CLAREMONT GROUNDWATER TREATMENT FACILITY

OPERATION AND MAINTENANCE MANUAL

CLAREMONT POLYCHEMICAL CORP. SUPERFUND SITE
505 Winding Road
Old Bethpage in Nassau County, New York 11804

Science Applications International Corporation

SAIC Project 01-1408-04-5386-000

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O&M Manual Table of Contents

Tables

Figures

Attachments

Related and Stand Alone References

Environmental, Health & Safety

Site Safety and Health Plan for Groundwater Treatment Operations and Maintenance Activities at the Claremont Polychemical Superfund Site – Old Bethpage, Nassau County, New York

SAIC Corporate Environmental Compliance & Health & Safety Plan

Drawings

Log of Operating System Drawings – Claremont Polychemical Superfund Site GWTP

Construction Design Drawings	- CSK Design Drawings - Rust Construction Design Drawings

MSDS

Manual of Material Safety and Data Sheets – Claremont Polychemical Superfund Site GWTP

Procedures

Manual of Standard Operating Procedures and System Instructions - Claremont Polychemical Superfund Site GWTP

Sampling

Sampling and Analysis Plan for Groundwater O&M at the Claremont Polychemical Superfund Site (includes - Field Sampling Plan and Quality Assurance Project Plan)

Abbreviations and Accronyms

AS	Air Stripper
ASF	Air Stripper Feed
BGS	Below ground surface
CA	Carbon Adsorber (liquid phase carbon, LGAC)
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFM	Cubic Feet per Minute
DCA	Dichloroethane
DCE	Dichloroethylene
EQ	Equalization
FCV	Flow Control Valves
GAC	Granular Activated Carbon
GACF	Carbon adsorber feed (Liquid side)
GPH	Gallons Per Hour
GPM	Gallons Per Minute
GWTF	Groundwater Treatment Facility
GWTP	Groundwater Treatment Plant
GWTS	Groundwater Extraction, Treatment and Reinjection System
HCl	Hydrochloric Acid
HDPE	High Density Polyethylene
HMI	Human Machine Interface
HP	Horsepower
HSM	Health and Safety Manager
HVAC	Heating Ventilation and Air Conditioning
HZ	hertz
KV	kilo-volts
KVA	kilo-volt AC current
LGAC	Liquid Granular Activated Carbon (carbon adsorber, CA)
LIPA	Long Island Power Authority
LP	Lighting Panel
LSH	Level Switch - High
LSL	Level Switch - Low
MCC	Motor Control Cabinet (Center)
MCP	Main Control Panel
MSDS	Material Safety Data Sheets
NaOH	Sodium Hydroxide (Caustic)
NCDOH	Nassau County Department of Health
NPDES	National Pollutant Discharge Elimination System
NYSDEC	New York State Department of Environmental Conservation
NYSDOW	New York State Division of Water
O&M	Operation and Maintenance
OU	Operable Unit
P&ID	Process and Instrumentation Diagram (Drawing)
PCE	Tetrachloroethylene
PCV	Pressure Control Valve
PID	Photo-Ionization Detector
PLC	Programmable Logic Controller

PM	Preventative Maintenance
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
PSI (G)	Pounds per Square Inch (Gage)
PVC	Poly-Vinyl Chloride
RX	Reaction Tanks
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCY	Water Recycle System
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record Of Decision
RPM	Revolutions Per Minute
RPZ	Reduced Pressure Zone
RQ	Reportable Quantity
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SCBA	Self Contained Breathing Apparatus
SCFH	Standard Cubic Feet per Hour
SCFM	Standard Cubic Feet per Minute
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SVOC	Semi-Volatile Organic Constituent
TCA	Trichloroethane
TCE	Trichloroethylene
TDH	Total Dynamic Head
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VAC	Volts Alternating Current
VFD	Variable Frequency Drive
VGAC	Vapor Phase Granular Activated Carbon
VOC	Volatile Organic Constituent

1.0 INTRODUCTION

1.1 Project Overview

The operations of a former manufacturer released hazardous chemicals, primarily volatile organic compounds (VOCs) into the soil and groundwater. Construction and operation of the Claremont Polychemical Groundwater Extraction and Treatment Facility (GWTF) is part of the remedy for Operable Unit 1 (OU1) for groundwater identified in the Record of Decision (ROD) (EPA, 1990). The GWTF was constructed and became operational and functional in February 2000. The plant pumps and treats the groundwater contamination. The project includes the operation and maintenance (O&M) of the groundwater extraction, treatment, and reinjection system; sampling and analysis; waste disposal; carbon replacement; corrective maintenance; and optimization of the Groundwater Treatment System at the Claremont Polychemical Superfund Site.

The GWTF receives and treats all contaminated and potentially contaminated flow from the extraction well system. The facility consists of three extraction wells, a flow equalization tank, two reaction tanks, two polymer addition coagulation/flocculation tanks, a clarification/thickening system, two down-flow filters, an air stripper, two liquid stream carbon adsorbers, two air stream carbon adsorbers, two effluent holding tanks, one filter press, chemical feed systems, and other support systems and equipment. Treated effluent is pumped to the well field for reinjection into the aquifer. Analyses of influent, plant effluent, process water, groundwater samples, and wastes from operation of the GWTF are performed with on-site monitoring equipment and by off-site laboratories.

1.2 Physical Setting

The 9.5 acre site is located on Long Island in Old Bethpage, Nassau County, New York (see Figure 1-1). It is the site of the abandoned production facility of the Claremont Polychemical Company. Land use in the vicinity of the Site is light industrial and commercial. The Site is bordered to the south and southeast by the Bethpage State Park and Golf Course, to the east by the State University of New York-Farmingdale Campus, and to the north and west by light industrial and commercial properties. In addition to the extraction wells, injection wells and infiltration galleries, a network of monitoring wells surround the plant (see Figures 1-2, 1-3 & 1-4). Some of these monitoring wells are part of the Claremont network and others are part of the Nassau County and the Town of Oyster Bay monitoring well networks. The treatment facility is secured within a chain-link fence.

The Cretaceous Magothy Formation, a sole-source aquifer for central Long Island, underlies the Site. This formation extends approximately 300 feet below ground surface (bgs) and consists of well-stratified unconsolidated sand, silt, and clay. The silt and clay content dominates the northwestern portion of the Site, and the proportion of sand increases toward the southern boundary of the Site. Depth to water is typically 65 to 70 feet bgs and flows to the south-southeast, toward the golf course and Bethpage State Park.

There are two other groundwater extraction and monitoring programs ongoing in the area of the Claremont Site. These include a groundwater remediation program being performed by Nassau County in relation to a groundwater plume thought to be originating from the Fireman's Training Center, (south and west of Claremont), and a groundwater remediation program being performed by the Town of Oyster Bay in relation to a groundwater plume thought to be originating from the Old Bethpage Landfill (west of Claremont).

1.3 Project History

From 1968 to 1980 when on-site operations ceased, Claremont Polychemical manufactured inks and pigments for plastics, coated metallic flakes, and vinyl stabilizers in several on-site buildings. The principal wastes generated were organic solvents, resins, and mineral spirits wash wastes. In 1979, the state identified improper storage practices on-site, including stockpiles of over 2,000 uncovered or leaking drums of wastes and an on-site spill area. Organic solvents from several on-site spills and discharge incidents may have contaminated on-site soil and groundwater. By 1980, most of the on-site drums were sorted and removed off-site, reused, or burned on-site. Subsequently, contaminated soil was excavated and placed on a plastic liner, which degraded over time.

Groundwater investigations in 1980 revealed groundwater contamination directly under the Site. The remedy identified in the ROD for addressing groundwater contamination near the Site included groundwater capture via extraction wells and treatment of the groundwater using air stripping in association with carbon adsorption to control off-gasses, followed by on-site re-injection of the treated groundwater back into the aquifer.

Operation of the existing GWTF began in February 2000. The GWTF was operated by URS Corporation from February 2000 through March 24, 2002. SAIC assumed responsibility for operations and maintenance of the site on March 25, 2002, and has been operating the system since that date.

1.4 Purpose and Objectives

This Operation and Maintenance (O&M) Manual provides guidelines for supervisory and operating personnel to achieve and sustain successful operation of the Groundwater Extraction, Treatment and Reinjection System (GWTS).

This manual includes a discussion of the design of the facility and supplements the various service manuals provided by the manufacturers of the equipment. It will be available to operating personnel at all times and will serve as a primary reference for day-to-day operation.

1.5 Operation and Managerial Responsibilities

To ensure the efficient and economical operation of the GWTS, the responsibilities of both the operating personnel and management need to be clearly defined. These responsibilities are presented in the following three sections.

1.5.1 Operational Personnel's Responsibilities

It is the responsibility of the staff to:

- Know and understand this O&M Manual;
- Know and understand the proper procedures for operating the GWTF systems;
- Maintain neat and accurate operational and maintenance records;
- Know and follow proper safety, health and environmental policies and procedures
- Be able to recognize and respond to potential problems; and
- Understand how to monitor and troubleshoot the systems

Operational personnel are charged with the goal of continuous improvement and system optimization using the best available operating, engineering and maintenance practices.

1.5.2 Management's Responsibilities

It is the responsibility of the management team to:

- Provide the proper and safe working conditions for operation of the GWTS
- Determine the requirements for the staff, provide guidance and training
- Ensure that the operation has the necessary resources (labor, equipment, parts, and supplies) to meet the objective of continuous and efficient operation of the Claremont GWTF.
- Maintain adequate treatment system records.
- Monitor the GWTS, recognize and respond to operational problems, and provide feedback to staff.
- Prepare budgets, reports and plans for the facility

For the current facility organizational chart, refer to Figure 2.

1.5.3 Key Personnel

Program Manager – The SAIC Program Manager is responsible for ensuring that the O&M of the treatment plant is performed in a manner consistent with the USACE and SAIC Health and Safety Programs and that the plant performance is in compliance with the effluent discharge (Equivalency) permit. The Program Manager has the authority to take the following actions:

- Determine personnel assignments for this project;
- Immediately suspend operation of the facility if the health and safety of personnel are endangered; and
- Temporarily suspend GWTS operation in the event of discharge permit violation until an investigation determines the reason for the violation and an effective remedy is enacted.

The Program Manager reports to and maintains all communications with USACE. The Program Manager also ensures that SAIC-specific protocols and procedures are followed.

Site Supervisor – The SAIC Site Supervisor is responsible for the general day-to-day operation and maintenance of the GWTF, compliance with the health and safety requirements, and the attainment of effluent discharge limits as outlined by the discharge (Equivalency) permit. The SAIC Site Supervisor is responsible for maintaining all operational and maintenance data, and managing all labor, equipment, materials, and supplies provided to operate the GWTF. The SAIC Site Supervisor reports to the SAIC Program Manager.

Plant Operator – The SAIC Plant Operator supports the Site Supervisor in the general day-to-day operation and maintenance of the GWTF, compliance with the health and safety requirements, and the attainment of effluent discharge limits as outlined by the discharge (Equivalency) permit. The SAIC Plant Operator is responsible for performing operational and maintenance duties as assigned by the Site Supervisor, using the equipment, materials, and supplies provided to maintain and operate the GWTF, and performing the daily activities required to keep the GWTF functioning efficiently. The SAIC Plant Operator reports to the SAIC Site Supervisor.

1.6 Treatment Requirements/Effluent Limitations

As per the Record of Decision (ROD) for the Claremont site, the target groundwater cleanup goals are the New York Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (USEPA) Drinking Water Standards.

The GWTS is designed to achieve this standard. Table 1 summarizes the chemical concentrations in the groundwater influent assumed in the design for the GWTS. The plant's discharge is currently regulated by a NYSDEC Equivalency Permit dated December 2004. A request for an extension of this permit has been submitted to NYSDEC and a response is pending.

A copy of the NYSDEC Final Effluent and Monitoring Requirements along with the NYSDEC letter modifying the effluent pH criteria are provided in Attachment 1. A copy of the Equivalency Permit and General Consent Order Conditions is included as Attachment 2. The current chemical quality limits for the treated effluent, as mandated by the Equivalency Permit, are summarized in Table 2.

1.7 System Process Overview – Basis of Design

The objective of the groundwater extraction system is to recover contaminated groundwater from the Cretaceous Magothy Aquifer for on-site treatment. The system was originally designed to remove solids, metals, VOCs and SVOCs from the contaminated groundwater. The current operation of the system is significantly different from the initial plant start-up design. This is due to the difference between the actual influent groundwater conditions and those anticipated in the Design Basis for the GWTS. Specifically, influent iron and dissolved solids concentrations are lower than anticipated and therefore, the need to remove these constituents is not warranted. The following discussion of the treatment process includes a summary of changes that have occurred in the day-to-day operations based on actual plant conditions, operational experience, and influent monitoring over the past several years. It should be noted that where process changes have occurred, all equipment from the original design remains in place or available to be reactivated should the need arise.

To capture the contamination plume, a well point recovery system has been installed that consists of three extraction wells with pumps. Groundwater extracted from the well point system is sent to the treatment plant designed to treat a maximum flow of 500 gallons per minute (gpm). Each extraction well pump delivers groundwater to the plant through dedicated piping which meets at a common header pipe inside the plant. The groundwater then flows to the equalization (EQ) tank located outside the treatment plant building. The EQ tank provides both flow and chemical equalization.

Groundwater from the equalization tank is pumped to the top of two reaction tanks which are at the head of two separate but identical treatment trains within the facility. The maximum design flow rate for each treatment train is 250 gpm. The flow rate from the influent pumps is monitored and set at the HMI (Human-Machine Interface control system) operating through the main control panel (MCP). The pumps are controlled by individual variable frequency drives.

The original design of the GWTS called for the precipitation of metals from the influent water. This process would start in the reaction tanks where influent water would be mixed with metered solutions of sodium hydroxide (pH controlled) and potassium permanganate (flow controlled). The process flow would continue from the reaction tank into the flash mix and flocculation tanks where additional caustic and polymer would be added to aid metal precipitation. The system flow would continue through the plate clarifier to separate the developed solids from the supernatant liquid.

Currently, the concentration of metals in the extracted groundwater is minimal (<2 parts per million [ppm]) and therefore, the water does not require the addition of chemicals in the treatment process. The addition of potassium permanganate and sodium hydroxide for metal hydroxide precipitation is not necessary and is offline. The sodium hydroxide and polymer addition in the flash mix and flocculation (floc) tanks has been discontinued also.

The flash and floc mix tanks now act as flow through tanks. The inclined plate Lamella clarifier is used to remove most of the solids in the wastewater by gravity settling. Settled material in the form of sludge is collected in the bottom of each Lamella clarifier and transferred by sludge transfer pumps to the sludge storage tank. Effluent from the clarifier, typically less than 20 mg/L TSS, flows to the gravity filters for further solids removal.

The removal of sludge from the bottom of the clarifiers is currently accomplished by manually pumping the sludge to the sludge storage tank. Once the level in the storage tank cone becomes approximately 60% to 80% full, the operator can dewater the sludge in the filter press or in drums.

The decant from the sludge storage tank, filtrate from the filter press, overflow from the sand filters and water collected by the floor drains are transferred to the water recycle tank. Two 100 gpm centrifugal pumps that are activated by a level control in the recycle tank transfer wastewater back to the equalization tank for treatment.

Sufficient hydraulic head at the Lamella Clarifier effluent trough allows for unassisted flow through the Settling Filters, located downstream of the clarifier. Filtration is provided by screened nozzles and slotted risers. When required, the effluent from each clarifier can be directed to either filter.

In the original design, the settling filters were utilized as sand-filled polishing filters with a continuous backwash process. As no metal hydroxides are precipitated, the sand filters are no longer required.

Effluent from the filters flows by gravity into two air stripper feed tanks. The level in these tanks is set to maintain enough volume to continuously supply water to the air stripper feed pumps (each rated at 300 gpm). Two of the three pumps deliver water to the top of the air stripper tower.

The original system design allowed for the introduction of hydrochloric acid (HCI) into the pump discharge line prior to the in-line static mixer, upstream of the air stripper. The acid was to reduce the pH of the wastewater to a range of 6 to 8 and to prevent the fouling of the air stripper media. Due to the lack of pH adjustment at the head of the treatment process, the acid addition has been terminated.

The packed-tower air stripper removes volatile organic compounds (VOC) from pumped groundwater by counter-current flow against forced air through high surface area media. Vapor effluent from the air stripper tower is conveyed to one of two vapor phase carbon adsorbers, (the second unit is off line as a spare), for the treatment of off-gas from the air stripper and reduces volatile air emissions to within regulatory limits. To maximize the efficiency of the vapor-phase adsorbers, and to increasing their carbon life, the relative humidity in the vapor stream is minimized.

Water effluent from the air stripper tower enters the carbon adsorber feed tanks prior to being pumped through the liquid-phase granular-activated carbon system (LGAC). Under normal operation, 2 of 3 carbon adsorber feed pumps transfer water from the carbon adsorber feed tanks to two liquid-phase carbon adsorbers.

The sand filter effluent is valved to allow for its bypass of the air stripper feed system and flow directly to the LGAC feed tanks.

The LGAC system removes any semi-volatile organics and residual volatile organics remaining after air stripping. The adsorbers operate in parallel. The design of the system is such that each adsorber can be removed from service while the system remains operational.

Two treated water storage tanks receive effluent from the liquid-phase carbon adsorbers. The treated groundwater is transferred to an injection well and gallery system via two centrifugal pumps (configured in a lead/lag arrangement) at approximately 250 gpm each (a third pump is a spare). The total volume pumped into the injection system is monitored and totalized. The flow rate is also monitored.

The injection pump discharge is also valved to allow for water from the treated water tanks to recycle to the equalization tank. This recycle mode is used as a safety measure to deal with plant operational problems and to prevent the discharge of untreated water back to the aquifer. In addition, if a chemical spill in the plant reaches the sump, the "Recycle mode" would be used until the condition is rectified. It is recommended that after any change in the process which could result in the discharge of water out of permit limits, the plant is run in this "Recycle" mode until the change in process has been completely tested.

1.8 System Checkout and Start-up Overview

Attachments 4, 6, 7, and 8, contain written procedures and policy regarding system isolation, start-up, shutdown, and emergency shutdown procedures, respectively. Attachment 9 contains the chemical handling procedures.

1.9 Equipment Summary

The major equipment components of the treatment plant include the following:

Unit Process No. 1 - Groundwater Extraction and Metals Removal:

Three (3)	Groundwater extraction well pump systems
One (1)	Flow equalization tank
Three (3)	Influent pump systems
Two (2)	Reaction tanks
Two (2)	Flash mix, flocculation, and clarifier systems
Two (2)	Sludge recycle pumps
Two (2)	Settling Filters (formerly sand filters)

Unit Process No 2 – Volatiles Removal and Groundwater Injection:

Two (2)	Air stripper feed tanks
Three (3)	Air stripper feed pumps
One (1)	Air stripper tower system
One (1)	Draft blower
Two (2)	Vapor-phase carbon adsorbers
Two (2)	Carbon adsorber feed tanks
Three (3)	Carbon adsorber feed pumps
Two (2)	Liquid-phase carbon adsorber vessels
Two (2)	Treated water storage tanks
Three (3)	Injection pumps
Four (4)	Injection wells
Two (2)	Infiltration Galleries

Unit Process No. 3 - Sludge Handling and Plant Recycle:

One (1)	Sludge storage tank
Two (2)	Sludge transfer pumps
One (1)	Filter press feed pump
One (1)	Filter press system
One (1)	Recycle tank
Two (2)	Recycle pumps

Unit Process No. 4 - High Pressure Air System:

One (1)	Air compressor system

Unit Process No. 5 - Chemical Preparation and Feed Systems:

One (1)	Potassium permanganate feed system
One (1)	Sodium hydroxide feed system
One (1)	Hydrochloric acid feed system
One (1)	Polymer feed system

Attachment 3 provides Process and Instrumentation Diagrams (P&ID) for the Claremont GWTS. These 'As-Built' drawings are PDF copies of MS Visio documents. Visio drawings are Auto CAD compatible.

2.0 PERMITS AND STANDARDS

2.1 Discharge Permit and Permit Requirements

The Claremont treatment system has a SPDES equivalency discharge permit issued by NYSDEC. This permit originally dated March 29, 1993 has been extended through December 31, 2008. A request for further extension has been submitted to NYSDEC and the extension is pending. This permit establishes the criteria the water treatment plant effluent must meet prior to discharge. A copy of the permit is included as Attachment 2. In 2004, the lower limit of the plant effluent's pH criteria was reduced from 6.5 to 5.5 (standard pH units).

2.2 Air Permit Equivalence Requirements

There is no requirement for an air permit equivalence for the GWTS at the Claremont site. See Attachment 11 for NYSDEC letter dated October 8, 1998.

2.3 Water Allocation Permit Requirements

There is no requirement for a water allocation permit for the GWTS at the Claremont site. See Attachment 12 for USEPA letter undated, received Sept. 3, 1998 referencing letter dated August 28, 1998.

2.4 Spill Reporting Procedures

Any incidents that involve spills or releases of raw, inadequately treated water shall be reported to the USACE Project Coordinator who, in turn, shall report the incident to the appropriate agencies (NYSDEC, USEPA, etc.). Emergency procedures and a list of necessary emergency equipment are provided in Section 14 of this document and Section 10.2.2 of the Site Safety and Health Plan (SSHP).

2.5 Reporting Procedures for Odors and/or Air Emissions

If an odor or air emission incident occurs, the USACE Project Coordinator shall be notified. Refer to the SSHP Section 10.

3.0 METALS REMOVAL SYSTEM

3.1 Extraction Well System

Contaminated groundwater is extracted from the Cretaceous Magothy Aquifer through three extraction wells (Ext-1, Ext-2 and Ext-3) located south of the plant. The water is treated and then reinjected into the well field to the east of the plant. These extraction wells are shown on Figure 1-3. The well construction logs are found in Attachment 14.

Each extraction well has a dedicated discharge pipe that enters the GWTP. Each discharge pipe has a flowmeter and flow totalizer. The three dedicated lines are manifolded inside the plant and discharge into the top of the Equalization Tank.

3.1.1 Design Specification

(refer to P&ID CPS-DWG-005 in Attachment 3)

Extraction Well Pump: (P-1-1-1, P-1-1-2, P-1-1-3):

Manufacturer	Grundfos 5 stage Submersible Vertical Turbine
Product Number	78955512
Service	160 gpm vs. 140-ft. TDH
Motor	10 HP, 480 V, 3-Phase, 60 HZ, 3450 RPM

Extraction Well Flowmeter: (FE/FT-1-1-1, FE/FT-1-1-2, FE/FT-1-1-3):

Manufacturer	+GF+Signet
Model	Flow Sensor Model 515/2536-X0
	Flow Transmitter Model 3-8510-P0

Pitless Adaptors

Model J Weld on adaptor	P/N 928145	M/N 8J3
3” lateral, 3” discharge		
Viton and Teflon o-rings	304 ss with brass inserts	

Well screen

Cork Screen Technology 10” PS
304 SS with 0.020” slot
73.59 sq. in./ft and 18.18% open area
22.8 gpm/ft with <51.2 psi

Well Construction–

14” dia. bore hole with 10” dia. carbon steel casing and 3” discharge pipe
Ricci Sand (#0) filter pack
Screen 10” dia. 100-130’ long

Extraction Well System Tag List (Attachment 20)

3.1.2 Extraction Well Pump Operation

Each extraction well pump is controlled by several in-series switches. The Siemens Motor Control Cabinet (MCC) is the main power source and disconnect. At the MCC each pump has an On-Off switch. In series with the MCC switches are the Main Control Panel (MCP) switches with HAND-OFF-AUTO dedicated switches (P-1-1-1, 2, 3) and then at the Human Machine Interface (HMI) are remote switches (AUTO-OFF). The pumps can be operated in the automatic mode or manually. In automatic mode, the pumps are controlled by a level monitor/transmitter in the EQ tank.

The flow monitoring system consists of dedicated paddle wheel flow sensors connected to flow transmitters. The signals from the transmitter are read locally or on the HMI. The flow elements are mounted in each of the dedicated discharge lines and are located inside the treatment plant. See Section 8 for the system's control details.

3.2 Equalization Tank

The equalization tank stores extracted well water and recycle water for processing through the GWTP. The tank acts to equalize the flow of the plant as well as the chemical makeup of the incoming water.

3.2.1 Design Specification

(refer to P&ID CPS-Dwg-003 in Attachment 3)

Equalization Tank (T-1-3-1):	
Manufacturer	TecTank
Diameter	21-ft.
Height	22-ft.
Water Level max.	21-ft.
Nominal Capacity	59,700 gallons
Construction	Bolted steel panels, flat bottom with baffles
Level Transmitters (LT-1-3-1):	
Manufacturer	Rosemount
Model	Model 1151
Transmitter	Smart Pressure
Tank Mixer (M-1-3-1):	
Manufacturer	Chemineer
Shaft Material	316SS
Impeller	3 - Blade
Motor	3 HP, 460V, 3-Phase, 60 HZ, 1200 RPM
Basket Strainer:	
Manufacturer	Hayward
Model	8" Simplex Basket Strainer
Screen Size	1/8-inches

Equalization System Tags are provided in Attachment 20.

3.2.2 Equalization Tank Operation

The Flow Equalization Tank T-1-3-1 is used to store contaminated groundwater transferred from the well field via the extraction-well pumps and below-ground piping. Water leaves the equalization tank through an 8-inch line and gravity flows through an 8-inch Hayward basket strainer, continues to the header located inside the plant, and feeds the influent pumps.

