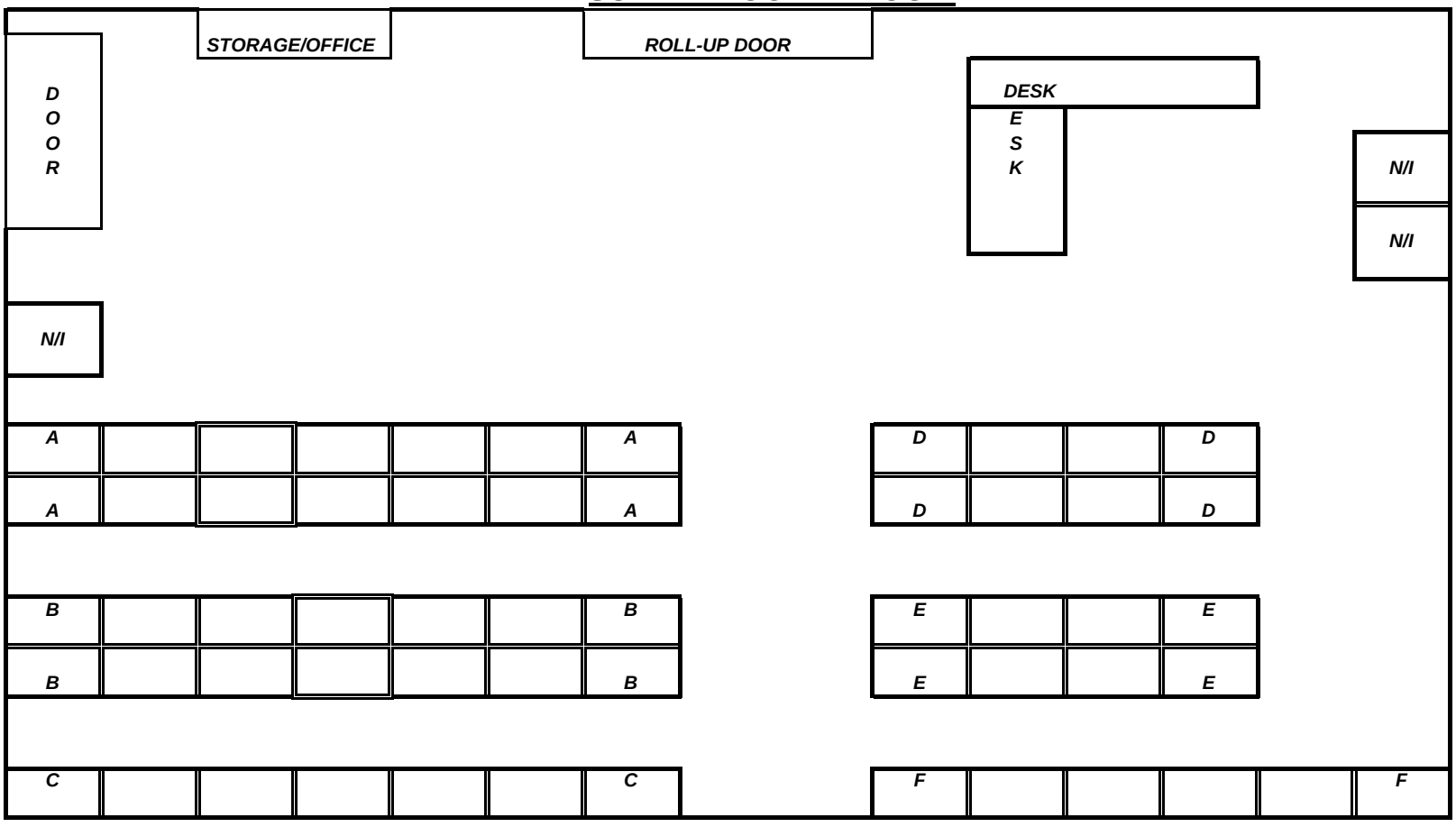
BOTTOM SHELF - BS-5

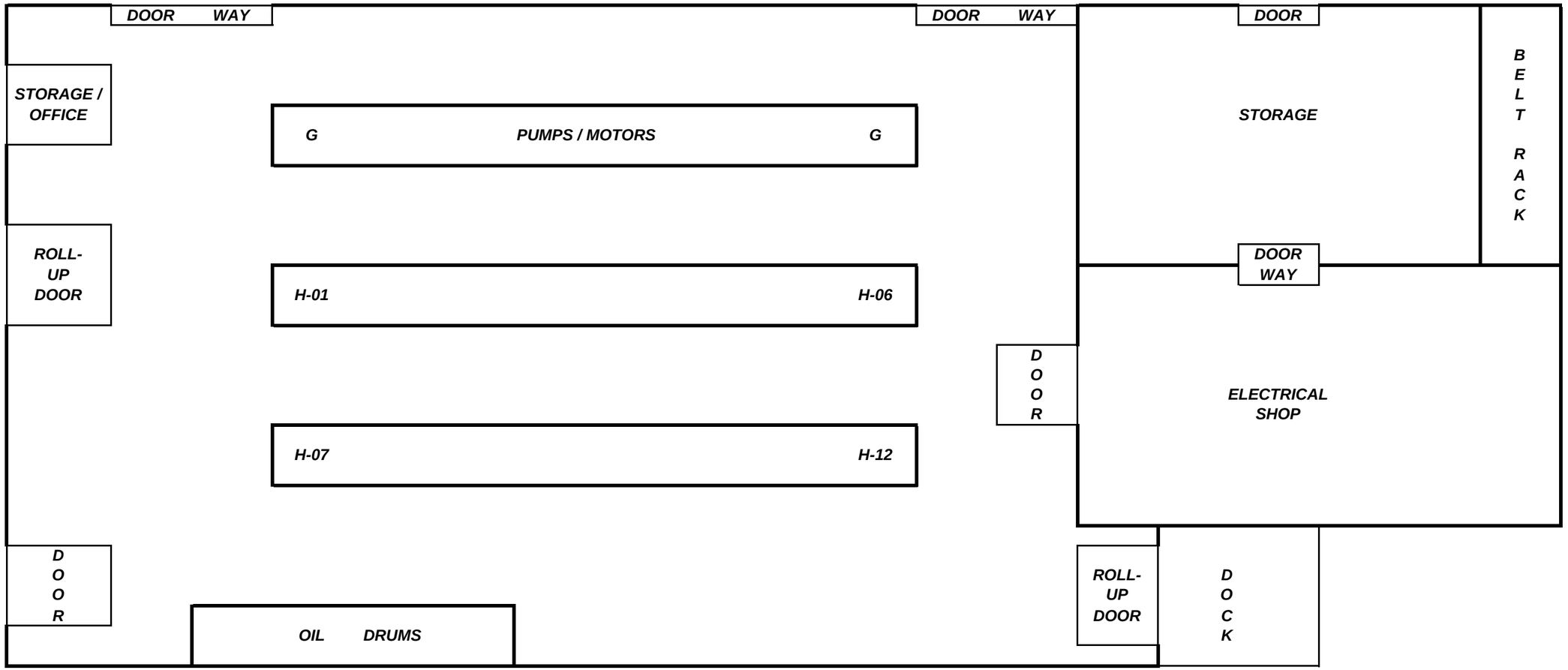
BOTTOM SHELF - BS-6

FLOOR - F-5

FLOOR - F-6

SUPPLY ROOM LAYOUT:




DOOR WAY
DOOR WAY
DOOR
STORAGE / OFFICE
G
PUMPS / MOTORS
G
STORAGE
B E L T R A C K
ROLL- UP DOOR
H-01
H-06
DOOR WAY
D O O R
ELECTRICAL SHOP
H-07
H-12
D O O R
ROLL- UP DOOR
D O C K
OIL DRUMS

Attachment B: Standard Operating Procedures for Warehouse Inventory Control of Critical Equipment and Spare Parts

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Division: Pump Station Group **Subdivision:** Maintenance

SOP Title: Warehouse Inventory Control for Critical Equipment /Parts

APPROVED:

_____ _____
Author, John Garland, Materials Inventory Clerk Date

_____ _____
WWTP Assist Superintendent Maintenance, Gene House Date

_____ _____
Interim , David Wiman Date

Revision	Date	Responsible Person	Description of Change	Page Number of Change
1				
2				

Annual Reviewer (initials)	
Date	

The following Standard Operating Procedure (SOP) was developed for use by City of Columbia Metropolitan Wastewater System staff and contractors. This SOP template, prepared by the Clean Water 2020 Program (CW2020), was formatted in accordance with the U.S. Environmental Protection Agency's (EPA) standard document: *Guidance for Preparing Standard Operating Procedures (SOPs) EPA QA/G-6* (April 2007).