The Equalization Tank is equipped with a mechanical mixer (M-1-3-1). When operated, the mixer ensures that groundwater contaminant concentrations in the tank are uniform which increases the efficiency of treatment system. The mixer is currently off-line as it is not needed for the current water characteristics. At the Motor Control Cabinet (MCC), the mixer has an ON-OFF breaker switch in series with a “HAND-OFF” switch at the Main Control Panel (MCP). In auto mode the mixer is activated via the PLC once the level in the tank is greater than 50% full. At the tank is a keyed emergency shut off switch.

In the Equalization Tank (T-1-3-1) are level switches which indicate and alarm for low level and high level conditions. LSLL-1-3-2 signals the tank low-low level condition and triggers the visual alarm LALL-1-3-2. LSHH-1-3-2 signals the tank high-high level condition and triggers the visual alarm LAHH-1-3-2.

The tank is continuously monitored by the PLC via level indicating transmitter LT-1-3-1. This transmitter is a pressure transducer that monitors and transmits the tank’s water level and is set up to control the extraction well pumps and influent pumps. The control levels are set by the operator at the Citech SCADA HMI operator interface as follows:

LSL-1-3-1	tank low level condition	in Auto Mode- activate well pumps, deactivate influent pumps
LSH-1-3-1	tank high level condition	in Auto Mode deactivate well pumps, activate influent pumps
LSLL-1-3-1	tank low-low level condition	interlocks off the influent pumps
LSHH-1-3-1	tank high-high level condition	interlocks off the well pumps

See Section 8 for the system control details. When necessary, draining and cleaning the equalization tank is accomplished by shutting off the well pumps and the mixer, and then processing as much of the tank volume as possible.

> ***NOTE:*** **When draining the Equalization Tank, to prevent structural damage to the tank through vacuum formation, the drain valve must be opened very slowly.**

3.3 Process Water Influent System

The influent system transfers the contaminated groundwater from storage to the head of the treatment process.

3.3.1 Design Specification

(refer to P&ID CPC-Dwg-003, 004 in Attachment 3)

Influent Pumps (P-1-4-1. 2 & 3):

Manufacturer	Flow Serve (Formerly Ingersoll/Dresser)
Model	D814 4x3x6 Horizontal Centrifugal
Service	250 gpm vs. 30-ft. TDH
Electrical	460 V, 3-Phase, 60 HZ, 5 HP, 1750 RPM

***NOTE*: The pump flow is controlled by variable frequency drives through flow rate set points.**

Influent Pump Variable Frequency Drive (3 units)

Manufacturer	Danfoss - Adjustable Frequency Drive (AFD)
Model	VLT 4006VT
Electric	380v – 460v, 60Hz, 3-phase

Influent Pump Check Valves (SC-1400, 1401 & 1402):

Manufacturer	Golden Anderson
Type	4” Swing Check Valve
Construction	Cast Iron Body, Bronze Seat, flanged

Flow Control Valve(s) (FCV-1-6-1 & 2):

Manufacturer	Milliken Valve Co.
Model	3” Millcentric Series 601 Eccentric Plug Valve
Materials of Construction	Cast Iron Body, D.I Plug coated with EPDM

Magnetic Flowmeter(s) - (FE-1-6-1 and FE-1-6-2):

Manufacturer	Brooks Instrument
Model	5004B5TTF1ACBA

Magnetic Flowmeter Transmitter(s) – (FT-1-6-1 and FT-1-6-2):

Manufacturer	Brooks Instrument
Model	3585C-2B4D1

3.3.2 Influent System Operation

Two of the three influent pumps (P-1-4-1, P-1-4-2, P-1-4-3) transfer contaminated groundwater from the equalization tank into two reaction vessels (T-1-8-1 and T-1-8-2) at the head of two parallel and identical treatment trains. Each train is designed for a maximum flow rate of 250 gpm.

At the MCC each pump has an ON-OFF switch in series with a HAND-OFF-AUTO selector switch at the MCP and an AUTO-OFF software switch on the HMI. When in the AUTO mode, the pumps deliver groundwater at the desired flow rate to each treatment train. The flow rates are set by the operator (maximum 250 gpm) at the HMI. Mounted downstream of the pumps are magnetic flow meters (FE-1-6-1 and -2) with their accompanying transmitters (FT-1-6-1 and -2).

Variable frequency drives have been installed on the influent pumps to control their motor speed.

The flow meters measure the flow rate and transmit that information to the PLC where it is then displayed on the HMI. The PLC integrates the transmitted signal and adjusts the variable frequency drives to maintain the set flow rate.

A third pump is off line and is rotated into service as part of the preventive maintenance program.

3.4 Treatment Trains

The parallel treatment trains were designed as a metals removal and clarification system. Due to the low concentrations of dissolved and suspended metals in the contaminated groundwater, the metals precipitation process is currently not required.

3.4.1 Design Specification

(refer to P&ID CPC-Dwg-004, 007, 009 in Attachment 3)

Reaction Tank(s) (T-1-8-1 & 2):

Diameter	10-ft.
Height	17-ft.
Design Flow Rate	250 gpm each
Design Capacity	7500 gal. each

pH Transmitter(s) (AIT-1-8-1, AIT-1-8-2):

Manufacturer	Johnson Yokogawa
Model	PH400-P-U-1-E*A/U/Q

pH electrode (s) – (AE-1-8-1, AE-1-8-2):

Manufacturer	Johnson Yokogawa
Model	FU-20-05-T2NPT

Reaction Tank Mixers (M-1-8-1 & 2):

Model	Sharpe, 48 RPM
Electrical	460 V, 3-Phase, 60 HZ, 1725 RPM, 1 HP

Flash Mix Tank (T-1-9-1 & 2):

Dimensions	3-ft. long x 3-ft. wide x 5-ft. tall
Design Flow Rate	250 gpm each
Design Capacity	286 gal

Flash-Tank Mixer (M-1-9-1 & 2):

Manufacturer	Sharpe
Model	G-050 350 RPM ½ HP motor
Electrical	460 V, 3-Phase, 60 HZ 1725 rpm

Flocculation Tank (T-1-10-1 & 2):

Dimensions	5-ft. wide x 5-ft. long x 7-ft. high
Design Flow Rate	250 gpm each

Design Capacity	1075 gal

Flocculation Tank: Mixer (M-1-10-1 & 2):

Manufacturer	Sharpe
Model	0.5E05-15VF 30 RPM ½ HP Motor
Electrical	460 V, 3-Phase, 60 HZ 1725 rpm

Lamella Clarifier JCL-1-12-1 & 2):

Size	860 sq. ft. effective surface area
Design Flow Rate	250 gpm
Plate Spacing	1-in.

Flocculation Tank Mixer - Variable Frequency Drive (VFD-1-10-1 & 2):

Model	Reliance SP500
Input Voltage	460 Volts, 3-Phase, 50/60 HZ
Rated Horsepower	1 HP
Output Voltage	0-460 Volts, 3-Phase

Sludge Recycle Pump- (P-1-11-1 and P-1-11-2):

Manufacturer	Wilden Pump
Model	M1/OO/WF/WF/WF/LF

Sludge Transfer Pump- (P-1-12-1 and P-1-12-2):

Manufacturer	Wilden Pump
Model	M4/WPPB/WF/WF/WF

System Tag Lists (Attachment 20)

3.4.2 Treatment Train Operation

Each treatment train consists of a reaction tank, a flash tank, a floc tank, a clarifier, a sand filter and the related equipment and controls. The treatment trains operate as flow through and settling tanks. Water enters the reaction tanks and gravity flows to the flash mix tanks. From here it overflows into the floc tanks and gravity flows to the clarifiers. The clarifier overflows into the sand filters.

In each reaction tank, the pH of the water is measured and monitored by a pH-specific electrode (AE-1-8-1 and AE-1-8-2) and a pH controller/transmitter (AIT-1-8-1 and AIT-1-8-2). As originally designed, the pH controller/transmitter can use this signal to control the metering of sodium hydroxide into the reaction tanks by chemical feed pumps (P-5-2-1and P-5-2-2). The desired pH values are set at the HMI.

This control system would be used to raise the pH of the groundwater to induce the precipitation of metals required by the treatment process. Chemicals added to the reaction tank would be thoroughly mixed with in-tank mixers (M-1-8-1 and M-1-8-2) to ensure the most efficient use of the added chemicals. As noted, the metals precipitation process is offline due to significantly lower than expected concentrations of metals in the groundwater.

Dilute potassium permanganate is another chemical solution designed to be fed into the reaction vessels as an aid to metals precipitation. Again, as noted, due to the much lower mass of dissolved and suspended metals existing in the influent, potassium permanganate additions have been discontinued.

Flash-mix tanks (T-1-9-1 and T-1-9-2) receive process water by gravity feed from the reaction tanks. By design, a dilute polymer solution can be added to each flash mix tank when needed at a volume proportional to the flow rate of the incoming water. The polymer and influent water are mixed by the flash-tank mixers (M-1-9-1 and M-1-9-2). The polymer addition system has also been discontinued due to the lower concentration of dissolved and suspended metals in the influent.

The wastewater flows by gravity from the two flash mix tanks to the two flocculation tanks (T-1-10-1 and T-1-11-2). A variable frequency drive (VFD-1-10-1 and VFD-1-10-2) mixer (M-1-10-1 an M-1-10-2) was installed in each flocculation tank to slowly mix tank contents in order to keep the flocculent uniformly suspended and prevent it from shearing. Currently the mixers are not in use. On/Off switches for the reactor, flash and flocculation mixers are located at the MCP and shut off switches are mounted locally for the tank mixers.

Effluent from the flocculation tanks flows by gravity into two lamella inclined plate clarifiers JCL-1-12-1 and JCL-1-12-2. The clarifier separates solids and liquids by directing the flow between a series of inclined plates. The inclined plates increase the surface area that suspended particles can attach to. Here the sludge builds-up (in weight and size) and then sloughs-off down to the bottom of the clarifier. The clarifier operates at peak efficiency when plates remain clean and parallel and the influent hydraulic flow rate is stable.

In the designed operation, the operator is to monitor the accumulated sludge buildup in the bottom of the clarifier by using the three ¾-inch sample ports to determine the sludge height. Once this sludge level is determined (by trial and error) and if necessary, the sludge transfer pumps (P-1-12-1 and -2) are activated to pump sludge out of the bottom of the clarifiers and over to the Sludge Holding Tank. Proper sludge level control is a critical parameter to be monitored and controlled. Currently, the plant is running without metal precipitation and very little sludge is generated.

Also to aid in floc buildup, the system provides for sludge in the bottom of the clarifiers to be pumped into the flocculation tanks via the sludge recycle pumps (P-1-11-1 and P-1-11-2). Again, this system is not currently operated due to the low volume of metal solids in the influent.

WARNING*:* Before operating a positive displacement pump, be sure to check all upstream valves to make sure that they are open and that there are no blockages. Positive displacement pumps can cause pipes to shatter and even explode.

Each of the sludge pumps has a three-position HAND-OFF-AUTO selector switch at the MCP in series with software switches (AUTO-OFF) on the HMI. Due to the lack of metals precipitation, the selector switches are normally set to the “OFF” position. Periodically, the settled solids in the clarifier are pumped out to the sludge holding tank. This is initiated by operating the air compressor, turning the transfer pump selector switch to the ON position and the software switch to AUTO and visually observing the clarity of the fluid coming over to the sludge holding tank. Both switches are returned to the “OFF” position after the transferred fluid has visually cleared.

NOTE:**The elevation of the sludge level is one of the many operating control points for proper water treatment. Sludge formation is dependent upon many variables such as water composition, chemical feeds, temperature, pH, flow rate, etc. However, insufficient or excessive blow-off of sludge creates conditions which are to be avoided and can cause the precipitates to carry over into the effluent water.**

See Section 8 for the system's control details

3.5 Gravity Filter

The gravity filter originally acted as a polishing sand filter downstream of the clarification process.

3.5.1 Design Criteria

(refer to P&ID CPC-Dwg-010 in Attachment 3)

<u>Gravity Filters (M-1-14-1 & 2)</u>:

Manufacturer	Volcano
Dimensions (Straight Side)	10-ft x 10-ft
Design Flow Rate	250 gpm each
Risers	Eight (8) 4 inch 0.008 slotted PVC risers

Gravity Filter System Tag List (Attachment 20)

3.5.2 Gravity Filter Operation

The clarifier effluent flows by gravity to two gravity settling filters (M-1-14-1 and M-1-14-2). Originally, the filters operated as sand filters in a continuous backwash mode and were intended to polish or remove suspended solids that made their way past the metals precipitation system (clarifier). Currently the sand has been removed and the filters operate by gravity settling.

Each gravity filter is divided into four quadrants with an octagonal, eight-inch header in each quadrant. Each header has two 4-inch-diameter 0.008 screen well riser pipes (10 ft. high). At the risers, solids and fine particles separate from the water stream, and fall to the bottom of the tank. The solids are removed periodically through manual cleaning.

The gravity filters produce a continuous filtrate stream. In order to maintain flow rate or to remove the small volume of suspended solids in the process water, the operator must surge the risers periodically with a pressurized air wand. The frequency of air surging the risers is usually determined by flow rate and the volume of overflow to the recycling tank. In the case where there is a heavy build up of solids on the risers or on the bottom of the tank, the system is emptied and high pressure water and brushes are used to clean the risers.

4.0 VOLATILE ORGANIC CONSTITUENT REMOVAL SYSTEM

4.1 Air Stripping

4.1.1 Design Criteria

(refer to P&ID CPS-Dwg-012, 013 in Attachment 3)

Air Stripper Feed Tank (T-2-1-1, T-2-1-2):

Manufacturer	IMG
Diameter	5.33-ft
Height	8-ft.
Capacity	1225 gallons each
Construction material	HDPE

Level Transmitters (LE/LT-2-1-1, LE/LT-2-1-2):

Manufacturer	Rosemount
Model	Model 1151, Smart Pressure Transmitter

Air Stripper Feed Pumps (P-2-3-1, P-2-3-2, P-2-3-3):

Manufacturer	Flow Serve (Formerly Ingersoll/Dresser)
Model	D814, 4x3x10, Horizontal Centrifugal
Service	250 gpm at 75-ft. TDH
Motor	10 HP, 1755 RPM, 215TEFC
Electrical	460 V, 3-Phase, 60 HZ

Air Stripper Feed Pump Variable Frequency Drive (3)

Manufacturer	Danfoss VLT 4011VT Adj. Freq. Drive
Electric	380v – 460v, 60Hz, 3-phase

Air Stripper Feed Pump Check Valves (SC-600, SC-601 & SC-602):

Manufacturer	Golden Anderson 4” Swing Check Valve
Construction	Flanged, Cast Iron Body, Bronze Seat

Flow Control Valve (LCV 2-1-1):

Manufacturer	Milliken Valve Co.
Model	3” Millcentric Series 601 Eccentric Plug Valve
Materials of Construction	Cast Iron Body, D.I Plug coated with EPDM

Air Stripper (M-2-5-1):

Manufacturer	Carbonair
Model	055540 Packed Column 50 ft. high 5 ft. diameter
Construction (Exterior Finish)	Isopthalic Resin FRP w/Epoxy Gel-coat
Trough Distributor	304SS V-Notch
Collection/Re-distributor	304SS Pan w/ Covered Risers
Ambient Air Temperature	100°F Max. / -20°F Min.
Packing	3.5-inches Lampac Polypropylene (784 cu. Ft).
Packing Height	40-ft.

Water Temperature	65 degrees F Max. / 45 degrees F Min.
Mist Eliminator (Demister Pad)	Koch Engineering 2414 Flexi Mesh
Air to Water Ratio:	
Max. @ Max. Flow	7 cu. ft. per gallon
Min. @ Min. Flow	4 cu. ft. per gallon
Percentage flooding (maximums)	85%
Mist Eliminator Efficiency (maximums)	85%

Blower (M-2-6-1):

Manufacturer	New York Blower m/n 194DH SER20GI
Service	3,500 cfm @ 16-in. sp
Motor:	
- Horsepower	20 HP
- Electrical	230/460 VAC TEFC Motor

Air Stripping System Tag List (Attachment 20)

4.1.2 Air Stripping Operation

During normal plant operation, the treatment stream flows by gravity from the gravity filters to the air stripper feed (ASF) tanks (T-2-1-1, T-2-1-2). From here, the air stripper feed pumps transfer the water to the top of the air stripping tower where it falls through the packed tower countercurrent to forced air. The air stream strips the water droplets of VOCs which are captured in the downstream carbon beds. The water flows to two liquid carbon adsorber feed (L-GACF) holding tanks.

The level in the ASF tanks is continually monitored by the PLC using signals from the level-indicating transmitters (LT-2-1-1 and LT-2-1-2). The operator sets the operating level of the feed tank at the HMI. Using the transmitted signal and the operator set points, the PLC controls the operation of the ASF pumps (P-2-3-1, P-2-3-2, and P-2-3-3) through the pump variable frequency drives. Formerly, the system was controlled through a Level Transmitter - PLC - actuated flow control valve loop. The actuator for this flow control valve has been removed and the valve is normally open.

Each ASF pump is controlled by an ON-OFF switch at the MCC in series with a HAND-OFF-AUTO switch at the MCP and an in-series AUTO-OFF software switch at the HMI.

An ASF tank high-high level condition will shut down the influent feed pumps at the head of the plant. The pumps will not restart until after the high level condition is cleared.

A high level condition in the AS tower sump will sound an alarm and shut off the ASF pumps. After the condition is alleviated, the ASF pumps will restart after a short time delay.

During normal operations, the MCP selector switch remains in the AUTO position for all three pumps while at the HMI, two of the pumps are in the Auto mode (the third pump held in reserve, has its switch in the “Off” position). The pumps operate automatically based on the control logic described above. However, the pumps can be controlled manually when required, by placing the MCP selector switch in the HAND position with the software switch in the ‘Auto’ mode.

For Pump 3, the operator must select which feed tank level control the pump is going to operate under. This is done at the MCP panel at the selector switch labeled “Pump 3 Tank 1/2 Select” with position designations labeled “1” and “2.”

The original design of the plant called for the pH of the ASF pump discharge to be adjusted to between 3 and 5 standard pH units. A static mixer was installed in the ASF pump discharge line to mix the process water with dilute hydrochloric acid prior to entering the air stripping tower. The pH is measured downstream of the static mixer by a pH probe (AE-2-2-1) and controller/transmitter (AIT-2-2-1). The controller transmits an electronic signal to the acid feed system control PLC. The PLC controls the HCl feed pump and the acid feed. A high and low level alarm is activated if the pH is measured outside of the 3 and 5 standard unit set-point range.

Due to the elimination of the caustic additions, the acid addition operation is not necessary or in use. The inline pH meter is still monitored and readings are taken daily.

To achieve optimal air stripping performance through the tower (M-2-5-1) the following conditions must be met:

- The proper air flow (3500 cfm for 500 gpm water) must be delivered by the blower (M-2-6-1),
- the water flow rate is within the design range (less than 500 gpm),
- the pressure drop across the packing is not excessive (greater than 3 to 4 in. WC), and
- there are no air leaks in the system.

As the unit is operated, the packing media may begin to clog due to chemical and bacterial fouling. As the packing media becomes clogged, the pressure drop across the unit will increase, causing a reduction in both air flow and contaminant removal efficiency.

Quarterly aqueous sampling of the GACF discharge for VOCs determines the efficiency of the tower.

> ***NOTE:* It is important to prevent water in the tower sump from entering the blower housing and seizing the blower. The tower is equipped with high level float switch. When a high level occurs, the float sensor sends a signal to the PLC which turns off the air stripper feed pumps and activates an audible alarm. The feed pumps will not restart until the high level condition is resolved. It is wise to periodically check to make sure the float and associated alarm are operational.**

See Section 8 for system control details

4.2 Vapor-Phase Carbon System

4.2.1 Design Criteria

(refer to P&ID CPS-Dwg-013 in Attachment 3)

Vapor-Phase Carbon Adsorber (M-2-7-1 & 2):

Size	16-ft. 8^{1}/2-in. L x 5-ft W x 7^{1}/2-ft. H
Model	Carbon Air Model GPC 70
Bed Area	69.8 sq. ft. per Absorber
Flow Range	3,500 cfm max per adsorber with an

	8-in. WC Pressure Drop @ 3,500 cfm
Carbon Capacity	10,000 lbs each
Carbon Type	4 x 10 Mesh Virgin Activated Carbon
Construction	Carbon Steel (epoxy resin primer and polyurethane finish)

Indeeco Air Heater:

Model	166 Finned Tubular
Service:	
- Max. Outlet Air Temperature	90°F
- Max. Watt Density	65 Watts / sq.in.
- Min. Velocity	982 scfm
Construction	Aluminized Steel

System Tag List (Attachment 20)

4.2.2 Vapor-Phase Carbon System Operation

Plumbing from the air stripper tower to the vapor phase carbon adsorber (VGAC) vessels is configured using two valves that allow the air to enter either vessel. The operator chooses which carbon absorber will be used and then adjusts the valves accordingly. The air from the air stripper tower is introduced into the bottom of the selected absorber and is forced upward under pressure through the grate, wire mesh, carbon bed, and then out the two discharge stacks at the top of the unit. VOCs are removed from the air by adsorption onto the carbon as the air passes through the carbon bed. Moisture condensing from the air stream collects at the bottom of the carbon vessel. It is drained by gravity from the vessel through one-inch drain lines that are normally closed during operations. The stripped air is discharged into the atmosphere. The drier the air and carbon, the more efficient the organic constituent removal.

The system is equipped with an in-line heater in the tower air discharge ducting. Prior to entering the vapor-phase carbon absorbers the contaminated air from the air stripper tower passes through a single-stage air heater, bringing the air temperature to approximately 75 degrees Fahrenheit. The purpose of the air heater is to minimize condensate accumulation in the carbon vessel. The heater is controlled by a three-position selector switch that contains HAND-OFF-AUTO settings located on the local electrical panel. Under normal operating conditions, the selector switch remains in the OFF position. The heater control unit contains a physical interface solid-state temperature controller and a pressure switch. If the temperature of the air raises above a predetermined set-point, or the airflow switch senses low air flow, the heater shuts off and the operator is alerted via audible alarm.

To ensure safe and dependable operation of the vapor-phase carbon units:

- Verify that the drain valve is closed.
- Note the pressure drop across the unit.
- Determine the air flow rate and check the pressure drop chart (see Carbonair Operations and Maintenance Manual) to verify that the system is operating according to the design curve. The carbon absorbers are designed for a nominal airflow of 3,500 cfm, an optimum relative humidity of 50%, and a maximum inlet temperature of 100^0 F.

Performance of the carbon units should be checked periodically by measuring the pressure drop across the unit and evaluating the contaminant removal efficiency of the carbon bed by sampling inlet and outlet gas streams. As the carbon bed adsorbs contaminants and moisture, the pressure drop across the unit may increase. Carbon must be replaced when the concentration of the critical contaminant in the effluent approaches the discharge limit. Carbon replacement frequency will depend on specific operating conditions and contaminant loading. Measurement and sampling frequencies will be dictated by the SAP. See SAP, Project Schedule, Section 4, Table 4.1, Task 12.

Weekly sampling of the VGAC unit influent and effluent air streams with the PID meter indicate if emissions are present. (See Procedure CPS-GPO-005 – Photovac PID Calibration and Operation).

See Section 8 for system control details

4.2.3 Vapor Carbon Change-out

Periodically, the spent carbon will have to be removed and replaced with virgin or regenerated carbon as follows:

- Follow procedure CPS-PSP-004 in Attachment 21
- The spent carbon is removed from the outlets at the top of the vessel, and not through the access openings on the side of the vessel.
- The spent carbon is considered a hazardous waste and must be handled and documented properly.
- Fall protection and proper PPE is required to perform this task
- Ensure that the proper carbon is delivered
- When loading carbon, workers must be protected from breathing the fine carbon dust particles - a particle mask , eye goggles and protective coveralls are REQUIRED.

4.3 Liquid Carbon Adsorber System

4.3.1 Design Criteria

(refer to P&ID CPS-Dwg-014, 016 in Attachment 3)

<u>Carbon Adsorber Feed Tanks (T-2-8-1, T-2-8-2):</u>

Manufacturer	IMG
Diameter	5.33-ft.
Height	8-ft.
Capacity	1,163 Gallons
Construction	HDPE

<u>Level Transmitters (LE/LT-2-8-1, LE/LT-2-8-2):</u>

Manufacturer	Rosemount
Model	Model 1151, Smart Pressure Transmitter

<u>Carbon Adsorber Feed Pumps (P-2-9-1, P-2-9-2, P-2-9-3)</u>:

Manufacturer	Flow Serve (Formerly Ingersoll/Dresser)
Model	D814, 4x3x10, Horizontal Centrifugal
Motor:	
- Horsepower	10 HP, 1755 RPM

- Electrical	460 V, 3-Phase, 60 HZ

Carbon Adsorber Feed Pump Variable Frequency Drive (3)

Manufacturer	Danfoss VLT 4011VT, Ad. Freq. Drive
Electric	380v – 460v, 60Hz, 3-Phase

Carbon Adsorber Feed Pump Check Valves (SC-700, SC-701 & SC-702):

Manufacturer	Golden Anderson
Type	4” Swing Check Valve
Construction	Flanged, Cast Iron Body, Bronze Seat

Flow Control Valve (LCV 2-8-1 and LCV-2-8-2):

Manufacturer	Milliken Valve Co.
Model	3” Millcentric Series 601 Eccentric Plug Valve
Materials of Construction	Flanged, Cast Iron Body, D.I Plug coated with EPDM

Liquid-Phase Carbon Adsorbers (T-2-10-1, T-2-10-2):

Manufacturer	Oehler
Design Pressure	Max 60 PSI
Dimensions	10-ft. dia., 8-ft (side walls) - 14.5-ft (oah)
Design Flow rate	250 gpm
Carbon mesh size	8 (U.S. Mesh Standard)

Treated Water Storage - Tanks (T-2-11-1, T-2-11-2):

Manufacturer	TecTank
Dimensions	18-ft.dia. x 21 ft. height
Capacity	38,000 gallons each at 20 ft
Construction	Flat Bottom, Bolted Steel

Level Transmitters (LE/LT-2-11-1, LE/LT-2-11-2):

Manufacturer	Rosemount
Model	Model 1151, Smart Pressure Transmitter

Liquid Carbon Adsorber Tag List (Attachment 20)

4.3.2 Liquid Carbon Adsorber System Operation

The liquid-phase carbon system (LGAC) is used to remove semi-volatile organic compounds (SVOCs), residual VOCs remaining after air stripping, and other non-specific organics from the treatment stream. Water from the air stripper tower flows by gravity into the carbon adsorber feed (GACF) tanks T-2-8-1and T-2-8-2 where fluid levels are continuously monitored by the PLC using signals from the level indicating transmitters LE/LT-2-8-1 and LE/LT-2-8-2. Using the transmitted signal, the PLC controls the operation of the GACF pumps (P-2-9-1, P-2-9-2, and P-2-9-3) by operator-selected water level set points. If the level in the GACF tanks reaches a high-high level, the ASF pumps will shut down and will not restart until after the high level condition is cleared. The set-points determining the “pump on” and “pump off” levels are entered by the operator at the HMI operator interface.

The GACF pumps are equipped with variable frequency drives to control the pump's speed through feedback from the tank level transmitters. The level in the feed tanks should vary only slightly over time. Formerly, the system was controlled through a Level Transmitter - PLC - flow control valve loop. The actuators for this flow control valves have been removed and the valves are normally open.

Each GACF pump is controlled by a ON-OFF switch at the MCC in series with a HAND-OFF-AUTO switch at the MCP and an in-series AUTO-OFF software switch at the HMI.

During normal operation, the carbon adsorber (CA) vessels (T-2-10-1 and T-2-10-2) operate in parallel. Two of three GACF pumps (P-2-9-1, -2, -3) deliver water to the vessels with flow moving downward through the carbon bed and exiting through the lower drain laterals.

The operator inputs both high (Pump-On) and low (Pump-Off) tank levels at the operator interface (HMI). It is important that the high level setting be set below the blower inlet to the air stripper tower. Water flowing back toward the blower will damage the fan and cause downtime. The low level setting should be set above the pump intake to prevent the pump from becoming air bound.

When the GACF pump #3 is online, the operator must select which tank level will control the pump. This is done at the MCP by a selector switch labeled, "Pump 3 Adsorber 1/2 Select," with position descriptions labeled 1 and 2. The feed pumps can be manually operated by setting the MCP selector switch to *HAND*.

The Carbon Adsorbers T-2-10-1 and T-2-10-2 are each fitted with a pressure control valve (PCV 2-10-1 and 2) on the upstream side of the unit to maintain a steady operating pressure throughout the vessel. Pressure gauges were installed on the inlet and outlet lines to monitor the pressure drop across the carbon bed. When the pressure differential across the filters reaches 5 psi, the filters should be backwashed.

The backwash process is performed by surging the vessels through the bottom lateral sample port with plant air and then backwashing using the injection pumps (P-2-12-1 and/or P-2-12-2). Water is pumped from the treated water tanks through the GAC discharge lateral. Currently, the backwash effluent goes to the plant sump and then pumped to the sludge holding tank. Refer to Standard Operating Procedure CPS-PSP-001 and drawing CPS-Dwg-001 located Attachment 21. Table 3 gives valve information for this procedure.

The objective of backwashing is to remove the carbon fines and suspended solids from the carbon bed. During the process, the operator should periodically check for carbon in the backwash effluent. (The operator needs to be able to distinguish between granular carbon and carbon fines.) If granular carbon is visible in the backwash water, the operator must decrease the backwash flow rate. The backwash water is pumped from the floor drain sump to the sludge holding tank to allow suspended solids in the backwash water to settle overnight. The clear water in the holding tank is then decanted and returned to the head of the plant via the water recycle system.

The solids are vacuumed out of the sump and transferred to open top steel drums for non-hazardous waste disposal. The solids in the sludge tank can be gravity drained to drums or transferred to the filter press.

> ***NOTE:*** **For routine maintenance, backwashing should occur when the pressure differential through the vessel is 5 psi or greater.**

See Section 8 for system control details

4.3.3 Liquid Carbon Change-Out

Over time, the carbon bed will need to be changed-out because it has become fouled with solids, is spent due to absorption of organic compounds, or due to the physical breakdown of the carbon media. Due to the configuration of the carbon vessels (parallel operation), both vessels will require change-out on the same schedule. See procedure CPS-PSP-003 in Attachment 21. Knowledge of the carbon adsorber vessel valving is required. Valving is shown on drawings CPS-Dwg-001 and 014.

The procedure is repeated for the second LGAC unit. Return the valves to normal running position and return the plant to normal operation. Observe and note pressure reading in and out of the vessels and monitor pressure differential across the unit.

5.0 SLUDGE HANDLING and WATER RECYCLING SYSTEMS

5.1 Sludge System

The original GWTS design included the treatment of the groundwater by removing metals and suspended solids through the clarification process. These solids collected in the cone hopper of the plate clarifiers would be transferred to the sludge storage tank for further dewatering. The sludge tank contents are transferred to the filter press, dried and prepared for disposal as dried cake. Other solids collected in the floor drain-sump system are also transferred to the sludge storage tank for dewatering prior to disposal.

5.1.1 Design Criteria

(refer to P&ID CPS-Dwg-022 in Attachment 3)

Sludge Storage Tank (T-3-1-1):	
Diameter	8-ft.dia x 13-ft above cone
Capacity	4,300 gallons at 11.5-ft above cone
Construction	Welded Steel, Cone Bottom w/ Legs
Level Transmitters (LT-3-1-1):	
Manufacturer	Rosemount
Model	Model 1151, Smart Pressure Transmitter
Filter Press Sludge Transfer Pump (P-3-2-1):	
Type	Wilden Air-Double Diaphragm
Model	M4/WPPB/WF/WF/WF
Service	30 gpm vs. 10-ft. TDH

Sludge System Tag List (Attachment 20)

5.1.2 Sludge System Operation

The liquid level in the sludge storage tank is continuously monitored by a level-indicating sensor and transmitter programmed to respond to high and low level set-points. If the level in the sludge storage tank rises or falls below these set-points, a high or low level alarm will signal at the HMI of the condition. Three 1½-inch flanged ports are mounted along the straight side of the sludge storage tank and are valved to decant the clear water to the recycle tank. One 2-inch flanged port on the lower portion of the tank side is also valved and plumbed to the recycle tank. The 2 inch flanged port at the cone bottom drain is tied to a third sludge transfer pump and for hose discharge. The pump is for sludge transfer to the filter press.

Sludge is pumped over to the sludge holding tank from the clarifiers by the sludge transfer pumps (P-1-12-1(-2)). A high-level condition in the sludge tank will shut the pumps off. Backwash effluent from the aqueous-phase carbon vessels is pumped to the sludge holding tank through the plant sump. During normal operations, the amount of solids pumped from the sludge holding tank is small, filling approximately two 55-gallon drums/year. The filter press is currently off-line but is operated as needed.

See Section 8 for system control details

5.2 Water Recycling

5.2.1 Design Criteria

(refer to P&ID CPS-Dwg-020 in Attachment 3)

Recycle Water Storage Tank (T-3-4-1):

Manufacturer	IMG
Dimension	5.3-ft. dia. x 6.75 ft high
Capacity	960 gallons at 6-ft.
Construction	HDPE

Recycle Pumps (P-3-4-1 & P-3-4-2):

Manufacturer	Flow Serve (Formerly Ingersoll/Dresser)
Model	D814, Horizontal Centrifugal
Size	3x2x6F 100gpm
Motor	1.5 HP, 1755 RPM, 460 V, 3-Phase, 60 HZ

Check Valves (SC-1500 and SC-1501):

Manufacturer	Golden Anderson
Type	4” Swing Check Valve
Construction	Flanged, Cast Iron Body, Bronze Seat

Level Transmitter (LT-3-4-1):

Manufacturer	Rosemount, Model 1151, Smart Pressure Transmitter

Recycle system Tag List (Attachment 20)

5.2.2 Water Recycling Operation

Supernatant overflow and decant from the sludge storage tank, water in the floor sump, overflow from the sand filters, and dewatered permeate from filter press operation are collected in recycle tank T-3-4-1. The recycle water is then pumped via P-3-4-1 and P-3-4-2 to the equalization tank.

The liquid level in the recycle tank is continuously monitored by level-indicating sensor LT-3-4-1 and a transmitter. The level sensor in the recycle tank transmits a signal to the PLC which controls the pump operation using set-points entered by the operator. There are four set-points associated with the recycle tank level that the operator can adjust using the operator interface at the HMI. The table below provides set-point descriptions and actions required, in addition to the current set-points in use as follows:

Set-point Description	Action	Current Setting
Recycle Tank High/High Level	Recycle lag pump ON	80% full
Recycle Tank High Level	Recycle lead Pump turns ON	60% full
Recycle Tank Low Level	Recycle lag Pump turns OFF	30% full
Recycle Tank Low/Low Level	Recycle lead Pump turns OFF	25% full

In addition, high level and low level floats switches are also installed in the recycle tank and are connected to the PLC. Alarms are activated if fluid levels in the tanks rise to the high set-point or fall below the low set-point, alerting the operator of an upset condition

The water recycle pumps are controlled by an On-Off switch at the MCC in series with a three-position selector switch (HAND-OFF-AUTO) on the MCP in series with software switches (Auto-Off) on the HMI. As part of the plant containment system, the two pumps are normally placed in the AUTO position that allows the pumps to be operated via the controls noted above. On the MCP is a switch to select which pump will operate as the lead pump.

See Section 8 for control system details

5.3 Filter Press

The filter press system is designed to separate collected sludge from process waters. The sludge as is currently generated is typically carbon fines from backwashing the Carbon Adsorber (CA) vessels, sand from injection well redevelopment, suspended solids from the extracted water or other dirt and non hazardous materials generated in the plant.

Originally the system was set up to dry metal hydroxide sludge generated in the reaction tanks, separated in the clarification system and collected in the sludge storage tank.

The bulk of the sludge dewatering is completed in the sludge storage tank which is set up to decant the supernatant liquor leaving a thickened solids-liquid mixture. This mixture is pumped through the filter press where the solids are further separated from the liquid. The solids are held in filter cloth cavities as filter cake and the liquid is passed to the recycle tank. Compressed air is used to further dry this cake which is then transferred to lined metal drums for disposal as a non-hazardous material.

The press requires the high pressure air service of the air compressor system. The air is used to assist the hydraulic pump which opens and closes the filter chambers of the press. It is also used to operate the feed pump and to monitor the press cycle and conditions.

5.3.1 Design Criteria

(refer to P&ID - CPS-Dwg-030 in Attachment 3)

Filter Press Feed Pump (P-3-2-1), (also noted in Sludge System Sec. 5.1.1):

Type	Wilden Air-Double Diaphragm
Model	M4/WPPB/WF/WF/WF
Service	30 gpm at 10-ft. TDH

Filter Press (FP-3-3-1):

Type	Durco Plate and Frame, EPG630/32-20
Net Filter Volume	6.1 cu. ft.
Design Pressure	100 psig
Number of Chambers	23 plus connection plate
Cake Thickness	1.25-in.
Plate Shifter	Semi-Auto
Filter Cloth Material	Polypropylene, Style 46XK2 with Latex Edging
Gasket Material O-Ring	EPDM
Gasket Material Plates	EPDM

Hydraulic Type/Model	Air/Oil J-38602G
Pneumatic Pump Type	H35035A02A (M71)
Closure Ram Size / Quantity	5-in. Bore x 18-in. Stroke, 2-in. Diameter Rod
Maximum Hydraulic Pressure	3,000 psig
Additional Features	Incremental Pump, Control and Hopper

Filter Press System Tag List (Attachment 20)

5.3.2 Filter Press Operation

The sludge level in the sludge storage tank is manually monitored. When required, the sludge can be pumped to the filter press with the filter press feed pump or can be manually drained through a hose to drums.

The filter press is run from the local filter press control panel (10-LCP-3-1). The system can be operated in automatic mode or in manual mode. The operation of the air compressor and the high pressure air system is required. The air is needed to close the press and to operate the sludge transfer pump, (refer to the Durco Filter Press Operation and Maintenance Manual in the control room files).

In order to perform filter press operation, the operator must open the appropriate valves at the sludge storage tank, at the sludge pump, on the HP air system and on the press influent and effluent manifold.

The filtrate from the filter press is plumbed to the recycle tank. The filter press cycle (press load) is run until the feed pump struggles to continue pumping. At this point the pump is stopped and the press is put into the drying mode. When dry, the press is opened and the filter cake is dropped into the hopper. The cake is then transferred to a lined 55-gallon steel drum..

See section 8 for system control details. In Attachment 21 are procedures for the Automatic Operation of the Filter Press (CPS-PSP-006).

NOTE: It should be noted that due to the lack of solids generated from the treatment of the groundwater, the filter press system is used only as needed.

5.4 Floor Drain and Sump System

The floor drain and sump system is part of the plant wide spill/overflow containment system. As such, the system is required to be in automatic operation mode while the plant is unmanned.

5.4.1 Design Criteria

(Refer to PID CPS-Dwg-032 in Attachment 3)

<u>Sump Pump P-3-7-1</u>
Gould submersible sewage pump – series WE
Model WE0534HH, cast iron with 2 inch discharge
Discharge line – 2 inch flexible reinforced PVC hose

<u>Sump Alarm LAHH-3-7-1</u>
Ronin single point annunciator – series X19

Model X19-GP-115-1 with audible and visual signals

Sump Water Level Switch LSH-3-7-1, LSL-3-7-1, LSHH-3-7-1
SJE Rhombus Controls – sensor float switch
HL – model 1002128 NO
LL – model 1002125 NC

Floor Clean Out Ports FCO
Josam Kleenatron flush floor clean outs – series 57000-Z
Model – 3 inch with scoriated plain secure cover, leveleeze collar, and ABS Plug

Pre Sump Tank T-3-7-1B
Vertical cylindrical coated steel tank
Flat bottomed, open top with lip, bolted steel plate cover with ports
24 inch diameter x 96 straight side wall (~190 gallons)
6 inch influent and effluent ports at 60 inch below top

Sump Tank T-3-7-1
Vertical cylindrical coated steel tank
Flat bottomed, open top with lip, bolted steel plate cover, 26 inch manway, and ladder
60 inch diameter x 96 straight side wall (~1100 gallons)
6 inch influent port at 60 inch below top

Floor drain and sump system tag list (Attachment 20)

5.4.2 Floor Drain System Description

The floor drain system in the GWTP consists of 10 floor drains (FD), 4 elevated hub drains (HD), a fiberglass trench drain, 13 vents and 6 floor cleanout ports (FCO). All are connected below the concrete plant floor to the drainage piping system. The system drains to the outdoor sump system.

A second drainage system connects the floor drain of the control room and the sanitary discharges from the sinks and toilet to the sanitary public sewer system connection. The sanitary drainage system has 2 floor cleanout ports.

The drains consist of flush floor grates connected to below-surface drain ports connected to the piping system. The piping manifold conveys the water and waste by gravity to the outdoor, below-ground sump. The floor cleanouts are below-surface plugged connections to the piping manifold. The vents are open ended connections to the piping manifold which rises through the floor to a suspended manifold which penetrates the roof and is open to the atmosphere. The hub drains (HD) collect water from specific equipment (e.g. air compressor drains, HVAC, pump mechanical seals). These drains are above-surface, screened bowls piped to the floor drain manifold

The sump system consists of 2 below-surface tanks. The first tank (~190 gal.) is a flow-through tank used to collect debris and heavy solids; this tank drains to the main sump (~1100 gal). The main sump contains a submersible pump which discharges to the plant water recycle system through a flexible hose connection. A level float switch system controls the pump operation. The main sump has a 30 inch man-way and access ladder.

The pump can be operated in manual or auto mode. In manual mode, the pump will continuously run until there is a high-high level condition in the Recycle Water Tank. In the Auto mode, the pump will operate by level control. A low level in the sump will shut off the pump and a high level in the sump will activate the pump. A high-high level condition in the sump will activate an alarm system in the control room.

See Section 8 for system control details

6.0 CHEMICAL FEED SYSTEMS

See Attachment 9 for detailed chemical handling and solution make-up procedures.

6.1 Potassium Permanganate Feed System

6.1.1 Design Specifications
(refer to drawing CPS-Dwg-026 in Attachment 3)

Potassium Permanganate Feed Tank (T-5-1-1):

Type	Flat bottom, dome top, HDPE
Capacity	480 gallons
Dimension	46" dia. X 69" sidewall

Potassium Permanganate Mixer (M-5-1-1):

Model	Sharpe G-033, Gear-Driven
Motor	1/3 HP, 1750 RPM
Electrical	110 V, 1 Phase, 60 HZ

Potassium Permanganate Feed Pump (P-5-1-1, P-5-1-2):

Model	Milton Roy LMI Series A
Capacity	2 gph at 50 psi
Motor: Electrical	110V, 1 Phase, 60 HZ

Level Switch (LSH/LSL-5-1-1):

Manufacturer	Ametek Drexelbrook, 506-3000-004-00
Model	Series 506-3000 Multipoint II Level Controller using 406-3000 electronics

Solenoid Valve (FV-5-1-1):

Manufacturer	Automatic Switch Co.
Model	½" Red-Hat II, c/n 8210G94

Permanganate feed system tags (Attachment 20)

6.1.2 Potassium Permanganate Chemical Feed System
(currently off-line)

As designed, potassium permanganate ($KMn0_4$), a strong oxidizing agent, is used to aid in the precipitation of metals from the groundwater processed through the treatment plant. Chemical feed pumps P-5-1-1 and P-5-1-2 deliver dilute $KMnO_4$ from the potassium permanganate makeup tank T-5-1-1 to the two reaction tanks where, when required, metal hydroxides are formed. This diluted solution is metered into the reactor tanks at a rate proportional to the plant flow rate.

In order to make up the solution, concentrated dry potassium permanganate is manually added to water in the makeup/feed tank through an 18-inch man-way, (see procedure CPS-PSP-002 – Attachment 9).

To begin the process, the operator activates the START switch on the local electrical control panel to energize solenoid valve FV-5-1-1 that allows potable water to enter the day tank. A timer is incorporated into the mixer control circuit that is set to automatically stop the mixer motor after a set time period that coincides with the time required to add and properly mix the chemical. The water level in the tank is monitored and controlled by high- and low-level switches LSH/LSL-5-1-1. At a low fluid level, the feed pump motors stop and a low level alarm sounds. At a high fluid level in the tank, the solenoid valve automatically closes to prevent overflow of the tank.

Each chemical feed pump has a two-position START/STAND-BY switch on the local electrical control panel and a HAND-OFF-AUTO selector switch at the MCP that operates the pump. The chemical feed dosage amount has to be determined in the field and the feed pump calibrated to provide the required chemical dosage proportional to total plant flow.

> ***NOTE:*** **In order to restart the chemical feed pumps, the operator has to reset the pump control at the local control panel**.
>
> ***WARNING:*** **As with any hazardous material, caution is required when handling potassium permanganate.**

See Section 8 for system control details

6.2 Sodium Hydroxide Feed System

6.2.1 Design Specifications

(refer to drawing CPS-Dwg-027 in Attachment 3)

Sodium Hydroxide Feed Tank (T-5-2-1):	
Type	Dome top, flat bottom, vertical HDPE
Capacity	378 gallons
Dimensions	46” dia. X 69” sidewall
Sodium Hydroxide Mixer (M-5-2-1):	
Manufacturer	Sharpe, 2E5-30, Gear Driven
Motor	Reliant 1/3 HP, 1750 RPM
Electrical	230 V, 3Phase, 60 HZ
Foil	12” dia. Hyflo II impeller, 350 rpm
Sodium Hydroxide Feed Pump (P-5-2-1. P-5-2-2):	
Manufacturer	Milton Roy, LMI metering pump Series A
Capacity	Max. 2 gph
Motor- Electrical	120 V, 1 Phase, 60 HZ
Level Switch (LSH/LSL-5-2-1):	
Manufacturer	Ametek Drexelbrook
Model Number	506-3000-004-00
Model	Series 506-3000 Multipoint II Level Controller using 406-3000 electronics

<u>Solenoid Valve (FV-5-2-1):</u>

Manufacturer	Automatic Switch Co.
Model	½ “Red-Hat II, 8210G94

Sodium Hydroxide System Tag List (Attachment 20)

6.2.2 Sodium Hydroxide (NaOH) Feed System Operation

(the system is currently off-line)

As designed, a dilute sodium hydroxide or caustic solution (25% NaOH) is used to increase the influent stream pH and to facilitate metals precipitation. Tank T-5-2-1 is used for the make-up and storage of the dilute caustic solution. Chemical feed pumps P-5-2-1 and P-5-2-2 are used to deliver the solution to the two reaction tanks (T-1-8-1 and T-1-8-2). This feed system can also be used to transfer caustic to the carbon adsorber feed tanks T-2-8-1 and T-2-8-2 when required to raise the pH of the treatment stream to meet discharge criteria.

The system is designed to use caustic in a 25% w/w solution. The operator mixes the 50% sodium hydroxide with non-potable water in equal amounts to make a 25% solution (see procedure CPS-PSP-002). The operator begins the operation by activating the START switch on a local electrical control panel which energizes a solenoid valve allowing potable water to enter the day tank. A timer is incorporated into the mixer control circuit that is set to automatically stop the mixer motor after a set time period that coincides with the time required to add and properly mix the chemical. The water level in the day tank is monitored by a high and low level electrical sensors and switches. At a low fluid level, the feed pump motors stop and a low level alarm sounds. At a high fluid level in the tank, the water solenoid valve closes to prevent overflow of the tank.

Each chemical feed pump has a two-position START/STANDBY switch on the local electrical control panel (10-LCP-5-2), a HAND-OFF-AUTO selector switch on the MCP and a Auto-Off software switch at the HMI that operate the pumps. The chemical feed pump is set to operate according to measured pH of the water in the reaction tank(s). A 4-20 milliamp signal from the pH control transmitter is used to adjust the proper amount of caustic feed to meet the pH set-points determined and entered by the operator at the HMI.

Currently pH additions are not required due to the low level of metals in the groundwater and a lower pH discharge limit. This pump station is currently off-line. If the groundwater characteristics change or the discharge permit level for pH is raised and requires the sodium hydroxide feed system to operate again, the system will be put into operation.

> ***NOTE:*** **In order to restart the chemical feed pumps, the operator has to reset the pump control at the local control panel.**
>
> ***WARNING:*** **As with all hazardous materials, caution is required when handling sodium hydroxide solutions.**

See Section 8 for system control details

6.3 Hydrochloric Acid Feed System

6.3.1 Design Specifications

(refer to drawing CPS-Dwg-028 in Attachment 3)

Hydrochloric Acid Feed Tank (T-5-3-1):

Type	Vertical, HDPE, domed top, flat bottom
Capacity	728 gallons
Dimensions	64” dia. x 54” side

Hydrochloric Acid Mixer (M-5-3-1):

Manufacturer	Sharpe G-033, Gear-Driven
Motor	Reliance 1/3 HP, 1750 RPM
Electrical	115 V, 1-Phase, 60 HZ
Foil	12” Hyflo II impeller, ¾” shaft, 350 rpm

Hydrochloric Acid Feed Pump (P-5-3-1, P-5-3-2):

Manufacturer	LMI metering pump series A 961
HCL Capacity	2GPH
Motor: Electrical	110V, 1 Phase, 60 HZ

Level Switch (LSH/LSL-5-3-1):

Manufacturer	Ametek Drexelbrook
Model Number	506-3000-004-00
Model	Series 506-3000 Multipoint II Level Controller using 406-3000 electronics

Solenoid Valve (FV-5-3-1):

Manufacturer	Automatic Switch Co.
Model	½” Red-Hat II - 8210G94

HCl feed system tag numbers in Attachment 20

6.3.2 Hydrochloric Acid Feed System Operation

(System is currently off-line)

A hydrochloric acid (HCl) makeup tank and two chemical feed pumps are used to make-up, store and deliver dilute acid to the air stripper feed pump discharge line. The addition is upstream of a static mixer (M-2-4-1) prior to flowing into the air stripping tower. The acid is needed to lower the pH of the process water and prevent fouling in the tower. In addition, the acid is used to clean the mist eliminator and packing in the stripping tower during preventive maintenance activities.