Table of Contents

PURPOSE AND APPLICABILITY

The purpose of this Standard Operation Procedure (SOP) is to provide guidance, steps and instructions for maintaining critical spare parts and equipment in the warehouse.

SUMMARY OF THE METHOD

The warehouse inventory is updated as new equipment is added or old equipment is removed from the pump stations. An equipment criticality review was completed to identify critical spare parts and equipment that need to be readily available to minimize the potential for sanitary sewer overflows. Critical spare parts and equipment are available in stores and/or can be readily obtained from vendors. Activities related to stores management include: 1) Initial add to stores; 2) Checking items out to complete maintenance and emergency response tasks; 3) Annual inventory review; and 4) Permanently removing items from stores.

HEALTH AND SAFETY WARNINGS AND CAUTIONS

All proper Personal Protection Equipment will be worn, and the City of Columbia Metro Wastewater Treatment Plant Written Safety Program will be followed.

PERSONNEL QUALIFICATIONS

Supervisor or his designee will assign qualified personnel to perform the procedure.

EQUIPMENT AND SUPPLIES

Equipment:	**Materials:**
Inventory Management Computer	N/A

PROCEDURAL STEPS

Initial Add to Stores

1. If a part or piece of equipment has been identified as critical, by meeting the definition presented in the Inventory Management System Technical Memorandum, a Requisition Form will be completed by the person identifying the need. It will include the following in the description:
    a. Equipment type
    b. Manufacturer
    c. Model
    d. Source
    e. Cost
    f. Associated pump station(s)
    g. Min/Max

2. The Pump Station Supervisor will review and approve the Requisition Form.
3. A stock number will be added to the item by the Materials Inventory Clerk (Clerk).
4. The warehouse inventory management system will be updated by the Clerk.
5. The part will be ordered by the Clerk
6. Once the part has been received the Pump Station Supervisor will be notified that the critical part is in stores and available for use.

Checking Out Items to Complete Maintenance Tasks

1. Complete either the "Items Issued" or "Items Loaned" form which will include:
   a. Stock number
   b. Work order number Note: Until the City Works CMMS is fully installed, identify where the part will be used
   c. Quantity
2. The Clerk will fill the order
3. If checking out the item reduces the quantity on hand to the minimum level, the Clerk will order enough items to bring the level back to the maximum amount. (see the Return/ Refill to Stores procedure below)

Return/Refill Stores

Return

1. When a piece of equipment, such as a reserve pump, has been refurbished or a part was checked out and not used it must be returned to stores.
2. The person returning the item will fill out the "Returned" column of the "Items Loaned" form.
3. The Materials Inventory Clerk will return the item to the appropriate location and update the electronic inventory management system.

Refill

1. When items that are purchased to refill stores received the Clerk will place the item in the appropriate location and update the inventory management system.

Annual Inventory Review

Dormant Stock

1. A list of critical parts and equipment that have not been checked out from the warehouse for 2 years will be generated annually by the Clerk.
2. The list will be provided to Pump Station Supervisor to review and determine if the parts and equipment are still critical and are to remain in stores.
3. After the review, the inventory management system will be updated to reflect any changes that were made such as:
   a. Items which are to remain in stores but are no longer identified as critical
   b. Item which can be removed because the associated system or equipment no longer exists; the Permanently Removing Items from Stores procedure will then be followed.

Managing Parts and Equipment Quantities

1. Annually a report will be generated to indicate how many times each critical part or equipment was not available (stock out) from the warehouse when needed.
2. The Clerk and Pump Station Supervisor will review the report to determine what is causing the stock out, such as the min/max amount needs adjustment or there is a planning and scheduling issue.
3. If it is determined the min/max qualities are incorrect, a Requisition Form will be completed noting that is only updating the min/max levels to be kept in stores.
4. The inventory management system will be updated by the Clerk.
5. Parts and equipment will be ordered to meet the new requirement by the Clerk.
6. The Pump Station Supervisor will be notified once the additional parts or equipment have been received.