The operator begins the process by activating the START switch on a local electrical control panel (10-LCP-5-3) that energizes a solenoid valve, allowing potable water to enter the day tank. A timer is incorporated into the mixer control circuit that is set to automatically stop the mixer motor after a set time period that coincides with the time required to add and properly mix the chemical, (see procedure CPS-PSP-002). The water level in the day tank is monitored and controlled by high- and low-level electrical sensors and switches. At a low fluid level, the feed pump motors stop and a low-level alarm sounds. At a high fluid level in the tank, the water solenoid valve closes to prevent overflow of the tank.

Each chemical feed pump has a two-position START/STANDBY switch on the local electrical control panel, a HAND-OFF-AUTO selector switch on the MCP, and an Auto-Off software switch on the HMI that operate the pumps.

> ***NOTE:* In order to restart the chemical feed pumps, the operator has to reset the pump control at the local control panel**.

The chemical feed pump is set to operate according to measured pH of the treated water prior to entering the air stripping tower. A 4-20 milliamp signal from the pH control transmitter is used to adjust the acid feed to meet the pH requirement of the water. Currently the process water is of suitable pH and acid additions are not required. The system is off line.

> ***WARNING:* As with all hazardous materials, caution is required when handling Hydrochloric Acid solutions. See procedure CPS-PSP-002 in Attachment 9**

See Section 8 for system control details

6.4 Polymer Feed System

6.4.1 System Specifications

(Refer to drawing CPS-Dwg-029)

<u>Polymer Feed Tanks T-5-4-1(T-1100) and T-5-4-2 (T-1101)</u>:

Manufacturer	IMG
Type	Vertical, HDPE, domed top, flat bottom
Capacity	728 gallons
Dimensions	5.3-ft. diameter x 5.3-ft. high

<u>Polymer Mixer (M-5-4-1 and M-5-4-2):)</u>

Model	Sharpe 2E5-30, Gear Driven
Motor	Reliance P14H3596, 2 HP, 1750 rpm
Electrical	460 V, 3-Phase, 60 HZ
Gear Box	Sharp 935 CDSF single worm 30:1
Prop	2” 316ss shaft with 36: Hiflo II impeller

<u>Polymer Feed Pump (P-5-4-1, P-5-4-2 and P-5-4-3)</u>:

Model	Vector 2002, Peristaltic
Service/Capacity	2 gph/15 gph
Motor	1/6 HP, 1750 RPM, 90 VDC

<u>Level Switch (LSH/LSL-5-4-1 and LSH/LSL-5-4-2):</u>

Manufacturer	Ametek Drexelbrook
Model Number	506-3000-004-00
Model	Series 506-3000 Multipoint II Level Controller using 406-3000 electronics

Solenoid Valve (FV-5-4-1 and FV-5-4-2):

Manufacturer	Automatic Switch Co.
Model	½” Red-Hat II - 8210G94

See attachment 20 for Polymer System Equipment tag list

6.4.2 Polymer Feed System Operation

(not currently used)

The Polymer Feed System consists of makeup tanks with mixers and three feed pumps that deliver dilute polymer solution to the flash mix tanks T-1-9-1 and T-1-9-2 at the clarifiers. The polymer feed system is used to flocculate the metal hydroxide formation and aid the precipitation process in the clarifier units JCL-1-12-1 and JCL-1-12-2. One pump is available on stand-by while the other two pumps operate. Concentrated polymer in powder or liquid form is diluted with water and stored in the polymer day tanks.

The operator begins the make up process by activating the START switch on the local electrical control panel (10-LCP-5-4) that energizes a solenoid valve allowing potable water to enter the day tank. A timer is incorporated into the mixer control circuit that is set to automatically stop the mixer motor after a set time period that coincides with the time required to add and properly mix the polymer. While the tank is filling with water, the dry polymer is added at the top of the tank through the funnels affixed to each tank. The water level in the day tank is monitored and controlled by high- and low-point level sensors and switches. At a low fluid level, the feed pump motors shut off and a low-level alarm sounds. At a high fluid level in the tank, the solenoid valve closes to prevent overflow of the tank. A high-high set-point has been included that, when activated, sounds an alarm that alerts the operator that the solenoid valve has not closed and that an overflow accident is imminent.

Each chemical feed pump has a three-position HAND-OFF-AUTO switch on the local electrical control panel, a HAND-OFF-AUTO switch on the MCP, and an Auto-Off software switch at the HMI that operate the pumps. The pump used to feed either flash mix tank must be manually set by the operator.

> ***NOTE:*** **In order to restart the chemical feed pumps, the operator has to reset the pump control at the local control panel.**

When the pumps are set in the AUTO mode, a PLC in the Local Control Panel meters the dilute polymer at a rate proportional to the total plant flow. The operator may elect to control the polymer manually by simply selecting the HAND mode that allows control of the pump by using the speed control knobs on the Local Control Panel.

> ***CAUTION:*** **The viscosities of polymers are extremely high and CAUTION must be taken if a spill occurs. It is very slippery! (See Attachment 9 – Chemical Unloading procedures or CPS-PSP-002)**

See Section 8 for system control details

6.5 Supply and Chemical Usage Table

Chemical Feed	Solution %	Make up Addition to 1 gallon water	Gallons Per Day	Calculated Chemical Usage
Potassium Permanganate	10	0.92 lbs	0	0
Sodium Hydroxide	25	1.0 gal	0	0
Hydrochloric Acid	17	1.0 gal	0	0
Polymer	5	0.42 lbs	0	0

* Actual feed rate will be determined in the field during the system startup period.

6.6 Material Safety Data Sheets

Material Safety and Data Sheets (MSDS) for all the above-listed chemicals will be available on-site for review and reference and are located in the plant MSDS manual.

7.0 TREATED WATER STORAGE AND REINJECTION SYSTEM

7.1 System Specifications

(refer to P&ID CPS-Dwg-018 in Attachment 3)
(Construction logs for the wells and galleries can be found in Attachment 14)

Treated Water Tanks (T-2-11-1, T-2-11-2)

Manufacturer	TecTank, bolted steel, flat bottomed, cone top
Spec.	41,000 gallon, 18.5-ft dia. X 21-ft sidewall

Level Transmitters (LT-2-11-1, 2):

Manufacturer	Rosemount
Model	Model 1151, Smart Pressure Transmitter

Injection Pumps (P-2-12-1, P-2-12-2, P-2-12-3):

Manufacturer	Flow Serve (Formerly Ingersoll/Dresser)
Model	D814 6x4x8, horizontal centrifugal
Service	500gpm vs. 44-ft. TDH
Motor	10 HP, 460 V, 3-Phase, 60 HZ

Injection Pumps 1&2 Check Valves (SC-1403 & SC-1404):

Manufacturer	Golden Anderson
Type	6" Swing Check Valve
Construction	Flanged, Cast Iron Body, Bronze Seat

Injection Pump 3 Check Valve (SC-1405):

Manufacturer	Hayward
Type	6" Swing Check Valve
Construction	Flanged, PVC with Teflon seat

Magnetic flow meter (FE/FT-2-12-1):

Manufacturer	Krohne
Model	Aquaflux F IFC 020 D
Size	4 inch diameter

Injection Well Flowmeters (FE/FT-2-14-1, FE/FT-2-14-2, FE/FT-2-14-3, FE/FT-2-14-4: (not in service)

Manufacturer	GF Signet
Model	515 paddle wheel element 8515 transmitter

Injection Well Level Sensors (LSHH-2-15-1 LSHH-2-15-2, LSHH-2-15-3, LSHH-2-15-4):

Manufacturer	KPSI.
Model	Submersible Transducer with 4-20 mA open face transmitter

Injection System Tag List (Attachment 20)

7.2 Treated Water Reinjection Operation

Effluent from the liquid-phase carbon absorbers is stored in the treated-water storage tanks and then is re-injected back into the aquifer by an injection pumping system consisting of two pumps (a third pump is off-line) and a pipe network. Under normal operation, treated water is pumped through a main header and distribution manifold into four injection wells and two infiltration galleries. As part of the injection pump discharge header, a flow meter (FM-2-12-1) measures instantaneous flow rate, as well as totalizing total flow volume.

Downstream of this flow meter, the header is split into four manifold pipes, one for each of the four injection well systems. In the well field, influent to well 1 (IW-1) is split and valved to feed gallery 1(IG-1). Influent to well 3 (IW-3) is split and valved to feed gallery 3 (IG-3).

Each of these manifold pipes has an in-line flow meter (FE-2-14-1 though FE-2-14-4) to record flow to the individual well systems. The four manifold pipes have throttling valves that allow the operator to control the flow rate to each individual well system. Generally, the operation of both pumps are required to meet discharge requirements of the plant. Influent to each gallery is a metered using a flow totalizer.

The fluid level of each Treated Water Storage (TW) tank is continuously monitored by electronic level-indicating transmitters LT-2-11-1 and LT-2-11-2. These level monitors are programmed for high-level and low-level set-points, set by the operator at the HMI. These set points control the operation of the pumps. If the level in a feed tank rises above a pre-set High-High level, an alarm warns the operator of an upset condition and the LGAC feed pumps will shut down.

Each injection pump is controlled by an On-Off switch at the MCC in series with a HAND-OFF-AUTO selector switch at the MCP in series with an Auto-Off software switch at the HMI. Normally, the switch for the injection pump is set to the AUTO position so that pump operation is controlled by the level sensor set-points. However, the injector pumps can be manually operated by setting the selector switch to the HAND position. During start-up and troubleshooting of the system, the operator has the option to recycle the water from the treated water tanks back to the head of the plant into the equalization tank.

Each injection well has a pressure transducer for level monitoring. The signal from the transducer is transmitted to the PLC and the well water level is indicated on the HMI. A high level set point is inputted into the PLC and if the level in the injection well rises above this set-point, an alarm will be indicated. This alarm indicates that the well is near overflow conditions. It is necessary for the operator to balance the flow of water to each well to avoid an overflow condition.

Each infiltration gallery has two piezometer pipes. At each pipe a manual reading of the water level in the gallery can be taken.

See Section 8 for system control details

8.0 PROCESS CONTROL SYSTEMS

This section describes the controls in place to operate the plant treatment processes.

8.1 Control System Description

(refer to P&ID CPS-Dwg-024 in Attachment 3)

8.1.1 Extraction Well Pumps and Equalization Tank

There are three extraction well pumps controlled from the motor control panel through the Main Control Panel (MCP) with PLC controls and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. A description of the extraction well pump operations is as follows:

At the MCP, each pump has a Hand-Off-Auto (H-O-A) hand switch:
- HS-1-1-1 for Extraction Well #1 pump P-1-1-1
- HS-1-1-2 for Extraction Well #2 pump P-1-1-2
- HS-1-1-3 for Extraction Well #3 pump P-1-1-3

In the Auto Mode, the pumps will operate based on high and low fluid levels in the Equalization Tank (T-1-3-1). The tank is equipped with a Rosemont Pressure Transducer (LE/LT-1-3-1) which translates pressure on the transducer into tank water level. The operating levels are operator set at the HMI and controlled through the programmable logic controller (PLC) at LIC-1-3-1. At tank High Level (LSH-1-3-1) the extraction pumps will shut off. At tank Low Level (LSL-1-3-1) the extraction pumps will start. In the Hand mode, the pumps will run continuously until the tank High-High Level condition (LSHH-1-3-1) cuts out the pump. The controller also includes timers for protection against instantaneous start up of the pumps in case of a power failure or pump restart. Each pump has a *Delay On* restart timer KC-1-3-1(2, 3). Delay times are operator set in PLC.

Extraction well discharge flow is monitored and totalized by the PLC and is sensed by inline Signet flow meters:
- Extraction Well 1 monitor - FQI-1-1-1 sensor FE/FT-1-1-1
- Extraction Well 2 monitor - FQI-1-1-2 sensor FE/FT-1-1-2
- Extraction Well 3 monitor - FQI-1-1-3 sensor FE/FT-1-1-3

The tank Low-Low Level condition (LSLL-1-3-1) will shut off the Influent Pumps (P-1-4-1(2, 3)). The Equalization Tank is also equipped with float switches (LSHH-1-3-1-2 and LSLL-1-3-1-2) set to alarm in high level (LAHH-1-3-1-1) and low level (LALL-1-3-1-1) conditions. The EQ tank mixer is equipped with and controlled by a series of switches, to include an On/Off switch at the MCC, a Hand/Off at the MCP, and a keyed E-Stop at the tank.

8.1.2 Influent Pumps

There are three influent pumps controlled from the Siemens Motor Control Cabinet through the Main Control Panel (MCP) with PLC controls and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a Hand-Off-Auto (H-O-A) hand switch:

- HS-1-4-1-2 for influent pump #1 P-1-4-1

- HS-1-4-2-2 for influent pump #2 P-1-4-2
- HS-1-4-3-2 for influent pump #3 P-1-4-3

In the Auto Mode, the pumps will operate based on high and low water levels in the Equalization Tank (T-1-3-1). The tank is equipped with a Rosemont Pressure Transducer (LE/LT-1-3-1) which translates pressure on the transducer into tank water level. The operating levels are operator set at the HMI and controlled through the programmable logic controller (PLC) at LIC-1-3-1. In the Hand mode, the pumps will run continuously until the EQ Tank experiences a Low-Low Level (LSLL-1-3-1) condition or the ASF tank a High-High Level (LSHH-2-1-1(2)) condition. The pumps will operate when the EQ tank is above the tank Low Level (LSL-1-3-1). The pumps will shut off if the Air Stripper Feed (ASF) tanks are at High–High Level (LSHH-2-1-1(2)). The pumps will cut out if the EQ Tank goes to Low-Low Level (LSLL-1-3-1).

Influent flow is monitored at the PLC (FIC-1-6-1(2)) for each treatment train and is sensed by inline Brooks flow meters (FE/FT-1-6-1(2). Desired flow for each treatment train is operator set at the HMI and is controlled through the PLC by the variable frequency drives for each pump motor. Pump 1 flow is controlled at train 1 (FIC-1-6-1) and pump 2 flow is controlled at train 2 (FIC-1-6-2). Also at the MCP is selector switch HS-1-5-1. It is used indicate which flow sensor and treatment train is to be used to monitor the discharge of influent pump 3. The choice is manually set at the MCP.

The controller also includes timers for protection against instantaneous start up of the pumps in case of a power failure or pump restart. Each pump has a Delay- On- Restart timer KC-1-4-1(2, 3). Delay times are operator set at the HMI. The signals to and from the flow controllers are sent to the potassium permanganate and polymer feed systems. The feed rates for these systems are based on treatment train flows.

8.1.3 Reaction Tanks

The system is equipped with mirror image tanks. The reaction tanks are equipped with mixers which are controlled from the MCP with On-Off hand switches:

- Reaction Tank 1 T-1-8-1 Mixer M-1-8-1 Switch HS-1-8-1-2
- Reaction Tank 2 T-1-8-2 Mixer M-1-8-2 Switch HS-1-8-2-2

In the Hand position the mixers will run continuously. The reaction tanks are also equipped with pH control. Each tank has a pH probe and a transmitter (AE/AIT-1-8-1(2)) which sends a signal the PLC and controller (AIC-1-8-1(2)). High and low pH set points are operator set at the HMI. The controller output is sent to the sodium hydroxide pump controls. The controller also allows for alarms. A high-high level condition (ASHH-1-8-1(2)) will signal the condition (AAHH-1-8-1-2(-2-2). A low-low level condition (ASLL-1-8-1(2) will signal the condition (AALL-1-8-1-2(-2-2).

8.1.4 Clarifier System

There are twin clarification systems with the reaction tanks at the head of each. Each clarification system consists of a 4-tank flow through system. Each train has in-line, a flash mix tank with a mixer, a floc tank with a mixer and a plate settling clarifier with two sludge pumps and a sand-filter settling tank. The mixers are controlled at the MCP with On-Off hand switches:

- Flash Tank 1 T-1-9-1 Mixer M-1-9-1 Switch HS-1-9-1-2
- Flash Tank 2 T-1-9-2 Mixer M-1-9-2 Switch HS-1-9-2-2
- Floc Tank 1 T-1-10-1 Mixer M-1-10-1 Switch HS-1-10-1-2
- Floc Tank 2 T-1-10-2 Mixer M-1-10-2 Switch HS-1-10-2-2

In the On mode, the mixers will run continuously. Each clarifier (JCL-1-12-1(2)) has 2 sludge pumps (recycle and transfer) which are controlled from the Main Control Panel (MCP) with PLC controls and through the SCADA Human Machine Interface (HMI). The Sludge Recycle Pumps (P-1-11-1(2)) are operated by Hand-Off-Auto selector switches HS-1-11-1(2) and Auto-Off software switches. In the Auto mode, the pumps are run based on interval-duration timers (KC-1-11-1(2)). The intervals and durations are operator set. In the Hand mode, the pumps will run continuously. The Sludge Transfer Pumps (P-1-12-1(2)) are operated by Hand-Off-Auto selector switches HS-1-12-1(2) and Auto-Off software switches. In the Auto mode, the pumps are also run based on interval-duration timers (KC-1-12-1(2)). The pumps are cut out when the Sludge Holding Tank T-3-1-1 is at High-High Level condition (LSHH-3-1-1). In the Hand mode, the pumps will run continuously. The AS Tower is equipped with a forced air blower. It is controlled by an On/Off switch at the MCC. The absence of flow to the tower will shut the blower off.

8.1.5 Air Stripping System

There are three Air Stripper Feed (ASF) pumps controlled from the motor control center (MCC) through the Main Control Panel (MCP) with PLC controls and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a Hand-Off-Auto (H-O-A) hand switch:

- HS-2-3-1-2 for ASF pump #1 P-2-3-1
- HS-2-3-2-2 for ASF pump #2 P-2-3-2
- HS-2-3-3-2 for ASF pump #3 P-2-3-3

In the Auto Mode, the pumps will operate based on high and low fluid levels in the ASF Tanks (T-2-1-1(2)). The tank is equipped with a Rosemont Pressure Transducer (LE/LT-2-1-1(2)) which translates pressure on the transducer into tank water level. The operating levels are operator set at the HMI and controlled through the programmable logic controller (PLC) at LIC-2-1-1(2). In Hand mode, the pumps will run continuously until LSLL-2-1-1(2) or LSHH-2-8-1(2) conditions are reached. The controller also includes timers for protection against instantaneous start up of the pumps in case of a power failure or pump restart. Each pump has a *Delay On* restart timer KC-2-3-1(2, 3). Delay times are operator set at the HMI. A high level condition in the AS Tower or in the L-GAC feed tanks will signal an alarm and shut off the ASF pumps.

The level controller (LIC-2-1-1(-2)) will also signal a high-high level condition in the ASF tank. This condition will shut down the influent pumps (P-1-4-1(-2, -3)). Tank high and low level set points establish the operating range of the tank at the PLC. The tank level is controlled through the variable frequency drive pump control. The range of the drive is set for 30 Hz to 60 Hz. The speed of the pumps corresponds to the range of the tank level set points. At higher tank levels the pump will pump faster to maintain the proper level.

Float switches (LSHH-2-1-1-2(2-2) and LSLL-2-1-1-2(2-2)) in the tanks are set to alarm the tank High-High (LAHH-2-1-1-1(-2)) and Low-Low (LALL-2-1-1-1(-2)) conditions. At the MCP is selector switch HS-2-1-1 used to direct which tank's level controls will operate on ASF pump #3. The system is equipped with a pH control on the pump discharge. In-line pH probe and transmitter (AE/AIT-2-2-1) senses the condition which is monitored at the PLC by controller AIC-2-2-1. The high and low operational set points are operator set. The controller output is sent to the Hydrochloric Acid feed control system. At the controller the High-High pH value (ASHH-2-2-1) and Low-Low pH value (ASLL-2-2-1) are set. These values set the high-high pH alarm (AAHH-2-2-1) and low-low pH alarm (AALL-2-2-1). Both alarms are combined into a “pH Out of Range” alarm (AA-2-2-1-2) at the PLC.

8.1.6 Carbon Adsorber Feed (Liquid)

There are three Carbon Adsorber Feed (GACF) pumps controlled from the motor control panel through the Main Control Panel (MCP) with PLC controls and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a Hand-Off-Auto (H-O-A) hand switch:

- HS-2-9-1-2 for GACF pump #1 P-2-9-1
- HS-2-9-2-2 for GACF pump #2 P-2-9-2
- HS-2-9-3-2 for GACF pump #3 P-2-9-3

In the Auto Mode, the pumps will operate based on high and low fluid levels in the GACF Tanks (T-2-8-1(2)). Each tank is equipped with a Rosemont Pressure Transducer (LE/LT-2-8-1(2)) which translates pressure on the transducer into tank water level. The operating levels are operator set at the HMI and controlled through the programmable logic controller (PLC) at LIC-2-8-1(2). In Hand mode, the pumps will run continuously until LSLL-2-8-1(2) or LSHH-2-11-1(2) conditions are reached. Each tank’s high LSH-2-8-1(-2) and low LSL-2-8-1(-2) level set points establish the operating range of the tank at the PLC. The tank level is controlled the through variable frequency drive pump control. The range of the drive is set for 30 Hz to 60 Hz. The speed of the pumps corresponds to the range of the tank level set points. At higher tank levels the pump will pump faster to maintain the proper level.

A high-high level condition LSHH-2-8-1(-2) in the feed tanks will shut off the ASF pumps. A low-low level condition LSLL-2-8-1(-2) in the feed tanks will shut off the GACF pumps. A high-high level condition LSHH-2-11-1(-2) in the treated water tanks (T-2-11-1(-2)) will shut off the GACF pumps. Each tank is equipped with a high-high level float switch LSHH-2-8-1-1(-2-1) which will signal a tank high-high level alarm LAHH-2-8-1-2(-2-2). Each tank is equipped with a low-low level float switch LSLL-2-8-1-1(-2-1) which will signal a tank low-low level alarm LALL-2-8-1-2(-2-2). At the MCP, a selector switch HS-2-8-1 is used to select which GACF tank will control the action of feed pump 3 (P-2-8-2). Each pump has a Delay-On-Restart timer (KC-2-9-1(-2,-3) which will prevent an instantaneous restart of the pumps after an off condition. Delay times are set by operator at the HMI.

8.1.7 Treated Water Storage and Reinjection

There are two Injection (INJ) pumps in operation. They are controlled from the motor control panel through the Main Control Panel (MCP) with PLC controls and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a Hand-Off-Auto (H-O-A) hand switch:

- HS-2-12-1-2 for INJ pump #1 P-2-12-1
- HS-2-12-2-2 for INJ pump #2 P-2-12-2
- Pump 3 is not currently online or electrically installed.

In the Auto Mode, the pumps will operate based on high LSH-2-11-1(-2) and low LSL-2-11-1(-2) fluid levels in the Treated Water Tanks (T-2-11-1(-2)). Each tank is equipped with a Rosemont Pressure Transducer (LE/LT-2-11-1(2)) which translates pressure on the transducer into tank water level. The operating levels are operator set at the HMI and controlled through the programmable logic controller (PLC) at LIC-2-11-1(2). In Hand mode, the pumps will run continuously until a LSLL-2-11-1(2) condition is reached. A high-high level condition LSHH-2-11-1(-2) in the TW tanks will shut off the GACF pumps (P-2-8-1(-2,-3). A low-low level condition LSLL-2-11-1(-2) in the TW tanks will shut off the INJ pumps. Each tank is equipped with a high-high level float switch LSHH-2-11-1-2(-2-2) which will signal a tank high-high level alarm LAHH-2-11-1-2(-2-2). Each tank is equipped with a low-low level float switch LSLL-2-11-1-2(-2-2) which will signal a tank low-low level alarm LALL-2-11-1-2(-2-2).

At the MCP, a selector switch HS-2-12-1-3 is used to select which TW tank level will control the action of injection pump 1 (P-2-12-1). At the MCP, a selector switch HS-2-12-2-3 is used to select which TW tank level will control the action of injection pump 2 (P-2-12-2). At the MCP, a selector switch HS-2-13-1 is used to set the lead and lag pump priorities. Each pump has a Delay-On-Restart timer (KC-2-12-1(-2) which will prevent an instantaneous restart of the pumps after an off condition. Delay times are set by operator at the HMI. Influent flow is to be monitored and totalized by flow elements and transmitters in-line on each well influent line (FE/FT-2-14-1(-2,-3,-4)). Each injection well is also equipped with a level transducer, LE/LT-2-15-1(-2,-3,-4) which signals back to the HMI the water level in each well. A high level condition LAHH-2-15-1(-2,-3,-4) is alarmed on the HMI.

8.1.8 Sludge Storage

The fluid level in the Sludge Holding Tank (T-3-1-1) is sensed with a Rosemount Pressure Transducer (LE/LT-3-1-1) which translates pressure on the transducer into tank fluid level. The operating levels are operator set at the HMI and controlled and monitored through the programmable logic controller (PLC) at LIC-3-1-1. Operator selectable set points include the sludge tank high-high level condition LSHH-3-1-1, the tank high level condition LSH-3-1-1, the tank low level condition LSL-3-1-1 and the tank low-low level condition LSLL-3-1-1. If the sludge tank reaches the high-high or the low-low levels, an alarm condition will be signaled (LAHH-3-1-1 and LALL-3-1-1). The high-high level condition will cut off the sludge transfer pumps (P-1-12-1(-2)).

8.1.9 Filter Press

Air line tubing (¼" I.D. polypropylene) connects A/S regulator (PCV-300) at the sludge pump to the filter press control panel. This supplies air to the sludge pump control solenoid valves (KC-3-3-1, -2, -3, -4). The system air pressure is indicated on the pressure gauge PI-3-3-4. Air line tubing (¼" I.D. polypropylene) connects the sludge pump control solenoid valves (KC-3-3-1, -2, -3, -4) in the control panel to the control valve FCV-300 at the pump. The air pressure delivered to the pump is indicated on pressure gauge PI-3-3-3. Air line tubing (¼" I.D. polypropylene) connects the sludge pump exhaust to a pressure switch (PS-3-3-2) in the hydraulic control cabinet. When air inputted into the pump and the air exhausted from the pump differs by < 5 psi (a pump stall condition) the press feed cycle will stop and sound the alarm YA-3-3-1 and light signal light YL-3-3-2. Air line tubing (¼" I.D. polypropylene) connects the A/S regulator at the press Blow-Down system to the control panel. The air pressure delivered to blow down the press is indicated on pressure gauge PI-3-3-1.

The filter press system is run from the control panel and is powered by with switch HS-3-3-1. In the ON position, the switch will light. High pressure air is supplied to the filter press system by the facility air compressor system. The compressor is activated manually by switching ON unit 1 or 2 and putting that unit in the AUTO mode. This is accomplished at the compressor. Isolation valves in the HP Air system are manually opened (BV-305 at the sludge pump and BV-406 at the press). High pressure air is supplied to the hydraulic cabinet through solenoid valve FCV-400. This valve is actuated by HS-3-3-3 'Filter Press Air Supply On'. In the On position, this switch will light.

At the control panel, pressing switch HS-3-3-2 "Start/ Jog Feed" will start the press fill cycle through the PLC. When activated, this switch will light. The PLC controls the stacked solenoid valves (KC-3-3-1, -2, -3, -4), which in turn controls the air supplied to the sludge pump. In stage-1, valve #1 will open and deliver air at 25 psi to the pump for 10 minutes, then in stage-2, valve #2 will open to deliver air at 50 psi to the pump for 10 minutes. In stage -3, valve #3 will open to deliver air at 75 psi to the pump for 10 minutes. In stage-4, valve #4 will open to deliver air at 100 psi; this will continue until the press reaches a full condition or there is an insufficient amount of sludge to move. Pressing the switch HS-3-3-2 for a continuous 10 seconds will increment the control to the next fill stage.

The fill process can be stopped by pressing switch HS-3-3-5 'Stop Feed/Silence'. Pressing this switch will also silence the audible alarm. If 15 seconds have elapsed after starting the fill cycle, the hydraulic ram is not at 3000 psi, pressure switch PSL-3-3-1 will stop the fill cycle and light alarm light YL-3-3-1. A high pressure condition in the hydraulic ram system will trigger pressure switch PSH-3-3-1 to sound the alarm, and the pressure relief valve (PCV-404) on the HP manifold will open.

8.1.10 Recycle Water System

There are two Recycle (RCY) pumps in the water recycle system. They are controlled from the motor control panel through the Main Control Panel (MCP) with PLC controls and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a Hand-Off-Auto (H-O-A) hand switch:

- HS-3-5-1-2 for RCY pump #1 P-3-5-1
- HS-3-5-2-2 for RCY pump #2 P-3-5-2

The fluid level in the Recycle Tank (T-3-4-1) is sensed with a Rosemount Pressure Transducer (LE/LT-3-4-1) which translates pressure on the transducer into tank fluid level. The operating levels of the tank and pumps are operator set at the HMI and controlled and monitored through the programmable logic controller (PLC) at LIC-3-4-1. The tank high level set point (LSH-3-4-1) will turn on the first RCY pump. The tank high-high level set point (LSHH-3-4-1) will turn on the second pump. The tank low level set point (LSL-3-4-1) will turn off the second pump and the tank low-low level set point (LSLL-3-4-1) will turn off the first pump. In the Auto mode, the pumps will run based on the pump On-Off signals. In the Hand mode the pumps will run continuously until shut off by tank alarm conditions. A high-high level condition in the EQ tank (LSHH-1-3-1) will shut off the pumps. A low-low level (LSLL-3-4-1) in the RCY tank will shut off the pumps.

The RCY tank is equipped with a high-high level float switch LSHH-3-4-1-2 which will signal a tank high-high level alarm LAHH-3-4-1-1. The RCY tank is also equipped with a low-low level float switch LSLL-3-4-1-2 which will signal a tank low-low level alarm LALL-3-4-1-1. A manual switch (HS-3-6-1) at the MCP is used to alternate the lead-lag operation of the pumps. Each pump has a Delay-On-Restart timer (KC-3-5-1(-2) which will prevent an instantaneous restart of the pumps after an off condition. Delay times are set by operator at the HMI. The pump (P-3-7-1) in the floor drain-sump system is shut off by a high-high level condition LSHH-3-4-1) in the RCY tank.

8.1.11 Chemical Feed Systems

Potassium Permanganate ($KMnO_4$) Feed System- There are two feed pumps in the KMnO4 system. They are controlled from the Main Control Panel (MCP) with PLC controls through the local control panel (10-LCP-5-1). The pump switches operate in series. At the MCP, each pump has a manual Hand-Off-Auto (H-O-A) switch:

- HS-5-1-1 for feed pump #1 P-5-1-1
- HS-5-1-2 for feed pump #2 P-5-1-2

In the auto mode (MCP), the system will run base upon the operation of the influent pumps (P-1-4-1(-2, -3)) and the Run signal form the local controller. In the Hand mode, the pumps will run continuously. The flow controller (FIC-1-6-1(-2)) monitoring the plant influent flow will send the pacing signal to the pumps. The $KMnO_4$ tank (T-5-1-1) is equipped with a level sensor (LE/LT-5-1-1) which monitors the fluid level in the tank and closes the water inlet solenoid in a high level condition LSH-5-1-1. A low fluid level in the tank will (LSL-5-1-1) will alarm the condition (LAL-5-1-1) and shut off the feed pumps.

Sodium Hydroxide (NaOH) Feed System - There are two feed pumps in the NaOH system. They are controlled from the Main Control Panel (MCP) with PLC controls through the local control panel (10-LCP-5-2) and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a manual Hand-Off-Auto (H-O-A) switch:

- HS-5-2-1 for feed pump #1 P-5-2-1
- HS-5-2-2 for feed pump #2 P-5-2-2

In the auto mode (MCP), the system will run base upon the operation of the influent pumps (P-1-4-1(-2, -3)) and the Run signal form the local controller. In the Hand mode, the pumps will run continuously. The pH controllers (AIC-1-8-1(-2)) monitoring the reaction tanks (T-1-8-1(-2)) pH level will send the pacing signal to the pumps. The pH values are operator set at the HMI. The NaOH tank (T-5-2-1) is equipped with a level sensor (LE/LT-5-2-1) which monitors the fluid level in the tank and closes the water inlet solenoid in a high level condition LSH-5-2-1. A low fluid level in the tank will (LSL-5-2-1) will alarm the condition (LAL-5-2-1) and shut off the feed pumps.

Hydrochloric Acid (HCl) Feed System- There are two feed pumps in the HCl system. They are controlled from the Main Control Panel (MCP) with PLC controls through the local control panel (10-LCP-5-3) and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a Hand-Off-Auto (H-O-A) hand switch:

- HS-5-3-1 for feed pump #1 P-5-3-1
- HS-5-3-2 for feed pump #2 P-5-3-2

In the auto mode (MCP), the system will run base upon the operation of the influent pumps (P-1-4-1(-2, -3)) and the Run signal form the local controller. In the Hand mode, the pumps will run continuously. The pH controller (AIC-2-2-1) monitoring the discharge of the ASF flow will send the pacing signal to the pumps. The pH value of the discharge is operator set at the HMI. The HCl tank (T-5-3-1) is equipped with a level sensor (LE/LT-5-3-1) which monitors the fluid level in the tank and closes the water inlet solenoid in a high level condition LSH-5-3-1. A low fluid level in the tank will (LSL-5-3-1) will alarm the condition (LAL-5-3-1).

Polymer (PF) Feed System - There are three feed pumps in the PF system. They are controlled from the Main Control Panel (MCP) with PLC controls through the local control panel (10-LCP-5-4) and through the SCADA Human Machine Interface (HMI). The pump switches operate in series. At the MCP, each pump has a manual Hand-Off-Auto (H-O-A) switch:

- HS-5-4-1 for feed pump #1 P-5-4-1
- HS-5-4-2 for feed pump #2 P-5-4-2
- HS-5-4-3 for feed pump #3 P-5-4-3

In the auto mode (MCP), the system will run base upon the operation of the influent pumps (P-1-4-1(-2, -3)) and the Run signal form the local controller. In the Hand mode, the pumps will run continuously. The flow controller (FIC-1-6-1(-2)) monitoring the plant influent flow will send the pacing signal to the pumps. The PF tanks (T-5-4-1(-2)) are equipped with a level sensors (LE/LT-5-4-1(-2)) which monitors the fluid level in the tank and closes the water inlet solenoid in a high level condition LSH-5-4-1(-2). A high-high level condition (LSHH-5-4-1(-2)) will send an alarm signal LAHH-5-4-1-1 to the local panel and the HMI. A low fluid level in the tanks will (LSL-5-4-1(-2)) will alarm the condition (LAL-5-4-1(-2)).

8.1.12 Floor Drain and Sump System

In this system, there is one sump pump (P-3-7-1) in the outdoor sump (T-3-7-1). It is operated at the MCC by breaker switch HS-3-7-1-1 (On-Off) and switch HS-3-7-1-2 (Hand-Off-Auto) in series with switch HS-3-7-1-3 at local control panel LCP-7-7-1-2. Float switches in the sump control the pump when it is in the Auto mode as follows:

LSL-3-7-1 (sump low level condition)	-	pump is shut off
LSH-3-7-1 (sump high level condition)	-	pump is activated
LSHH-3-7-1 (sump high-high level condition)	-	audible and visual alarm is activated

A high-high level condition in the RCY tank (LSHH-3-4-1) will deactivate the sump pump.

8.1.13 Misc. PLC Monitored Conditions

At the filter press, the PLC will monitor Press Failure and alarm at YA-3-3-1. At the filter press, the PLC will monitor Low Hydraulic Pressure and indicate at PLL-3-3-2. At the compressor, the PLC will monitor System Low Air Pressure and alarm at PAL-4-9-1. At the compressor, the PLC will monitor System Run and Common Fail at YL-4-4-1(-2). At The Temperature Control Panel (TCP), the PLC will monitor Fire In Facility status and alarm at YA-6-1-1-2. The Auto Dialer System will call out for the following critical alarms:

- EQ tank high-high level (LAHH-1-3-1-1)
- ASF tank high-high level (LAHH-2-1-1-1(-2-1))
- ASF pH out of range (AA-2-2-1-2)

- GACF tank high-high level (LAHH-2-8-1-2(-2-2))
- TW tank high-high level (LAHH-2-11-1-2(-2-2))
- RCY tank high-high level (LAHH-3-4-1-2)
- Fire in the facility (YA-6-1-1-1)

8.2 Control System Tag Lists

8.2.1 Influent Systems

Water is pumped from 3 separate extraction wells through plastic piping to the Equalization Tank where it is stored prior to treatment. The influent system controls tag list is provided below.

FQI-1-1-1(-2, -3)	Flow monitor /totalizer for extracted well water.	
FE/FT-1-1-1(-2, -3)	Flow element – transmitter on extraction well pump effluent lines	Signet paddle wheel systems
HS-1-1-1(-2, -3)	Manual switches for Extraction (Ext.) well pumps at MCP	Hand-Off-Auto Pumps P-1-1-1(-2,-3)
LE/LT-1-3-1	Level monitor and transmitter at Equalization (EQ)Tank T-1-3-1	Rosemont pressure transducer
LIC-1-3-1	PLC monitoring and controlling the EQ tank level and Ext pumps	Operator programmed set points
LSH-1-3-1	High level set point for EQ tank	Shuts ext. pumps off in auto mode (LIC-1-3-1)
LSL-1-3-1	Low level set point for EQ Tank	Turns ext. pumps on in auto mode (LIC-1-3-1)
LSHH-1-3-1	High-high level set point for EQ tank	Shuts off ext. pumps in any mode (LIC-1-3-1)
LSHH-1-3-1-2	High-high level float switch in EQ tank	Triggers alarm
LSLL-1-3-1	Low-Low level set point for EQ tank	Shuts of influent pumps, (LIC-1-3-1)
LSLL-1-3-1-2	Low-Low level float switch in EQ tank	Triggers alarm
LAHH-1-3-1-1	High-high level alarm in EQ tank from float switch	Lights on MCP and HMI
LALL-1-3-1-1	Low-Low level alarm in EQ tank from float switch	Lights on HMI
KC-1-1-1(-2, -3)	Delay timer relays on each extraction well pump	Prevents pumps from an instantaneously start or restart after being off. Time set by operator.

8.2.2 Clarification Process

Water is discharged from the Equalization Tank to two (2) identical treatment trains. Stored water is gravity fed to a bank of three (3) centrifugal Influent Pumps (2 on-line at a time) and is pumped to the reaction tanks. From the reaction tanks, the water flows through the clarifiers (flash mix tank, floc tank, and plate clarifier) to the sand filter settling tanks. The clarification process controls tag list is provided below.

AE/AIT-1-8-1(-2)	pH monitoring system in Reaction (Rx) Tanks	Johnson-Yokogawa element and monitor
AIC-1-8-1(-2)	PLC monitoring and controlling pH in Rx tanks	Controls caustic pumps
ASH-1-8-1(-2)	High pH set point in RX tanks	Set by operator at AIC-1-8-1(-2) sent to caustic pump controls (10-LCP-5-2)
ASHH-1-8-1(-2)	High-high pH set point in RX tanks	Set by operator at AIC-1-8-1(-2)
ASL-1-8-1(-2)	Low pH set point in RX tanks	Set by operator at AIC-1-8-1(-2) sent to caustic pump controls (10-LCP-5-2)
ASLL-1-8-1(-2)	Low-low pH set point in RX tanks	Set by operator at AIC-1-8-1(-2)
AAHH-1-8-1-2(-2-2)	High-high pH alarm in RX tanks	Set by operator at AIC-1-8-1(-2)
AALL-1-8-1-2(-2-2)	Low-low pH alarm in RX tanks	Set by operator at AIC-1-8-1(-2)
FIC-1-6-1(-2)	PLC monitoring flow of treatment trains	Operator programmed flow set points at HMI Signals sent to $KMnO_4$ (10-LCP-5-1) and polymer (10-LCP-5-4) controls
FE/FT-1-6-1(-2)	Flow element and transmitter on each treatment train	Brooks Magnetic flow meter
HS-1-4-1-2(-2-2, -3-2)	Manual switches on MCP for operation of Influent (INF) pumps	Hand-Off-Auto Pumps P-1-4-1(-2,-3)
HS-1-5-1	Manual switch at MCP which directs which flow meter will control INF Pump 3	1-2
HS-1-8-1-2(-2-2)	Manual switches on MCP for the operation of the Reaction (Rx) tank mixers	Hand-Off Tanks T-1-8-1(-2) Mixers M-1-8-1(-2)
HS-1-9-1-2(-2-2)	Manual switches on the MCP for the operation of the Flash tank mixers	Hand-Off Tanks T-1-9-1(-2) Mixers M-1-9-1(-2)
HS-1-10-1-2(-2-2)	Manual switches on the MCP for the operation of the Floc tank mixers	Hand-Off Tanks T-1-10-1(-2) Mixers M-1-10-1(-2)
HS-1-11-1(-2)	Manual switches on the MCP for the operation of the Clarifier sludge recycle pumps	Hand-Off-Auto Tanks JCL-1-12-1(-2) Pumps P-1-11-1(-2)
HS-1-12-1(-2)	Manual switches on the MCP for the operation of the Clarifier sludge transfer pumps	Hand-Off-Auto Tanks JCL-1-12-1(-2) Pumps P-1-12-1(-2)
KC-1-4-1(-2, -3)	Delay timer relays on each INF pump	Prevents pumps from an instantaneously start or restart

		after being off. Time set by operator.
KC-1-11-1(-2)	Interval timer for sludge recycle pumps	Set at HMI by operator
KC-1-12-1(-2)	Interval duration timer for sludge transfer pump	Set at HMI by operator
LE/LT-1-3-1	Level monitor and transmitter at Equalization (EQ)Tank T-1-3-1	Rosemont pressure transducer
LIC-1-3-1	PLC monitoring the EQ tank level	Operator programmed set points at HMI
LSL-1-3-1	Low level set point for EQ tank	Turns INF pumps on in auto mode (LIC-1-3-1)
LSLL-1-3-1	Low-low level set point for EQ tank	Shuts of influent pumps, (LIC-1-3-1)
LSHH-2-1-1(-2)	High-high level set point for Air Stripper Feed (ASF) Tank	Shuts off INF pumps (LIC-2-1-1(-2))
LSHH-3-1-1	High-high level set point for Sludge tank (T-3-1-1)	Condition shuts off sludge transfer pumps

8.2.3 Air Stripping Process

Discharge from the sand filter settling tanks flows into the two Air Stripper Feed (ASF) tanks. This water is pumped by 2 of 3 centrifugal pumps to the top of Air Stripping Tower from where it cascades down through high surface area plastic media and a countercurrent forced air flow. The airborne volatiles are collected in one of two in-line vapor carbon beds (VGAC). The liquid flow continues to the liquid phase granular activated carbon feed system (GACF). The air stripping process controls tag list is provided below.

AE/AIT-2-2-1	pH monitoring system in ASF discharge line	Johnson-Yokogawa element and monitor
AIC-2-2-1	PLC monitoring and controlling pH in ASF discharge	Controls HCl pumps
ASH-2-2-1	High pH set point for ASF Discharge	Set by operator at AIC-2-2-1. Signal sent to HCl pump controls (10-LCP-5-3)
ASHH-2-2-1	High-high pH set point for ASF discharge	Set by operator at AIC-2-2-1
ASL-2-2-1	Low pH set point for ASF discharge	Set by operator at AIC-2-2-2. Signals sent to HCl pump controls (10-LCP-5-3)
ASLL-2-2-1	Low-low pH set point for ASF discharge	Set by operator at AIC-2-2-1
AAHH-2-2-1	High-high pH alarm for ASF discharge	Set by operator at AIC-2-2-1
AALL-2-2-1	Low-low pH alarm for ASF discharge	Set by operator at AIC-2-2-1

AA-2-2-1-2	Out of pH range alarm	Output from both LL and HH level pH alarms
HS-2-3-1-2(-2-2, -3-2)	Manual switches at the MCP for the operation of the Air Stripper Feed (ASF) pumps	Hand-Off-Auto Pumps P-2-3-1(-2, -3)
HS-2-1-1	Selector switch at MCP directs which ASF tank level will control ASF pump 3	1-2
LE/LT-2-1-1(-2)	Level monitor and transmitter at ASF tanks	Rosemont pressure transducer Tanks T-2-1-1(-2)
LIC-2-1-1(-2)	PLC monitoring the ASF tank levels and ASF pump action	Operator programmed set points at HMI
LAHH-2-1-1-1(-2)	High-high level alarm in ASF tanks	Generated by level float switch lights on HMI and MCP
LALL-2-1-1-1(-2)	Low-low level alarm in ASF tanks	Generated by level float switch lights on HMI
LSH-2-1-1(-2)	High level set point for ASF tanks	Operator set at HMI (LIC-2-1-1(-2))
LSHH-2-1-1(-2)	High-high level set point for ASF tanks	Shuts off influent pumps (LIC-2-1-1(-2))
LSHH-2-1-1-2(-2-2)	High-high level float switch in ASF tank	Signals alarm on HMI and MCP
LSHH-2-8-1(-2)	High-High level set point for Carbon Adsorber feed (GACF) tanks (T-2-8-1(-2))	Shuts off ASF pumps (LIC-2-8-1(-2))
LSL-2-1-1(-2)	Low level set point for ASF tanks	Turns on ASF pumps
LSLL-2-1-1(-2)	Low-low level set points for ASF tanks.	Shuts ASF pumps off (LIC-2-1-1(-2))
LSLL-2-1-1-2(-2-2)	Low-low level float switch in ASF tanks	Signals alarm on HMI
LALL-2-1-1-2(-2-2)	Low-low level alarm in ASF tank	Generated by level float switch
KC-2-3-1(-2, -3)	Delay timer relays on each ASF pump	Prevents pumps from an instantaneously start or restart after being off. Time set by operator.

8.2.4 Liquid Carbon Process

From the Air Stripping Tower, the water flows to the Granular Activated Carbon Feed (GACF) Tanks. This stored water is pumped by 2 of 3 centrifugal pumps through the Carbon Adsorber (CA) vessels. The process stream flows top to bottom through the parallel carbon beds and is discharged to the Treated Water (TW) Tanks. The liquid carbon process controls tag list is provided below.

HS-2-9-1-2(-2-2, -3-2)	Manual switches at the MCP for the operation of the GACF pumps	Hand-Off-Auto Pumps P-2-9-1(-2, -3)
HS-2-8-1	Manual switch at MCP to select the tank for controlling pump 3	Tank 1 or 2 Pump P-2-8-3
KC-2-9-2(-2, -3)	Delay on reset timer for GACF pumps	Prevents pumps from an instantaneously start or restart after being off. Time set by operator.
LE/LT-2-8-1(-2)	Level monitor and transmitter at GACF tanks	Rosemont pressure transducer Tanks T-2-8-1(-2)
LIC-2-8-1(-2)	PLC monitoring the GACF tank levels and GACF pump action	Operator programmed set points at HMI
LAHH-2-8-1-1(-2-1)	High-high level alarm in GACF tanks	Generated by level float switch lights on HMI and MCP
LALL-2-8-1-1(-2-1)	Low-low level alarm in GACF tanks	Generated by level float switch lights on HMI and MCP
LSHH-2-8-1(-2)	High-high level set point for the GACF tanks	Shuts off the ASF pumps P-2-3-1(-2, -3)
LSHH-2-8-1-1(-2-1)	High level float switch in GACF tank	Signals alarm condition at MCP and on HMI
LSHH-2-11-1(2)	High-high level set point for TW tanks	Shuts off GACF pumps
LSH-2-8-1(-2)	Operator set high level set point for GACF tanks	restarts GACF pumps
LSLL-2-8-1(-2)	Low-low level set point for GACF tanks	Shuts down GACF pumps
LSLL-2-8-1-1(-2-1)	Low level float switch in GACF tank	Signals alarm condition at MCP and on HMI
LSL-2-8-1(-2)	Operator set low level set point for the GACF tanks	Turns off GACF pumps

8.2.5 Water Re-Injection System

Water treated through the treatment process is stored in the Treated Water (TW) Storage Tanks prior to being re-injected into the well field. Water is pumped from the tanks by 2 of 3 centrifugal pumps into a manifold of 4 discharge pipes. Each discharge pipe feeds a separate well in the injection well field. The water re-injection system controls tag list is provided below.

FE/FT-2-15-1	Flow sensor and transmitter for monitoring and totalizing plant effluent flow	Khrone mag-meter
FIT-2-15-1	PLC monitoring plant effluent flow	
FE/FT-2-14-1(-2,-3,-4)	Flow sensor and transmitter for monitoring and totalizing flow to each injection well	Signet units

HS-2-12-1-2(-2-2)	Manual switches at the MCP for the operation of the INJ pumps	Hand-Off-Auto Pumps P-2-12-1(-2)
HS-2-12-1-3	Manual switch at MCP which selects which TW tanks will control pump 1	Tank 1 or 2 Pump P-2-12-1
HS-2-12-2-3	Manual switch at MCP to select the TW tank for controlling pump 2	Tank 1 or 2 Pump P-2-12-2
HS-2-13-1	Manual switch at MCP to set lead pump	Pump 1 or 2
KC-2-12-1(-2)	Delay on reset timer for INJ pumps	Prevents pumps from an instantaneously start or restart after being off. Time set by operator.
LAHH-2-11-1-2(-2-2)	High-high level alarm in TW tanks	Generated by float switch lights on HMI and MCP
LAHH-2-15-1(-2,-3,-4)	High level alarm in injection wells	Generated by well level transducer and signaled on HMI
LALL-2-11-1-2(-2-2)	Low-low level alarm in TW tanks	Generated by level float switch lights on HMI and MCP
LE/LT-2-11-1(-2)	Level monitor and transmitter at TW tanks	Rosemount pressure transducer Tanks T-2-11-1(-2)
LE/LT-2-15-1(-2,-3,-4)	Level transducers monitoring water levels in each injection well	
LIC-2-11-1(-2)	PLC monitoring the TW tank levels and TW pump action	Operator programmed set points at HMI
LSHH-2-11-1(-2)	High-high level set point for the TW tanks	Shuts off the GACF pumps P-2-9-1(-2, -3)
LSHH-2-11-1-2(-2-2)	High level float switch in TW tank	Signals alarm condition at MCP and on HMI
LSH-2-11-1(-2)	Operator set high level set point for TW tanks	Restarts INJ pumps
LSLL-2-11-1(-2)	Low-low level set point for TW tanks	Shuts down INJ pumps
LSLL-2-11-1-2(-2-2)	Low level float switch in TW tank	Signals alarm condition at MCP and on HMI
LSL-2-11-1(-2)	Operator set low level set point for the TW tanks	Turns off INJ pumps

8.2.6 Sludge Storage (SS) System

The sludge storage tank receives sludge in the form of a slurry from the clarifier sludge transfer pumps. The tank holds the sludge until it is to be transferred to the filter press or to drums for disposal. The sludge storage system controls tag list is provided below.