Permanently Removing Items from Stores

1. An Asset Disposition form will be completed for any critical item that will no longer be maintained in the warehouse. The form will include at a minimum
   a. Equipment Type
   b. Manufacturer
   c. Model
   d. Quantity
   e. Cost
   f. Reason for removing from stores
2. The Pump Station Supervisor will review and approve the Asset Disposition Form.
3. The warehouse inventory management system will be updated by the Clerk.
4. The part or equipment will be disposed of in the accordance with City of Columbia disposal procedures.

DATA AND RECORDS MANAGEMENT

1. Inventory management system

QUALITY CONTROL AND QUALITY ASSURANCE

1. All SOPs will be reviewed at least once every year in order to maintain their relevancy.
2. As procedures, major equipment and/or personnel job descriptions change in such a manner that it affects an SOP, that SOP will be revised accordingly.
3. For those SOPs which do not require a revision, documentation attesting to that fact must be submitted to the Superintendent (QA/QC Officer) who in turn initials and dates the table located at the bottom of the title page of the original SOP.

REFERENCES

1. Contingency Emergency Response Plan (CERP)
2. Inventory Management System Technical Memorandum

ATTACHMENTS / CHECKLISTS

1. Items Loaned Form
2. Items Issued Form
3. City of Columbia Requisition Form
4. City of Columbia Asset Disposition Form

Attachment C: Existing Inventory Management Forms

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CITY OF COLUMBIA
METRO PLANT WAREHOUSE
ITEMS LOANED FORM

DATE	DESCRIPTION	QUANITY	RETURNED	WORK LOCATION	EMPOYEE	CONDITION/COMMENTS

CITY OF COLUMBIA
METRO PLANT WAREHOUSE
ITEMS ISSUED FORM

DATE	DESCRIPTION	QUANITY	RETURNED	WORK LOCATION	EMPOYEE	CONDITION/COMMENTS

WHITE COPY: PURCHASING
BLUE COPY: FOR YOUR FILES

CITY OF COLUMBIA
REQUISITION

For Purchasing Use Only

CHECK ONE: ☐ PURCHASE ☐ SURPLUS ☐ CONTRACT ☐ SERVICE ☐ RENTAL

1. **DEPARTMENT:** _____ **DIVISION:** _____

2. **REQUESTED BY:** _____ **DATE REQUESTED:** _____

3. **ITEM:** (List items with different Object Cost Codes on SEPARATE Requisitions.)

QUANTITY	DESCRIPTION

4. **CLASS CODE:** _____ **5. OBJECT COST:** _____

6. **DELIVER TO:** _____ (Use Receiving Location Code Only) **7. REQUESTED DELIVERY DATE:** _____

8. **SUGGESTED VENDORS:** _____

_____

9. **COMMENTS:** (i.e., Any previous correspondence with vendors on requested items, etc.)

_____

_____

_____

_____

PUR108201

_____ _____
DEPARTMENT HEAD DATE

City of Columbia

Asset Disposition Form

Fixed Asset ID # (FAID) _____ Tag Number _____

Department Utilities & Engineering Location of Asset L0031-Wastewater Treatment Plant

Description _____

Make _____ Model _____ Serial Number _____

Select the manner of disposal described below and provide the information requested;

Transferred: The asset was transferred to the _____ department effective _____

The person to contact at that department is _____

Trade-In: The asset was used as a trade in for the acquisition of a new asset, which is described as follows:

Vendor _____

Description _____

Manufacturer _____

Model/Serial No _____

Location _____

Purchase Order # _____

Sale: The asset was sold to _____ for $_____ on _____.

Please contact Edith Fisher regarding the payment received for the sale of this asset. If you have already deposited the payment, please attach a copy of the receipt to this form.

Discarded: The asset had no sale or trade-in value and was discarded on _____.

Theft: The asset was noticed missing on _____. CPD was notified of the theft on _____.

Other: _____

Employee Name (printed) Tommy O. Faulk Employee Signature _____

Department Head Name Joseph D. Jaco Dept Head Signature _____

Please Submit one copy of this form to Edith Fisher in Accounting 545-3324

KEY LOG

(for vehicle use)

DATE	SPECIFY WHICH KEY LOANED	LOANED TO (Print Name)	RETURN DATE	DESTINATION

Revised on 3/11/2014