LAHH-3-1-1	High-high level condition in SS tank	Signaled on HMI
LALL-3-1-1	Low-low level alarm in SS tank	Signaled on HMI

LE/LT-3-1-1	Level sensor and transmitter in the Sludge Storage tank (SS)	Rosemount level transducer
LIC—3-1-1	PLC monitoring the SS tank level	Operator programmed set points at HMI
LSHH-3-1-1	SS tank high-high level set point	Shuts down sludge transfer pumps and signals alarm Pumps P-1-12-1(2)
LSH-3-1-1	SS tank high level set point	Shuts off sludge transfer pumps in Auto mode
LSL-3-1-1	SS tank low level set point	
LSLL-3-1-1	SS tank low-low level set point	Signal alarm

8.2.7 Filter Press

A mixture of solids and water is transferred from the sludge storage tank to the filter press using an air driven diaphragm pump. The solids are dewatered in the press and the liquid is recycled for further treatment. The filter press controls tag list is provided below.

ETM-3-3-1	Filter Press CP cycle/event counter	Hours on-time
HS-3-3-1	Filter Press CP- Power Switch	On-Off
HS-3-3-2	Filter Press CP Start/Jog Feed Switch	Push On
HS-3-3-3	Filter Press CP Air Supply Switch	On-Off
HS-3-3-4 V3H	Filter Press Hydraulic Ram Mode Switch Extend-Retract	CompAir 8M 502-254
HS-3-3-5	Filter Press CP Stop Feed/ Silence Switch	Push Off
KC-3-3-1	Feed Pump Pressure – 25psi Control Valve 1	Stacked MAC valve 35A-BAR-DAAB-1-ROA
KC-3-3-2	Feed Pump Pressure – 50 psi Control Valve 2	Stacked MAC valve 35A-BAR-DAAB-1-ROA
KC-3-3-3	Feed Pump Pressure – 75 Control valve 3	Stacked MAC valve 35A-BAR-DAAB-1-ROA
KC-3-3-4	Feed Pump Pressure – 100 Control Valve 4	Stacked MAC valve 35A-BAR-DAAB-1-ROA
PAH-3-3-1	Filter Press CP high pressure alarm	
PI-3-3-1	Filter Press CP Blow Down air pressure	Noshok 0-160 psi
PI-3-3-2	Filter Press Hydraulic System pressure	Lenz WGRP-95-229
PI-3-3-3	Filter Press CP Feed Pump pressure	Noshok 0-160 psi
PI-3-3-4	Filter Press CP Air Supply Pressure	Noshok 0-160 psi
PI-3-3-5	Filter Press Hydraulic System Air Supply Regulator	Wilkerson 0-160 psi
PI-3-3-6	Filter Press Hydraulic Pump air pressure	Noshok 0-160 psi
PLL-3-3-1	Filter Press CP Hydraulic Pressure Low – signal light	
PLH-3-3-1	Filter Press CP press full – signal light	
PSH-3-3-1	Filter Press pressure switch – hydraulic	Static O Ring

	pressure - high	3N3-K450P1 d4c
PSL-3-3-1	Filter Press pressure switch - Hydraulic Pressure– low	Static O Ring 3N3-K450P1 d4c
PSH-3-3-2	Sludge pump exhaust pressure switch	United Electric controls J400 m/n 553
YL-3-3-1	Filter Press CP Cycle Over signal light	
YL-3-3-2	Filter Press CP press full - cycle over	
YA-3-3-1	Filter Press CP press full - alarm	

8.2.7 Water Recycle System (RCY) and Floor Drain System

Water in the recycle system is transferred to the EQ tank where it is reprocessed. Water enters the RCY system from the floor drain pit, overflows from the sand filters, discharges from the filter press operation and decants from the sludge tank. The water recycle system controls tag list is provided below.

HS-3-5-1-2(-2-2)	Manual switches at the MCP for the operation of the water recycle (RCY) pumps	Hand-Off-Auto Pumps P-3-5-1(-2)
HS-3-6-1	Selector switch at MCP selects lead/lag operation of the RCY pumps	1 or 2
LE/LT-3-4-1	Level monitor and transmitter at RCY tanks	Rosemont pressure transducer Tanks T-3-4-1
LIC-3-4-1	PLC monitoring the RCY tank levels and RCY pump action	Operator programmed set points at HMI
LAHH-3-4-1-1	High-High level alarm in RCY tanks	Generated by level float switch lights on HMI and MCP
LAHH-3-7-1	Floor sump high-high level alarm	Signals condition – audible and visual – in control room
LALL-3-4-1-1	Low-Low level alarm in RCY tanks	Generated by level float switch lights on HMI
LSH-3-4-1	High level set point for RCY tank, turns on the first pump	Operator set at HMI (LIC-3-4-1)
LSH-3-7-1	Sump high level set point	Turns on sump pump
LSHH-3-4-1	High-High level set point for RCY tank, turns on second pump, shuts off sump pump	Operator set at HMI (LIC-3-4-1)
LSHH-3-4-1-2	High-High level float switch in RCY tank	Signals alarm on HMI and MCP
LSHH-1-3-1	High-High level set point for EQ tank (T-1-3-1)	Shuts off RCY pumps (LIC-1-3-1)
LSHH-3-7-1	High-High level in sump	Triggers level alarm (LAHH-3-7-1)
LSL-3-4-1	Low level set point for RCY tanks, Shuts off second pump	Operator set at HMI (LIC-3-4-1)
LSLL-3-4-1	Low-Low level set point for RCY tank, shuts off the first pump	Operator set at HMI (LIC-3-4-1)

LSLL-3-4-1-2	Low-Low level float switch in RCY tanks	Signals alarm on HMI
LSLL-3-7-1	Low level condition in sump	Turns off sump pump
KC-3-5-1(-2)	Delay timer relays on each RCY pump	Prevents pumps from an instantaneous start or restart after being off. Time set by operator

8.2.8 Chemical Feed Systems

The treatment plant was set up to use four chemical feed systems to process the groundwater. Due to the current water characteristics, these systems are not required at this time. Each feed is set up with a local system controller, a make-up tank and feed pumps. The chemical feed system controls tag list is provided below.

Potassium Permanganate ($KMnO_4$)		
10-LCP-5-1	Local control panel for $KMnO_4$ system	
FIC-1-6-1(-2)	PLC monitoring influent plant flow	Operator managed set points at HMI
HS-5-1-1 (-2)	Manual switches at the MCP for the operation of the $KMnO_4$ pumps	Hand-Off-Auto Pumps P-5-1-1(-2)
LE/LT-5-1-1	Level monitor and transmitter at $KMnO_4$ tank	Drexelbrook level Transmitter Tank T-5-1-1
LIC-5-1-1	PLC monitoring the $KMnO_4$ tank level	Operator programmed set points at HMI
LAL-5-1-1	Low level alarm in $KMnO_4$ tank	Generated at level monitor and signals HMI
LSH-5-1-1	High level set point in $KMnO_4$ tank	Shuts off water fill
LSL-5-1-1	Low level set point in $KMnO_4$ tank	Signals low level alarm

Sodium Hydroxide (NaOH)		
10-LCP-5-2	Local control panel for NaOH system	
AIC-1-8-1(-2)	Reaction tank pH controller signals to 10-LCP-5-2	Operator programmed set point for pH control
HS-5-2-1 (-2)	Manual switches at the MCP for the operation of the NaOH pumps	Hand-Off-Auto Pumps P-5-2-1(-2)
LE/LT-5-2-1	Level monitor and transmitter at NaOH tank	Drexelbrook level Transmitter Tank T-5-2-1
LIC-5-2-1	PLC monitoring the NaOH tank levels	Operator programmed set points at HMI
LAL-5-2-1	Low level alarm in NaOH tank	Generated at level monitor and

		signals HMI
LSH-5-2-1	High level set point in NaOH tank	Shuts off water fill
LSL-5-2-1	Low level set point in NaOH tank	signals low level condition

Hydrochloric Acid (HCl)		
10-LCP-5-3	Local control panel for HCl system	
AIC-2-2-1	ASF discharge line pH controller signals to 10-LCP-5-3	Operator programmed set point for pH control
HS-5-3-1 (-2)	Manual switches at the MCP for the operation of the HCl pumps	Hand-Off-Auto Pumps P-5-3-1(-2)
LE/LT-5-3-1	Level monitor and transmitter at HCl tank	Drexelbrook level Transmitter Tank T-5-3-1
LIC-5-3-1	PLC monitoring the HCl tank levels	Operator programmed set points at HMI
LAL-5-3-1	Low level alarm in HCl tank	Generated at level monitor and signals HMI
LSH-5-3-1	High level set point in HCl tank	Shuts off water fill
LSL-5-3-1	Low level set point in NaOH tank	signals low level condition

Polymer System		
10-LCP-5-4	Local control panel for Polymer feed system	
FIC-1-6-1(-2)	PLC monitoring influent plant flow paces the pump feeds in Auto mode	Operator managed set points at HMI
HS-5-4-1 (-2, -3)	Manual switches at the MCP for the operation of the Polymer pumps	Hand-Off-Auto Pumps P-5-4-1(-2,-3)
LE/LT-5-4-1	Level monitor and transmitter at both Polymer tank	Drexelbrook level Transmitter Tank T-5-4-1(-2)
LIC-5-1-1	PLC monitoring the Polymer tank level	Operator programmed set points at HMI
LAHH-5-4-1(-2)	High level alarm in polymer tanks	Alarms at local panel and on HMI
LAL-5-4-1(2)	Low level alarm in Polymer tank	Generated at level monitor and signals HMI.
LSH-5-4-1(-2)	High level set point in Polymer tank	Shuts off water fill
LSHH-5-4-1(-2)	High-high level set point in polymer tanks	Signals for alarm
LSL-5-4-1(-2)	Low level set point in Polymer tank	Signals low level alarm

8.3 Control Panel Tag Lists

8.3.1 Motor Control Panel – Siemens Motor Control Center 95

The tag list for the motor control panel is provided below.

Switch	Equip Tag	Type
Air Stripper Feed Pump	P-2-3-3	On-Trip Reset
Air Stripper Feed Pump	P-2-3-2	On-Trip Reset
Air Stripper Feed Pump	P-2-3-2	On-Trip Reset
Exhaust Fan	10-EF-2	On-Trip Reset H-O-A
Exhaust Fan	10-EF-1	On-Trip Reset H-O-A
Air Stripper Blower	M-2-6-1	On-Trip Reset
Recycle Pump	P-3-5-1	On-Trip Reset
Recycle Pump	P-3-5-2	On-Trip Reset
Flash Mixer	M-1-9-1	On-Trip Reset
Flash Mixer	M-1-9-2	On-Trip Reset
Flocculation Mixer	M-1-10-1	On-Trip Reset
Flocculation Mixer	M-1-10-2	On-Trip Reset
Carbon Adsorb Feed Pump	P-2-9-3	On-Trip Reset
Carbon Adsorb Feed Pump	P-2-9-2	On-Trip Reset
Carbon Adsorb Feed Pump	P-2-9-1	On-Trip Reset
45 KVA Trans LTG panel	10-LP-1 Feed	On-Trip
Air Compressor Package	10-LCP-4-1	On-Trip
Heater (AS Tower)	M-2-7-3	On-Trip
Spare – heat trace panel Effluent Flow Meter		On-Trip
Overhead Door #1		On-Trip
Overhead Door #2		On-Trip
Extraction Well	P-1-1-3	On Trip Reset
Extraction Well	P-1-1-2	On Trip Reset
Extraction Well	P-1-1-1	On Trip Reset
Injection Pump	P-2-12-1	On Trip Reset
Injection Pump	P-2-12-2	On Trip Reset
Makeup Air Unit	10-MAU-1	On Trip
Influent Pump	P-1-4-3	On Trip Reset
Influent Pump	P-1-4-3	On Trip Reset
Flow Equal Tank Mixer	M-1-3-1	On Trip Reset
Reaction Tank Mixer	M-1-8-2	On Trip Reset
Reaction Tank Mixer	M-1-8-1	On Trip Reset
Floor Drain Sump Pump	P-3-7-1	On-Trip H-O-A
Polymer Mixer	M-5-4-2	On-Trip
Polymer Mixer	M-5-4-1	On-Trip
Main Breaker	MCC-1	On-Trip

8.3.2 Main Control Panel – Allen Bradley PLCs

The tag list for the main control panel is provided below.

Switch	Equip Tag	Type	Switch Tag
EQ Tank	T-1-3-1	Level alarm	LAHH-1-3-1-1
Air Stripper Feed Tank #1	T-2-1-1	Level alarm	LAHH-2-1-1-1
Air Stripper Feed Tank #2	T-2-1-2	Level alarm	LAHH-2-1-1-2
GAC Feed Tank #1	T-2-8-2	Level alarm	LAHH-2-8-1-1
GAC Feed Tank #2	T-2-8-2	Level alarm	LAHH-2-8-2-1
Treated Water Tank #1	T-2-11-1	Level alarm	LAHH-2-11-1-1
Treated Water Tank #2	T-2-11-2	Level alarm	LAHH-2-11-2-1
Recycle Tank	T-3-4-1	Level alarm	LAHH-3-4-1-1
Air Stripper pH out of range	T-2-1-1(2)	pH alarm	(AA-2-2-1-2)
Fire Alarm		Panel alarm	
Extraction Well Pumps	P-1-1-1	H-O-A	HS-1-1-1
Extraction Well Pumps	P-1-1-2	H-O-A	HS-1-1-2
Extraction Well Pumps	P-1-1-3	H-O-A	HS-1-1-3
Influent Pumps	P-1-4-1	H-O-A	HS-1-4-1-2
Influent Pumps	P-1-4-2	H-O-A	HS-1-4-2-2
Influent Pumps	P-1-4-3	H-O-A	HS-1-4-3-2
Influent Pumps	Pump 3 tank select	1-2	HS-1-5-1
EQ Tank Mixer	M-1-3-1	H-O	HS-1-3-1-2
Reaction Tank Mixer	M-1-8-1	H-O	HS-1-8-1-2
Reaction Tank Mixer	M-1-8-2	H-O	HS-1-8-2-2
Flash Mixer	M-1-9-1	H-O	HS-1-9-1-2
Flash Mixer	M-1-9-2	H-O	HS-1-9-2-2
Floc Mixer	M-1-10-1	H-O	HS-1-10-1-2
Floc Mixer	M-1-10-2	H-O	HS-1-10-2-2
Recycle Pumps	P-3-5-1	H-O-A	HS-3-5-1-2
Recycle Pumps	P-3-5-2	H-O-A	HS-3-5-2-2
Recycle Pump ½ Lead	Lead/lag	1-2	HS-3-6-1
Sludge Recycle Pump	P-1-11-1	H-O-A	HS-1-11-1
Sludge Recycle Pump	P-1-11-2	H-O-A	HS-1-11-2
Sludge Transfer Pump	P-1-12-1	H-O-A	HS-1-12-1
Sludge Transfer Pump	P-1-12-2	H-O-A	HS-1-12-2
Air Stripper Feed Pumps	P-2-3-1	H-O-A	HS-2-3-1-2
Air Stripper Feed Pumps	P-2-3-2	H-O-A	HS-2-3-2-2
Air Stripper Feed Pumps	P-2-3-3	H-O-A	HS-2-3-3-2
Air Stripper Feed Pumps	Pump 3 tank select	1-2	HS-2-1-1
Carbon Adsorber Feed Pumps	P-2-9-1	H-O-A	HS-2-9-1-2
Carbon Adsorber Feed Pumps	P-2-9-2	H-O-A	HS-2-9-2-2
Carbon Adsorber Feed Pumps	P-2-9-3	H-O-A	HS-2-9-3-2
Carbon Adsorber Feed Pumps	Pump 3 adsorber	1/2	HS-2-8-1
Injection Pumps	P-2-12-1	H-O-A	HS-2-12-1-2
Injection Pumps	P-2-12-2	H-O-A	HS-2-12-2-2

Injection Pumps	Pump 1 tank select	1-2	HS-2-12-1-3
Injection Pumps	Pump 2 tank select	1-2	HS-2-12-2-3
Injection Pumps	Pump Lead	1-2	HS-2-13-1
$KMnO_4$ Pump Train 1	P-5-1-1	H-O-A	HS-5-1-1
$KMnO_4$ Pump Train 2	P-5-1-2	H-O-A	HS-5-1-2
Polymer Pump 1	P-5-4-1	H-O-A	HS-5-4-1
Polymer Pump 2	P-5-4-2	H-O-A	HS-5-4-2
Polymer Pump 3	P-5-4-3	H-O-A	HS-5-4-3
Caustic Pump Train 1	P-5-2-1	H-O-A	HS-5-2-1
Caustic Pump Train 2	P-5-2-2	H-O-A	HS-5-2-2
HCl Acid Pump Train 1	P-5-3-1	H-O-A	HS-5-3-1
HCl Acid Pump Train 2	P-5-3-2	H-O-A	HS-5-3-2

8.3.3 HMI Switches and Control elements – Citech SCADA System – Operator interactive

Overview Screen – A listing of the switches, control readouts, and alarms on the overview screen is provided below.

Equipment	**Equip Label**	**Control**	
Extraction Well Pump 1	EW-1	Auto-Off switch	+Flow rate gpm
Extraction Well Pump 2	EW-2	Auto-Off switch	+Flow rate gpm
Extraction Well Pump 3	EW-3	Auto-Off switch	+Flow rate gpm
Equalization Tank	T-1-3-1	Tank level readout %	LIC-1-3-1, pump controls
Equalization Tank	T-1-3-1	Low-low level alarm	LIC-1-3-1 (LL)
Equalization Tank	T-1-3-1	High-High level alarm	LIC-1-3-1 (HH)
Influent Pump 1	P-1-4-1	Auto-Off switch	Pump speed Hz
Influent Pump 2	P-1-4-2	Auto-Off switch	Pump speed Hz
Influent Pump 3	P-1-4-3	Auto-Off switch	Pump speed Hz
Treatment Train 1 Flow	FT-1-6-1	Flow readout gpm	FCV-1-6-1 %-open
Treatment Train 2 Flow	FT-1-6-2	Flow readout gpm	FCV-1-6-2 %-open
Reaction Tank 1 pH	T-1-8-1	pH readout	AIC-1-8-1
Reaction Tank 2 pH	T-1-8-2	pH readout	AIC-1-8-2
ASF Tank 1	T-2-1-1	Tank level readout (in.)	LIC-2-1-1, pump controls
ASF Tank 1	T-2-1-1	High-High level alarm	LIC-2-1-1 (HH)
ASF Tank 1	T-2-1-1	Low-Low level alarm	LIC-2-1-1 (LL)
ASF Tank 2	T-2-1-2	Tank level readout (in.)	LIC-2-1-2 , pump controls
ASF Tank 2	T-2-1-2	High-High level alarm	LIC-2-1-2 (HH)
ASF Tank 2	T-2-1-2	Low-Low level alarm	LIC-2-1-2 (LL)
Air Stripper Feed Pump 1	P-2-3-1	Auto-Off switch	Pump speed Hz
Air Stripper Feed Pump 2	P-2-3-2	Auto-Off switch	Pump speed Hz
Air Stripper Feed Pump 3	P-2-3-3	Auto-Off switch	Pump speed Hz
AS Feed discharge pH		pH readout	AIC-2-2-1
Recycle Tank	T-3-4-1	Tank level readout (in.)	LIC-3-4-1, pump controls
Recycle Tank	T-3-4-1	High-High level alarm	LIC-3-4-1 (HH.)
Recycle Tank	T-3-4-1	Low-Low level alarm	LIC-3-4-1 (LL)

RCY Pump 1	P-3-5-1	Auto-Off switch	
RCY Pump 2	P-3-5-2	Auto-Off switch	
GACF Tank 1	T-2-8-1	Tank level readout (in.)	LIC-2-8-1, pump controls
GACF Tank 1	T-2-8-1	High-High level alarm	LIC-2-8-1 (HH.)
GACF Tank 1	T-2-8-1	Low-Low level alarm	LIC-2-8-1 (LL)
GACF Tank 2	T-2-8-2	Tank level readout (in.)	LIC-2-8-2 , pump controls
GACF Tank 2	T-2-8-2	High-High level alarm	LIC-2-8-2 (HH.)
GACF Tank 2	T-2-8-2	Low-Low level alarm	LIC-2-8-2 (LL.)
GACF Pump 1	P-2-9-1	Auto-Off switch	Pump speed Hz
GACF Pump 2	P-2-9-2	Auto-Off switch	Pump speed Hz
GACF Pump 3	P-2-9-3	Auto-Off switch	Pump speed Hz
TW Tank 1	T-2-8-1	Tank level readout (%)	LIC-2-8-1, pump controls
TW Tank 1	T-2-11-1	High-High level alarm	LIC-2-11-1 (HH)
TW Tank 1	T-2-11-1	Low-Low level alarm	LIC-2-11-1 (LL)
TW Tank 2	T-2-11-2	Tank level readout (%)	LIC-2-11-2, pump controls
TW Tank 2	T-2-11-2	High-High level alarm	LIC-2-11-2 (HH)
TW Tank 2	T-2-11-2	Low-Low level alarm	LIC-2-11-2 (LL)
INJ Pump 1	P-2-12-1	Auto-Off switch	
INJ Pump 2	P-2-12-2	Auto-Off switch	
Plant discharge	P-2-12-1(2)	Flow readout (gpm)	FIT-2-15-1
Injection Well 1	IW-1	Well Level readout (ft AMSL)	LE/LT-2-15-1
Injection Well 1	IW-1	High level alarm	LE/LT-2-15-1 (HH)
Injection Well 2	IW-2	Well Level readout (ft AMSL)	LE/LT-2-15-2
Injection Well 2	IW-2	High level alarm	LE/LT-2-15-2 (HH)
Injection Well 3	IW-3	Well Level readout (ft AMSL)	LE/LT-2-15-3
Injection Well 3	IW-3	High level alarm	LE/LT-2-15-3 (HH)
Injection Well 4	IW-4	Well Level readout (ft AMSL)	LE/LT-2-15-4
Injection Well 4	IW-4	High level alarm	LE/LT-2-15-4 (HH)

Flow Data Screen – Flow Totals and Set-points Screen – A listing of the possible operator settable controls and resulting readouts on the flow data screen is provided below.

Element	Monitor	Programmable
Flow Block		
Influent Flow 1	Current flow and Flow Control Valve % open	Desired flow
Influent Flow 2	Current flow and Flow Control Valve % open	Desired flow
Polymer P-1 Pacing Factor	-	Desired factor
Polymer P-2 Pacing Factor	-	Desired factor
Polymer P-2 Pacing Factor	-	Desired factor

Cumulative Flow Totals Block (gal)		
IW-1	Volume readout	-
IW-2	Volume readout	-
IW-3	Volume readout	-
IW-4	Volume readout	-
Plant Total	Volume readout	-
Daily Flow Block		
EW-1	Daily total volume pumped from well	
EW-2	12:00 am to 12:00 am	
EW-3	Recorded starting today (T-0) for 8 days (T-7)	

Set-point/Hrs – Operational Data and Set-points Screen – A listing of the operator settable controls and resulting readouts from the set-point/Hrs screen is provided below.

Element	Monitor	Programmable
pH Block		
AST Feed Tank	Current pH	LL, desired, and HH points
Reaction Tank 1	Current pH	LL, desired, and HH points
Reaction tank 2	Current pH	LL, desired, and HH points
Sludge Pumps Block		
Recycle Pump 1		Duration and interval
Recycle Pump 2		Duration and interval
Transfer Pump 1		Duration and interval
Transfer Pump 2		Duration and interval
Speed Block		
Floc Tank 1 Mixer	Current mixer speed	Desired mixer speed
Floc Tank 2 Mixer	Current mixer speed	Desired mixer speed
Levels Block		
AST Feed Tank 1	Current volume, high set point	Low, desired set points
AST Feed Tank 2	Current volume, high set point	Low, desired set points
Carbon Feed Tank 1	Current volume, high set point	Low, desired set points
Carbon Feed Tank 2	Current volume, high set point	Low, desired set points
EQ Tank	Current volume	Low, desired, high set points
Recycle Tank	Current volume	Low, high, high-high set points

Sludge Tank	Current volume	Low-low, high-high set points
Treated Tank 1	Current volume	Low, high set points
Treated Tank 2	Current volume	Low, high set points
Motor Data Block		
AST Feed Pumps 1, 2, 3	Run hours, cycles	Delay timer
AST Blower	Run hours, cycles	
Carbon feed Pumps 1, 2, 3	Run hours, cycles	Delay timer
Extraction well Pumps 1, 2, 3	Run hours	Delay timer
Influent pumps 1, 2, 3	Run hours	Delay timer
Injection pumps 1, 2	Run hours	Delay timer
Recycle Pumps 1, 2	Run hours	Delay timer
Polymer pumps 1, 2, 3	Run hours	

Support – Support Systems Screen - A listing of the operator settable controls and resulting readouts from the support systems screen is provided below.

Element	Monitor	Control
Sodium Hydroxide System		
NaOH Pump 1	Pump speed	Auto-Off switch
Reaction Tank 1	Tank pH level	AIT-1-8-2
Caustic Tank	Low level indicator	
NaOH Pump 2	Pump speed	Auto-Off switch
Reaction Tank 2	Tank pH level	AIT-1-8-2
Polymer System		
Polymer Make-up tank 1	Low level indicator	
Polymer Make-up tank 2	Low level indicator	
Polymer pump 1	Pump speed	Auto-Off switch
Polymer pump 2	Pump speed	Auto-Off switch
Polymer pump 3	Pump speed	Auto-Off switch
Hydrochloric Acid System		
HCl Pump 1	Pump speed	Auto-Off switch
HCl Pump 2	Pump speed	Auto-Off switch
HCL Make-up Tank	Low level indicator	
AST Feed	Discharge pH	AIT-2-2-1
Sludge Systems		
Recycle Pump 1	% on	Auto-Off Switch
Recycle Pump 2	% on	Auto-Off Switch
Transfer Pump 1		Auto-Off Switch
Transfer Pump 2		Auto-Off Switch
Sludge Tank	High-High, Low-Low level	LI-3-1-1

Trend Screens

The operator selects which elements from the plant operation to monitor on 3 separate trend screens and at what operating ranges to view the trend lines. See Attachment 17 for a List of Critical Alarms

9.0 PLANT TESTING

This section contains a brief summary of the periodic testing and sampling performed at the Claremont site. The Claremont Polychemical GWTS is monitored through the analysis of off-site laboratory analytical data and on-site field data.

9.1 Water Sampling Program

The laboratory testing program provides the basis for process control and produces a record of treatment system operating performance. This information allows operating personnel to gauge plant efficiencies and to predict potential problems in the operating systems.

Sampling of the plant processes, plant discharge and groundwater is described fully in the Claremont Sampling and Analysis Plan (SAP). The SAP document is incorporated into this O&M Manual by reference. There are various sampling points located throughout the treatment system. Table 4 lists the process water sample location points, the types of samples collected, and the frequency of collection. Included are the extraction wells (3) and the six plant monitoring points, (2, 7A, 7B, 8A, 8B, and 9), and the sludge storage tank that is sampled on an as-needed basis. Samples are collected as per the current Sampling and Analysis Plan. Not included in this table are the monitoring wells located in the injection well-field.

Monthly plant discharge (PD) samples are taken for organic analysis in compliance with the NYSDEC discharge permit and USACE contractual requirements. Quarterly groundwater (GW) samples are taken for organic analysis, and quarterly process water (PW) samples are taken for organic, inorganic, and generic analysis. Annually, groundwater samples are taken for inorganic analysis. The samples are sent to facilities assigned by the US EPA Contract Laboratories Program (CLP).

9.2 Field Data Collection

The on-site laboratory performs limited analytical tests on an as needed basis. As a result of these tests, the operator will adjust the various operations as necessary to meet the required quality of the plant discharge water.

Treatment plant effluent is monitored for pH and temperature on a weekly basis in order to obtain a monthly average in compliance with the NYSDEC discharge permit requirements. These readings are obtained from the discharge sample in a controlled area with calibrated portable meters.

Soundings to determine the depth to the bottom of the injection wells (IWs) are taken monthly and compared to previous readings.

Falling head test data for each IW is collected each month. A graphic representation of the time required to drop the water level to a static condition is generated and compared to past baseline graphs.

To comply with the plant discharge permits, the plant operators are required to collect a weekly PID (photo ionization detector) reading of the vapor-phase carbon effluent.

Periodically, the sound levels throughout the plant are measured and recorded to ensure a safe working environment

9.3 Quality Control

To provide accurate readings, precise measurements, and dependable operations, quality control procedures are outlined in the current Quality Assurance Project Plan (QAPP). The QAPP, (part of the SAP) is also included by reference in this O&M Manual.

Information gathered from plant readings can be used for reporting, as well as for basing future expenditures by the client or the operators.

Other than those specified in the QAPP, several quality control measures are in place that require certification. These are as follows:

9.3.1 Flowmeter Calibration

The plant effluent flow meter is the meter from which discharge flows are recorded and reported. While the manufacturer does not specify a calibration frequency, it is recommended this be done once every two years. The party performing the calibration should provide the results of the calibration, as well as a calibration certificate.

9.3.2 Laboratory Equipment Calibration Logbook

There are several laboratory instruments used in the plant: a pH meter, a temperature probe, water quality multimeter, and PID detector. The procedure to calibrate these instruments are in the Manual of Standard Operating Procedures and System Instructions located in the treatment plant control room. It is imperative that proper calibration records are maintained. The plant calibration logbook is kept near the instrument calibration station. Each calibration effort is logged in and includes the instrument identification (serial number), calibration results, calibration check date, and initials of individual calibrating the instrument.

The sound level meter is calibrated when used and the task is recorded on the Sound Level Monitoring Worksheet. The worksheet is kept with the Daily Log-sheets and included in the DQCR.

9.3.3 Checking Daily Readings

The Plant Supervisor reviews data collected by the Operator on a daily basis. However, the supervisor can as needed, accompany the Operator during the collection of plant operating data to ensure adherence to data logging and collecting procedures required for economic and trend analysis of plant operations.

10.0 RECORDS

Accurate records are used by plant personnel and management to efficiently operate and maintain the facility. The principal records required for the treatment plant operation are:

- Analytical laboratory reports;
- Process data which is automatically downloaded to the HMI;
- Daily operating logs;
- Waste manifests; and
- Compliance reports.

Other records include but are not limited to laboratory, maintenance, and safety records. These records are fully discussed in other sections of the O&M Manual, Site Safety and Health Plan and the Sampling and Analysis Plan. Miscellaneous records include system failure reports and monthly operating records.

10.1 Daily Activities and Operating Logs

Key operating process parameters such as flow rates, pH and pump output are monitored, checked, and recorded on a routine basis. The log sheets are also a record of daily activities and plant conditions. They provide information that is used when communicating the GWTP operating history to the Client and Regulatory Agencies. The Site Supervisor is responsible for distribution, filing, and retention of the activities, QC, inspection, and operating log sheets.

The Site Supervisor also prepares a Daily Quality Control Report (DQCR) using the daily operating and activities logs. The DQCR summarizes the quantity of water discharged, operational conditions, samples collected, data received, and air emissions excursions, if applicable, that occurred during the day. The format for the Daily QC Report is shown in Table 6.

The daily logs kept by the operators of this GWTS include:

- Daily Site safety Inspection (CPS-Form-009) (Table 5)
- Daily Activities Summary Report (CPS-Form-007) (Table 7)
- Daily Operating Log (CPS-Form-008) (Table 8)
- Employee Sign-In sheet (CPS-Form-011)
- Daily Plant Activity Notes (CPS-Form-023)

Other pertinent log sheets frequently used include but are not limited to:

- Field Sampling Data Form (CPS-Form-012)
- Sound Level Monitoring Worksheet (CPS-Form-015)
- Visitor-Subcontractor Log (CPS-Form-010)
- Weekly Air Monitoring Report (CPS-Form-006)

Refer to the Manual of Standard Operating Procedures and System Instructions for most current operating forms. This manual is also a stand alone plant reference and contains all the forms used by plant operations.

10.2 Lab and Field Records

Plant laboratory, analytical work, and field notes are recorded in bound logbooks that are maintained on-site. Operator activities and site supervisor activities are also recorded in bound notebooks that are kept onsite. Copies of all off-site laboratory reports are maintained in an electronic form in a data server maintained at the SAIC office in Harrisburg, Pennsylvania, and are accessible via a secured on-line connection at the site.

10.3 Progress Report and Compliance Reporting

A monthly progress report is prepared and submitted to the USACE that summarizes operational, maintenance, and testing activities that occurred during the month. Compliance data are collected as required by the permits and specifications. The appropriate reports are prepared and submitted to the USACE, USEPA and NYSDEC.

10.4 Plant Logs

Physical plant maintenance data are recorded on the Plant Maintenance Log sheets (CPS-Form-013) found in Table 9 and are available for reference at the Site Supervisors' office. Other valuable information maintained on-site includes the following:

- Plant O&M Manual;
- As-built and engineering drawings;
- System specifications and descriptions;
- Equipment supplier's manuals; and
- Piping and wiring diagrams.

10.5 Personnel Records

Records that reflect such things as individual training and health and safety records are retained in the respective individual's personnel file on-site.

10.6 Automatic Process Monitoring

The GWTS has been designed to provide continuous monitoring of the following process parameters:

- Influent and effluent flow rates;
- Liquid level in process tanks;
- The pH in reaction tanks;
- The pH of the flow to the air stripper; and
- Influent and effluent flow totals.

The treatment plant control system in its present configuration does not record the monitored process readings, but the information can be deduced from the HMI trend-lines.

10.7 Operating Costs and Recordkeeping

The major GWTS operating costs are labor, utilities and supplies. Labor costs consist of operation, administration, and maintenance labor categories. Utilities include electricity, gas, water, telephone and on-line connections. When needed, chemicals used in the treatment processes include caustic (50%) in 55-gallon drums and hydrochloric acid (31.5%) in 55-gallon drums.

Supplies also include laboratory chemicals and sampling supplies, cleaning materials, maintenance supplies, paints, lubricants, fuel for equipment and plant truck and miscellaneous expendable items.

11.0 MAINTENANCE

11.1 General

The objective of plant maintenance is to keep the operating and standby equipment, system structures, and other related facilities in good operating condition. The maintenance goal for the GWTF is to prevent unscheduled shutdowns and interruptions. Tools used by the Site Supervisor and Operator include:

- PM schedules, written guidelines, vender manuals, and equipment specifications
- System design, specifications, and drawings,
- Equipment and maintenance logs,
- Site Safety and Health Plan (SSHP),
- Sampling and Analysis Plan (SAP-FSP and QAPP),
- MSDS manual,
- Manual of Standard Operating Procedures and System Instructions
- Process and Instrumentation Drawings (P&ID)
- This O&M Manual.

These documents and tools are readily available to maintenance personnel and are located in the control room and in the plant filing cabinets.

The Maintenance Program starts with good housekeeping that consists of the following simple rules:

- Observe safety measures.
- Keep a clean, neat and orderly plant.
- Establish a systematic plan for execution of daily operations.
- Establish a routine schedule for inspection and lubrication of pumps, blowers, and mixer motors.
- Maintain data and records for each piece of equipment, with emphasis on unusual incidents and faulty operating conditions.

As mentioned above, maintenance will be carried out in a manner that prevents emergencies or unscheduled shutdowns. Setting up a regular schedule for servicing the equipment is required in order to get the most efficient operation and to reach the maximum lifespan of equipment. The manufacturer's recommendations for preventive maintenance (PM) tasks is one factor used to establish a maintenance schedule. Other factors that affect frequency of maintenance and monitoring include wear on moving parts; signs of corrosion; leaks; performance and efficiency trends of operating equipment; evaluating the operating range of pressures, amp draw, and temperature; and checking performance of equipment based on original versus existing operating and treatment parameters (i.e. changed conditions from the Basis of Design).

11.2 Planning and Scheduling

Equipment is inspected daily and maintained on a scheduled and as needed basis. Potential sources of equipment or process malfunction are addressed as they are identified. The Preventative Maintenance and Monitoring Schedule for the Claremont GWTS is included as Table 10.

11.3 Maintenance Personnel

Only properly trained personnel are to perform inspections, make repairs, and perform preventive maintenance tasks. Maintenance personnel must possess a thorough knowledge of the function and operations of their equipment and the procedures for servicing it. When emergencies and breakdowns occur, these tasks must be reviewed and work initiated to return the plant to its proper capacity, efficiency and function.

11.4 Maintenance Records

Maintenance records are to be kept on individual log sheets for each piece of equipment. A record of regular lubrication, inspection, cleaning, replacement of worn parts, and other pertinent data should be kept in these logs. The date of next regular servicing of the equipment should also appear on the log where it can easily be seen. The operator must review maintenance records and process equipment performance trends to determine the weakness of various pieces of equipment and to decide the inventory of spare parts kept in stock.

A separate lubrication record for each piece of equipment is also kept. On this record, the equipment is listed, as well as instructions for lubricating, including the type of oil or grease to be used, and the frequency of lubrication. From this record, the operator will be able to see when equipment should be lubricated again.

11.5 Preventative Maintenance

The preventative maintenance program is based on the manufacturers' recommendations for equipment servicing and on past performance of the system. A preventative maintenance schedule is developed for each major piece of equipment, and maintenance activities are tracked by the Site Supervisor.

11.6 Housekeeping

In the treatment plant, particular emphasis is placed on good housekeeping practices to create a safe working environment. Aisles will be kept free and open for access. Areas surrounding the floor drains will be kept clear. Floors will be routinely cleaned. Wash-down water will be recycled into the treatment system. Storage of raw material will take place in designated contained areas.

11.7 Site and Building Maintenance

Site maintenance is performed by the O&M crew or a subcontractor and will include:

- Mowing the lawn;
- Snow removal;
- Cleaning and maintaining the roadway;
- Repair of fence and gates;
- Repair of lighting; and
- Replacement of locks.

Building maintenance is performed by the O&M crew or a subcontractor and will include:

- Maintenance of the heating, ventilation and air conditioning (HVAC) system, per the manufacturers recommendations;
- Maintenance of the lighting system;
- Maintenance of the overhead doors, doors, and locks; and
- Maintenance of the building system such as gutters.

11.8 Lubrication

Manufacturer's instructions will be followed for lubricating equipment. Lubrication is an important function of a maintenance program. Specific lubrication requirements and a schedule for major system components of the plant are included as Attachment 15. The remaining equipment should be routinely examined and cared for as necessary.

It is important to warn against over-lubrication of motor bearings. This can cause motor failure. If in doubt, check the manufacturer's manual to determine proper lubrication frequency.

11.9 Major Equipment Information

The maintenance program for a piece of equipment should be in accordance with the manufacturer's recommendations. In order for any program to work effectively, five basic elements must be followed:

- Thorough knowledge of the equipment.
- Use of proper tools.
- Adequate repair parts.
- Planned program.
- Maintenance records.

Equipment manufacturers provide certain basic information which should include but is not limited to the following:

- Recommended installation instructions.
- Lubrication instructions.
- Operation instructions.
- Procedures for dismantling and reassembling.
- Parts list and repair order instructions.

11.10 Electrical Equipment

Electrical control equipment is routinely checked to ensure that is it operating at rated voltage and amperage. It should be checked regularly for tightness and ensure that moving parts are free, contact pressures firm, and shunts are un-frayed. All electrical controls are to be kept clean and dry.

Periodically, each starter should be checked to be sure that the tripping element is free and offers protection to the motor. If the contact points are pitted or corroded, the tips can be replaced or filed smooth. When a starter trips out, the cause should be found before it is started again. Dirty contacts should be cleaned. The cabinet should be cleaned with a blower or vacuum-type cleaner when necessary.

Each new motor is to be checked to see that adequate current protection is provided. Oversized heaters do not furnish protection and may permit damage to the motor.

11.11 Pumps

A complete understanding of the pump construction and operation is essential to provide proper maintenance. The daily inspections should give special attention to the following:

- Bearings - heat and noise.
- Motors - operating speed.
- Control equipment - cleanliness and condition.
- Operation- vibration and noise.
- Packing glands and/or mechanical seals - excessive leakage.

11.12 Tools

Good maintenance depends on availability of proper tools to do the job. All plant tools are stored in rolling tool cabinets, on peg board racks, and in storage cabinets located outside the plant office.

11.13 Spare Parts Inventory

A minimal number of spare parts will be stocked for pumps and other major equipment and process elements as per the manufacturers' recommendations in order to minimize the downtime for repairs.

11.14 Warranty Provisions

Some equipment manufacturers have the responsibility to repair, correct, or replace any equipment or material that fails to perform in accordance with the terms and provisions of the purchase agreement. Operators are to be cautioned that alteration of the guaranteed equipment without the knowledge and consent of the manufacturers may result in refusal of these parties to accept responsibility for any subsequent problems. Equipment which is not regularly in service during the guarantee period must be maintained and should be operated periodically to prevent problems which might arise due to the equipment not being operated. The fact that a guarantee is in effect should not be cause to allow improper maintenance or operation of equipment and thus reduce its useful life.

12.0 UTILITIES

12.1 High-Pressure Air System

(refer to drawing CPS-Dwg-023 and CPS-DWG-017F)

Compressed air is used in the operation of the sludge transfer and recycle pumps, filter press feed pump, and filter press. It is also used for maintenance tasks such as sparging the settling filter screens, blowing out sampling pump tubing and lifting the carbon beds. As these tasks are periodic in nature, the compressor is kept in off-line status. Components of the High Pressure Air System include:

- Two Champion Model PL-70 air compressors that deliver 102 cfm air at 125 psig, each driven by a Baldor 25 HP motor;
- One Airtek Model 407 air-cooled after-cooler;
- One 250-gallon air receiver tank rated at 250 psig working pressure;
- Two Airtek Model JW0200-C-C coalescing filters;
- One Atlas Copco Model FD-40 air dryer; and
- One air compressor control panel that houses the air compressor controls and the motor starters.

By design, only one compressor operates at a time. A relay in the control circuitry alternates the operation of the compressors in a manner that divides run times between the two compressors equally. Air under pressure from the compressor is stored in the air receiver tank. Pressure sensors mounted on the receiver tank send a signal to the electrical controls to either start and stop the operating compressor, depending on pressure demands of the system. A “low oil pressure” sensor is also installed on the compressors that will send a signal to the control panel to terminate compressor service when activated (i.e. the compressor has low oil pressure). Condensed water vapor is removed to a floor drain through an auto drain valve.

An after-cooler cools the compressed air by drawing it through a fan cooled finned radiator. It is cooled to within a range of +10 to +15 degrees of ambient temperature. A moisture separator removes about two-thirds of the water from the compressed air. The removed water is routed to a floor drain through an auto drain valve.

Two parallel-mounted coalescing filters located downstream of the air receiver remove liquid aerosols and mists from the compressed air before it is delivered to the plant equipment. The coalescing process causes aerosol particles to collide with one another and grow into droplets large enough to be removed by gravity. The coalescing filters are 99.9+% efficient in removing aerosols and mists in the 0.3 to 0.6 micron range.

The compressed air is further conditioned and dried by a refrigerated air dryer. Compressed air enters the dryer and is pre-cooled, then enters an evaporator where it is further cooled and vapor is condensed. The condensate is removed in the water separator and is drained from the unit. The cold dry air is then reheated before leaving the dryer and delivered to the plant process equipment.

The compressed air is delivered to stations throughout the plant. Each station can include in addition to an isolation valve and quick disconnect hose connections, air/water filters, pressure control regulators, oilers, operating solenoids and pressure control valves.

12.2 Potable Water System

(refer to drawing CPS-Dwg-031 and CPS-DWG-017G)

A two-inch potable (drinking) water line supplies potable water to the treatment plant. The water line enters the property at the reduced pressure zone (RPZ) vault (at the street) where the water meter and backflow prevention devices are located. The line follows the path of the driveway and enters the building at the southwest corner. After the 2-inch potable water main line enters the plant building, it tees to form the 2-inch potable water header and the 1½-inch non-potable water header. Another backflow prevention device separates the two.

Potable water system accessories include the isolation and shutoff valves and water hammer arrestors. The water hammer arrestors consist of in-line mounted expansion tanks which contain bellows air cushions that prevent water hammer from occurring. Potable water is used in the plant for the following purposes:

1. Safety showers and eyewashes.
2. Water for sanitary facilities and sinks.
3. Feed water for the water heater.
4. Outside water hydrants.

The piping system should be inspected weekly to check for leaks. The water heater and the water hammer arrestors should be maintained in accordance with the manufacturer's written instructions.

12.3 Non-Potable Water System

(refer to drawing CPS-Dwg-031 and CPS-DWG-017H)

The non potable water system consists of a 1½ -inch non-potable water header and a 1½-inch backflow preventer immediately downstream of the 2-inch tee preventing any non-potable water from contaminating the potable water line.

System accessories include pressure-reducing stations for seal water, isolation and shutoff valves and water hammer arrestors. Non-potable water can be used in the plant for the following purposes:

1. Seal water to the process pumps: the original plant design included piping for using non-potable water for pump seals. The pumps are presently using process water as seal water. The non-potable water piping has been capped at the pumps.
2. Equipment cleaning: hose bibs are located at several locations for use in hosing down tanks and equipment.
3. Dilution water for the chemical tanks: non-potable water can be used to dilute process chemicals to the correct concentration.

The piping system should be inspected weekly to check for leaks. Water hammer arrestors and pressure reducing valves should be maintained in accordance with the manufacturers' written instructions.

12.4 Fire Sprinkler System

The treatment plant is protected by 67 sprinkler heads, situated throughout the water treatment area and the control room. Each sprinkler heads cover 115 square feet each (6' radius) and activates at

155 degrees Fahrenheit. The six-inch fire service line runs east from the RPZ vault (at the street) under the driveway and enters the building on the south side. The six-inch line branches off before it enters the building and feeds the fire hydrant located on the south side of the building.

Inside the building, the six-inch line is reduced to a four-inch riser that supplies water to the three-inch east-west fire sprinkler main line that runs along the south side of the building. Eight 1¼-inch branch lines run north and tie into a 2½-inch east-west main along the north side of the building. The 1¼-inch branch lines follow the pitch of the ceiling. Vertical “tees” from the branch lines supply sprinkler heads that provide protection under equipment and vessels which would not be wetted by water falling from the ceiling. A two-inch “tee” from the three-inch main supplies water to sprinkler heads in the control room area.

Accessories on the four-inch riser include a butterfly shutoff valve with internal tamper switch, riser check valve, water flow switch, two-inch sprinkler system main drain, and four-inch branch which ties into the fire department Siamese connection on the south side of the building. There is a check valve and an automatic drain valve in the four-inch fire department branch to drain it and keep it from freezing. Other fire sprinkler system accessories include an inspector’s test connection on the east side of the building and a one-inch auxiliary system drain on the north side of the building.

The butterfly shutoff valve has a tamper switch, which sends a signal to the fire protection panel notifying operators that the water supply to the sprinkler system is shut off or restricted. When water flow is detected, the flow switch sounds a 10-inch electric fire bell (mounted on the south side of the building - outside) and sends an alarm to the fire protection panel. Eleven smoke detectors are located above the water treatment area and inside the control room. The smoke detectors set off an alarm in the fire protection panel. See Drawing No. SP-1 in Attachment 16 for the layout of the fire sprinkler system.

All maintenance manuals will be furnished to the fire sprinkler system contractor. The local fire protection authority (Plainview Fire Department) requires quarterly inspection and testing of the sprinkler system. The fire protection panel and alarm system alert local personnel only. The system is not connected to the fire department or a central answering station.

12.5 Auto-dialer - Emergency Call-Ins

An auto-dialer (AD) connected to the PLC is programmed to call-out when certain critical alarms are activated. The list of critical alarms and actions to be taken are included in Attachment 17.

The plant operators are on-call during evenings and on the weekends, and the AD is programmed with their home and cell phone numbers. Refer to Verbatim Auto-dialer manual in control room and procedure CPS-GPO-001 in the site SOP and Instruction Manual. The order of the phone calls will be as follows:

1. Site Supervisor cell phone.
2. Control room
3. Plant Operator cell phone
4. Site Supervisor home phone
5. Plant Operator home phone
6. Program Manager cell phone
7. Program Manager home phone

12.6 Public Utilities

The contacts for utilities that will be used at the Claremont site are as follows:

1. Electric and Gas:

Company:	Long Island Power Authority (LIPA)
Contact Name:	Ronald W. Angst
Title:	Account Sales Engineer, Government Facilities Specialist
Phone:	(516) 382-2078
Account No.:	478-28-4284-2
Customer ID:	0505-9000-32-2

2. Telephone:

Company:	Verizon
Contact Name:	Pamela Space (SAIC AT&T Representative)
Contact Phone:	(703) 676-8261
Account No.:	516-777-7242

3. Water:

Company:	Plainview Water District
Contact Name:	Salvatore Lupis
Contact Phone:	516) 931-6469
Fax Number:	(516) 931-8683
Account No.:	02-3621-21
ID - 2" Potable Water:	01-99-175-0
ID - 6" Fire Service:	01-99-175-1

4. Internet:

Company:	Verizon FiOS Internet
Contact:	
Contact Phone:	1-888-244-4400
Account No.:	0773316109622

The Plainview water district requires annual back flow prevention device inspection and testing by an outside licensed contractor. Contractor payment is the responsibility of the plant.

The Nassau County Fire Commissioner requires that the fire sprinkler system be inspected quarterly.

13.0 ELECTRICAL DISTRIBUTION AND CONTROLS SYSTEM

The wastewater treatment plant is supplied with 600 amp; 3-phase, 480-volt electric service.

High voltage leads run from service pole #31-C underground along the south side of the property and then north to the primary side of the 300KVA transformer. The 13.2KV incoming service is stepped down to 480 volts. The secondary leads run underground from the transformer vault to the watt-hour meter box located on the east side of the water treatment building.

From the watt-hour meter box, the secondary leads pass through the east wall of the building to the main breaker in the motor control center (MCC). The MCC distributes 480-volt service to the majority of the plant motors, the make-up air unit, air compressor package, air stripper heater, overhead door opener motors and step down transformers 10-T-1 and 10-T-2.

Motor starters located inside the individual cubicles in the MCC supply power to the 460-volt motors. The starters are controlled by a signal from the 120 VAC motor control circuit. The circuit incorporates inputs from manual devices (H-O-A switches and local lockout stop switches) and automatic devices (process instrumentation and outputs from the Allen-Bradley PLC) that operate and protect the plant process equipment.

Transformer 10-T-1 steps down power from the main breaker for low voltage power to lighting panel 10-LP-1. The panel is located on the north wall in the control room and provides 120VAC power to the main instrument panel, local control panels, flow and pH transmitters, injection well level switches, building lighting, the water heater, and miscellaneous receptacles located around the water treatment building. See electrical diagrams 99-E-1 and 99-E-2 in Attachment 18 for reference.

Transformer 10-T-2 steps down power from the main breaker for low voltage power to panel 10-LP-2. The panel located on the east wall of the control room provides power to the heat trace elements protecting the outdoor equipment from freezing.

The electrical controls logic for the plant is shown on Table 11. This table lists the components existing in the GWTS, the manufacturer of the component, and the process control logic explanation link to the process flow of the system.

14.0 SAFETY AND SPILL RESPONSE

14.1 Site Safety and Health Plan

As part of the USACE operating requirements, SAIC developed a Site Safety and Health Plan (SSHP) for the Claremont site. It was prepared to address the safety hazards associated with the operations and maintenance activities at the groundwater treatment facility. Due to its size, the SSHP is referenced as a stand-alone document.

14.2 Spill Response, Control, and Cleanup

This section provides contingency procedures to respond to uncontrolled spills of materials (solid or liquid) at the site. These procedures are designed to remediate contamination that may result from a spill and to prevent further contamination of surface water, groundwater, soil, structures, equipment, or other materials. (See Attachment 19 for the site's general Emergency Response Procedure)

14.2.1 Spill Control Equipment and Personal Protective Equipment

It is recommended that the site have spill control equipment and cleanup materials on hand and readily available. This should include:

- 100 pounds of SpeedyDry absorbent or equivalent.
- 50 square feet of oil-absorbent padding.
- At least one shovel with a plastic, not metal, blade.
- At least two 20-pound B:C fire extinguishers.
- 100 feet of ¾-inch garden hose with sprayer.
- 100 feet of 2-inch fire hose.
- PID or Flame Ionization Detector (FID).
- Multi-gas meter.
- At least two empty, lined, and open top 55-gallon drums or 20-feet x 60-feet of 6-mil polyethylene sheeting or other material capable of dry storage of 100 gallons of spill cleanup waste.
- First aid kit

The site supervisor will determine the level of protection needed for a spill incident based on the incident circumstances. Personnel Protective Equipment to have on hand is to include but is not limited to the following:

- Chemical-resistant goggles and safety glasses
- Chemical resistant apron, Tyvex suits
- N- butyl gloves
- Nitrile inner gloves
- Nitrile outer gloves
- Hard hats with polycarbonate face shields
- Earplugs
- Disposable rubber boots, steel toe rubber boots

- Two Self-Contained Breathing Apparatus (SCBA) units.

14.3 Training

Only persons trained in accordance with OSHA 29 CFR 1910.120e(7) (Hazardous Waste Operation and Emergency Response) will perform cleanup procedures for spills. Persons involved in spill control and cleanup will be equipped with the proper PPE and will be trained in the use of spill control equipment and cleanup materials.

14.4 On-Site Spill Response Procedures

In the event of a spill of hazardous or contaminated material, the procedures described below will be implemented.

The air monitoring action levels presented in the Site Safety and Health Plan will be followed during any spill cleanup.

Notification – The Program Manager, Operator, or Site Supervisor will immediately notify the USACE Project Coordinator of a significant spill if it threatens the environment. If the spill is reportable and/or human health or the off-site environment are threatened, the Site Supervisor will immediately contact the U.S. Coast Guard National Response Center at 1-800-424-8802. After the spill has been contained and emergency personnel have been contacted, notify the following personnel: (as per 11/17/09)

• Site Supervisor,	Peter Takach	516-777-7242
• USACE Project Manager,	Tom Simmons	816-389-3372
• SAIC Program Manager, and	Richard Cronce	717-901-8852
• SAIC Health and Safety Manager (HSM)	Steve Davis	865-481-4755
• USACE Local Support	Shewen Bian	646-942-4532

Spill Control/Containment – The wastewater, chemical storage and process areas inside the treatment plant are connected to a remote catch basin. As such, establishing a dike containment is not anticipated to be necessary. However, if there is a spill outside this system, then the first step will be to contain the spill to one area and prevent it from entering any natural or manmade waterways such as streams, manholes, and storm water catch basins. To contain the spill, a dike will be placed around the source of the spill. The dike can be constructed of absorbent material or dirt. A common practice is to form a second dike around the first dike in case there is more material than the first dike can contain.

Once the area around the spill is contained, the source of the spill should be stopped, if possible. This will only be attempted by trained persons to minimize risk to workers' personal safety.

All containers used to store caustic or acids are inspected during the comprehensive site safety inspections. Site personnel are instructed to report any indications of leakage of chemicals to the SSHO who is responsible to promptly follow-up the report with an inspection. If leakage is confirmed, the SSHO will implement the appropriate spill response procedures.

Spill Cleanup – Once the spill is contained and controlled, the actual cleanup of the material can begin. In most instances, when the spill is inside the containment dikes, the spilled waste will be hosed into the sumps from where it will be pumped into the equalization tank. Absorbent materials such as SpeedyDry, absorbent pads, pillows, and booms may be used to absorb liquid material. Sand may also be used. Spark-resistant shovels will be utilized when picking up potentially flammable materials.

Saturated absorbent materials can be either packed in drums, placed on a polyvinyl liner and covered with a polyvinyl cover, or placed in some other weather-proof container(s).

Decontamination of Equipment/Structures/Materials – Any spill control or plant equipment, on-site structures, or other materials which come into contact with the spilled material will be decontaminated, as necessary. Complete cleanup may require showers and cleansing or disposal of clothing and equipment.

Disposal – All contaminated materials, including solvents, cloth, soil, and wood that cannot be decontaminated will be properly containerized, labeled, and disposed of as soon as possible and in accordance with applicable local, state, and federal regulations.

Spill Incident Report – A spill incident report will be submitted to the USACE Project Officer within 24 hours of the incident. This report includes information on the date the spill occurred; the type, quantity, and location of spilled material; the cause of the spill; cleanup actions; and outside agencies involved. See Attachment 19 for incident report form and procedure.

Caustic Spills – There is one tank of 25% caustic solution (290 gallons of sodium hydroxide) and several plastic drums (55 gal) of 50% caustic within the GWTF. Personnel are instructed to utilize chemical splash suits and evaluate the situation to determine if self-contained breathing apparatus (SCBA) is required when responding. The cleanup procedures for caustic are the same as those for wastewater, except that site personnel must monitor the pH of the reactor tanks and at the air stripper feed system after the caustic has been introduced to the equalization tank.

Spills in excess of 1,000 pounds (approximately two 55-gallon drums) represent a Reportable Quantity (RQ). In the event of an RQ spill, the SSHO will follow the procedures given above. The SSHO needs to inform the listed agencies of the chemical constituent believed to be in the spill, the approximate quantity of materials spilled, and that the spill represents an RQ.

It should be noted that while there are several drums of caustic on site, the feed tank only contains water as the chemical feed system is not required at this time.

Acid Spills – There is one 290-gallon tank of 16% hydrochloride acid inside the GWTF and one plastic drum of 31% HCl. Spill procedures for an acid spill would be the same as for a caustic spill listed above. It should be noted that the discharged treated water is required to be above a pH of 5.5.

It should also be noted that while there is a single drum of HCl on site, the feed tank contains water as the chemical feed system is not required at this time.

14.5 Response to Off-Site Spills

Despite all precautionary measures, the possibility exists that spills of wastes being transported off-site, such as the sludge filter cake, may occur. This section describes contingency procedures to respond to such incidents.

Transportation-Related Wastes – All contaminated waste material destined for off-site disposal (such as filter press cake) will be transported by a hazardous waste transporter. Before awarding the subcontract, SAIC will confirm that the transporter has a current valid hazardous waste transporter identification number. SAIC will also verify that the transporter has established contingency plans to respond to a transportation-related spill. The Claremont Project Coordinator must approve the off-site transporter and disposal facility.

Cleanup of spills of waste material being transported off-site will be the responsibility of the transporter. If requested, SAIC will provide additional information on the spill material (if available) to enable a more expeditious cleanup.

If a discharge of material from a transporting vehicle occurs while in transit off-site, the following actions are expected to be taken to reduce potential migration of the waste material and to protect human life:

- The driver will immediately notify his office and the SAIC Site Supervisor.
- Immediate measures will be taken to contain the discharge.
- The point of discharge will be secured and/or eliminated, if possible.
- The driver will remain with the vehicle, keep unnecessary people away, isolate the hazardous area, and deny entry to unauthorized personnel.
- All personnel will stay upwind, keep out of low areas, and not contact the spilled material as much as possible.
- Local authorities and the local hazardous materials response unit will be contacted.
- Other actions will be taken, as advised.

Notifying the proper authorities that a transportation-related spill has occurred is the responsibility of the transporter. After the transporter informs SAIC of a spill, SAIC will notify the USACE Project Officer and Claremont Project Coordinator. SAIC will provide additional information as it becomes available.

15.0 PUBLIC RELATIONS AND SITE SECURITY

The USACE or the USEPA will be responsible for public relations and authorizing visitors to enter the treatment plant. If SAIC receives a call from the public inquiring about the Plant, the Program Manager or Site Supervisor will notify the USACE Representative immediately.

Currently there are two designated fenced areas: one that bounds the entire Claremont property and a second area containing the GWTP. Access to the site is by authorized individuals only. Visitors must sign in at the treatment plant, with the exception of utility meter readers, mail related deliveries and subcontractors of the USEPA who operate at the old production building.

When an unauthorized visitor is found on-site and is determined to be non-threatening, he/she will be informed that this is government property and that he/she needs to move off of the property for safety reasons.

If an unauthorized visitor is malevolent, authorities will be called. Under no circumstances should an individual place himself/herself in harms way to protect the treatment system.

When the plant is unoccupied, the plant doors are locked and both access gates are shut and padlocked.

TABLES

TABLE 1

Assumed Design Influent Chemical Concentrations in Groundwater

	Influent
pH.	4.3 Minimum
	5.5 Average
	7.0 Maximum
Total Hardness	90 mg/l Maximum as CaCo3
	80 mg/l Average
Iron	8 mg/l Maximum
	4 mg/l Average
Manganese	16 mg/l Maximum
	1 mg/l Average
Calcium	25 mg/l Maximum
	20 mg/l Average
Magnesium	10 mg/1 Maximum
	6 mg/l Average
Total Alkalinity	15 mg/1 Maximum as CaC03
	13 mg/l Average
Sulfate	50 mg/l Maximum
	30 mg/1 Average
Nitrate	5 mg/l Maximum
	2.5 mg/l Average
Chloride	100 mg/l Maximum
	60 mg/1 Average
Fluoride	0.15 mg/l Maximum
	0.15 mg/l Average
DCE	1,047 ug/l Maximum
	350 ug/l Average
TCE	2,078 ug/l Maximum
	115 ug/1 Average
PCE	1,395 ug/l Maximum
	465 ug/l Average

TABLE 2

National Pollutant Discharge Elimination System Permit Effluent Limits

Parameter	Discharge Limitations		Units	Min. Monitoring Requirements	
	Daily Avg.	Daily Max.		Frequency	Type
Flow	Monitor	Monitor	GPD	Continuous	Meter
pH (range)	5.5 to 8.5		SU	Monthly	Grab
Tetrachloroethylene	NA	5	ug/l	Monthly	Grab
Trichloroethylene	NA	5	ug/l	Monthly	Grab
1,2-(cis)-Dichloroethylene	NA	5	ug/l	Monthly	Grab
1,2-(trans)-Dichloroethylene	NA	5	ug/l	Monthly	Grab
Methylene Chloride	NA	5	ug/l	Monthly	Grab
1,1-Dichloroethylene	NA	5	ug/l	Monthly	Grab
1,1-Dichloroethane	NA	5	ug/l	Monthly	Grab
Chloroform	NA	7	ug/l	Monthly	Grab
1,1,1-Trichloroethane	NA	5	ug/l	Monthly	Grab
Benzene	NA	0.7	ug/l	Monthly	Grab
Toluene	NA	5	ug/l	Monthly	Grab
Chlorobenzene	NA	5	ug/l	Monthly	Grab
Ethylbenzene	NA	5	ug/l	Monthly	Grab
Bis (2-ethylhexyl) phthalate	NA	5	ug/l	Monthly	Grab
Di-n-butylphthalate	NA	50	ug/l	Monthly	Grab
Arsenic, Total Recoverable	NA	50	ug/l	Monthly	Grab
Barium, Total Recoverable	NA	2000	ug/l	Quarterly	Grab
Lead, Total Recoverable	NA	50	ug/l	Quarterly	Grab
Selenium, Total Recoverable	NA	40	ug/l	Quarterly	Grab
Iron, Total Recoverable	NA	600	ug/l	Quarterly	Grab
Manganese, Total Recoverable	NA	600	ug/l	Quarterly	Grab
Nitrogen, Total (as N)	NA	10	mg/l	Quarterly	Grab
Solids, Total Dissolved	NA	1000	mg/l	Quarterly	Grab
Antimony, Total Recoverable	NA	3	ug/l	Quarterly	Grab
Chromium, Hexavalent	NA	100	ug/l	Quarterly	Grab

The combined concentration of Iron, Total recoverable and Manganese, Total Recoverable shall not exceed 1000 ug/L

TABLE 3 - VALVE INFORMATION FOR CARBON BACK-WASHING

Backwash GAC Vessel #1 T-2-10-1

Valve No.	Valve Type	Valve description	Normal Position	Backwash Position
EP-301,2,3	1 ½" pvc BV	Sludge tank decant valves (3)	Open	closed
BV-1507	2" pvc BV	Pit discharge hose connection	Closed	open
BV-1506	2" pvc BV	Pit pump discharge	Open	Closed
BF-1421	3" cs BF	Discharge to IW-1	Open	closed
BF-1422	3" cs BF	Discharge to IW-2	Open	closed
BF-1423	3" cs BF	Discharge to IW-3	Open	closed
BF-1424	3" cs BF	Discharge to IW-4	Open	closed
BF-1499	8" CO BF	Backwash feed over INF pumps	Closed	open
BF-811	8" CO BF	CA effluent at INF pumps	Open	closed
BF-812	8" CO BF	CA effluent at INF pumps	Open	Closed
BF-806	8" CO BF	Carbon Adsorber effluent at GAC	Open	Closed
BF-804	4" CO BF	GAC-2 influent	Open	Closed
BF-899	8" CO BF	GAC-1 Backwash effluent	Closed	Open
BF-802	4" CO BF	GAC-1 influent	Open	Closed
BF-601	10" CO BF	Sandfilter discharge	Open	Closed
BF-602	10" CO BF	Sandfilter discharge	Open	Closed

Backwash GAC Vessel #2 T-2-10-2

Valve No.	Valve Type	Valve description	Normal Position	Backwash Position
EP-301,2,3	1 ½" pvc BV	Sludge tank decant valves (3)	Open	closed
BV-1507	2" pvc BV	Pit discharge hose connection	Closed	open
BV-1506	2" pvc BV	Pit pump discharge	Open	Closed
BF-1421	3" cs BF	Discharge to IW-1	Open	closed
BF-1422	3" cs BF	Discharge to IW-2	Open	closed
BF-1423	3" cs BF	Discharge to IW-3	Open	closed
BF-1424	3" cs BF	Discharge to IW-4	Open	closed
BF-1499	8" CO BF	Backwash feed over INF pumps	Closed	open
BF-811	8" CO BF	CA effluent at INF pumps	Open	closed
BF-812	8" CO BF	CA effluent at INF pumps	Open	Closed
BF-805	8" CO BF	Carbon Adsorber effluent at GAC	Open	Closed
BF-804	4" CO BF	GAC-2 influent	Open	closed
BF-898	8" CO BF	GAC-2 Backwash effluent	Closed	open
BF-802	4" CO BF	GAC-1 influent	Open	Closed
BF-601	10" CO BF	Sandfilter discharge	Open	Closed
BF-602	10" CO BF	Sandfilter discharge	Open	Closed

BV – Ball Valve
BF – Butterfly Valve
CO – *Chain Operated*
WO – Wheel Operated
cs – carbon steel
(Refer to drawing CPS-Dwg-001 Backwash Valving)

Table 4 – Process Water Sampling Locations, Methods, and Frequency

Task No./ Location No.[1]	Description and Analytes	Method	Matrix	Monthly	Quarterly	As needed
1	**Groundwater from 3 extraction wells (EX-1, EX-2, EX-3)**		groundwater			
	Field indicator parameters (DO, ORP, conductivity, pH, temp., turbidity)	field multimeter & flow-through cell			x	
	Volatile Organic Compounds (VOCs)	OLC 03.2			x	
	total metals (As, Ba, Cd, Cr, Fe, Mn)	ILM 05.3 ICP AES			x	
	total metals (Pb, Sb, Se)	ILM 05.3 ICP MS			x	
	total suspended solids (TSS)	160.2			x	
2	**Inlet to equalization tank**		process H_2O			
	VOCs	OLC 03.2			x	
	total Fe and Mn	ILM 05.3 ICP AES			x	
	total dissolved solids (TDS)	160.1			x	
	TSS	160.2			x	
7a or 7b Sample one on alternate quarters	**Inlet to 2 liquid GAC units**		process H_2O			
	VOCs	OLC 03.2			x	
	total Fe and Mn	ILM 05.3 ICP AES			x	
	total organic carbon (TOC)	9060			x	
	TSS	160.2			x	
8a,b	**Effluent from 2 liquid GAC units**		process H_2O			
	VOCs	OLC 03.2			x	
	TOC	9060			x	
	TSS	160.2			x	

Task No./ Location No.[1]	Description and Analytes	Method	Matrix	Monthly	Quarterly	As Needed
9	**Plant discharge**		process H_2O			
	field pH and temperature	field meter		weekly		
	VOCs	OLC 03.2		x		
	SVOCs (base neutral extractable only)	OLC 03.2		x		
	total metals (As, Ba, Cd, Cr, Fe, Mn)	ILM 05.3 ICP AES			x[2]	
	total metals (Pb, Sb, Se)	ILM 05.3 ICP MS			x[2]	
	hexavalent chromium (Cr^{+6})	7196A			x[2]	
	total kjeldahl nitrogen	351.4			x[2]	
	TDS	160.1			x[2]	
	anions (Cl^-, F^-, SO_4)	300.0			x	
10	**Sludge storage tank**		sludge			
	VOCs	OLM 04.2				x
	RCRA metals	ILM 05.3				x
11	**Groundwater from monitoring wells**		groundwater			
	Field indicator parameters (DO, ORP, conductivity, pH, temp., turbidity)	field multimeter & flow-through cell			x	
	VOCs	OLC 03.2			x	
	total metals (As, Ba, Cd, Cr, Fe, Mn)	ILM 05.3 ICP AES			Annually October	
	total metals (Pb, Sb, Se)	ILM 05.3 ICP MS			Annually October	
12	**Vapor phase carbon vessel influent & effluent**		air			
	field VOCs	PID		weekly		

Task No./ Location No.1	Description and Analytes	Method	Matrix	Monthly	Quarterly	As Needed
13	**Solid waste characterization samples**		soil/solid			
	field VOCs	PID				x
	Zero Headspace/TCLP Extraction	SW 846-1311				x
	TCLP VOCs (or total)	SW 846-8260B				x
	TCLP Metals (or total)	SW 846-6010A, 3020A, or 7000 series				x
	VOCs	OLC 03.2 or 8260B				x
	SVOCs/BNAs	OLC 03.2 or 8270C				x
	total metals	ILM 05.3 or 6010B				x
15	**Sediment and soils**		sediment/soil			
	VOCs	OLC 03.2 or 8260B				x
	SVOCs/BNAs	OLC 03.2 or 8270C				x
	Metals	ILM 05.3 or 6010B				x
16	**Discrete interval groundwater sampling/Other groundwater sampling**		groundwater			
	VOCs	OLC 03.2 or 8260B				x
	SVOCs/BNAs	OLC 03.2 or 8270C				x
	total metals	ILM 05.3 or 6010B				x

Notes:

1: Except for Nos. 1, 11, 13 - 16, tasks correspond to process locations.
2: Modified from March 2002 SAP in accordance with revised NYSDEC discharge permit requirements.

TABLE 5

DAILY SITE SAFETY INSPECTION
CLAREMONT POLYCHEMICAL SUPERFUND SITE

DATE:____________________

Check all areas, process systems, and equipment for general unsafe conditions.
This is to include but is not limited to the observation of <u>leaks, noise, abnormal function</u>.

Chemical Feed Skids	Pumps	Valves	Tanks	COMMENTS (include areas of leaks)
POLYMER				
CAUSTIC				
POTASSIUM PERMANGANATE				
HYDROCHLORIC ACID				

Process Tanks	Valves	Tanks	COMMENTS (include areas of leaks)
EQUALIZATION			
TREATED WATER			
REACTORS			
CLARIFIERS			
SAND FILTERS			
CARBON VESSELS (liq)			

Process Systems	Pumps	Valves	Tanks	COMMENTS (include areas of leaks)
INFLUENT				
SLUDGE SETTLER				
RECYCLE				
AIR STRIPPER FEED				
CARBON FEED				
INJECTION				

Floor and General Work Areas	General Conditions and Comments
SLIP, TRIP, & FALL HAZARDS	
SHARP EDGES	
PINCH POINTS	
OTHER HAZARDS	

Air Compressor	General Conditions and Comments
TANK	
AFTER COOLER	
AIR DRIER	
MOTOR & COMPRESSOR	

Air Stripper	General Conditions and Comments
COLUMN	
BLOWER & BELTS	
CARBON VESSELS	

Notes and Comments:

SIGNED: ______________________________ **DATE:** ________________________

TABLE 6

***Sample* – DAILY QUALITY CONTROL REPORT**

Day: Monday
Date: XX/XX/XX

Weather: description of weather forecast

Total Gallons Processed for Day: water processed in the period

Plant Operating Hours: 24.0 hrs. **Total Downtime**: 0.0 hrs.

Reason for Downtime:
No downtime to report.

Significant Operational Problems:
No new problems encountered.

Corrective Maintenance Performed:
Maintenance activities

Verbal/Written Instruction from Government Personnel:
None given.

Quality Management Inspections Performed and Results:
Conducted site safety inspection, found loose bolts on P-1-2-4 pump. Tightened bolts and returned to service.

Quality Control Records of any tests performed, samples taken, personnel involved:
Jim Jackson performed weekly O&M inspection and collected weekly pH readings from plant discharge, pH reading was 6.27 s.u and a temperature reading of 12.5 ^{0}C. Jim Jackson also collected weekly reaction tanks ph readings tank#1 was 5.76 s.u and Reaction tank #2 was 5.75 s.u with a temperature reading of 13.5 c.

Available Analytical Results:
None available.

Calibration Procedures Performed:

The Oakton pH meter was calibrated and found to be operational, calibration results are recorded in the calibration log book. The plant Photovac PID meter was calibrated and found to be operational, the calibration results were logged in the onsite calibration logbook.

General Remarks:
Plant is discharging to the injection well field at 403 gpm. Tightened bolts on P-1-2-4 pump and returned to service.

Plant Manager Signature: Richard C. Crouce ____

Attachments: Daily Site Safety Inspection
Daily Operating Log
Air Monitoring Log
Sign In Sheet

cc: SAIC Program Manager
USACE Project Manager
File

TABLE 7 - **DAILY ACTIVITIES SUMMARY REPORT**
CLAREMONT POLYCHEMICAL SUPERFUND SITE
OLD BETHPAGE, NEW YORK

OPERATOR: ____ **DATE:** ________________________

LISTING OF OPERATIONS ACTIVITIES	EQUIPMENT/MATERIALS USED
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	
11)	

LISTING OF MAINTENANCE ACTIVITIES	EQUIPMENT/MATERIALS USED
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	
11)	

IDENTIFIED PROBLEMS AND RECOMMENDED ACTIONS
1)

Table 8-2 - DAILY OPERATING LOG (Revised 12/18/08)

Operator: Day: Date: Time:

PLANT INFLUENT FLOW (GPM)		
TRAIN 1	TRAIN 2	TOTAL

PLANT EFFLUENT FLOW (GPM)		
PUMP	SYPHON	METER (X 10,000) GALs

WELL ID	Signet Flow Meter Total Volume	TOTAL EXTRACTED GALLONS (HMI - Flow Data) (12:00 am to 12:00 am) T-1	T-2	T-3	T-4	Motor Amp Load	System Operating Hours
EW-1							
EW-2							
EW-3							

WELL ID	Water Level ft. AMSL (HMI)	Signet Meter Total Volume
IW-1		
IW-2		
IW-3		
IW-4		

Observations and Comments

PUMP ID	System Operating Hours	Motor Amp Load	System Pressure Gauges Suction Side PSI	Discharge Side PSI	COMMENTS
INF 1					
INF 2					
INF 3					
ASF 1					
ASF 2					
ASF 3					
GAC 1					
GAC 2					
GAC 3					
REC 1					
REC 2					
INJ 1					
INJ 2					
INJ 3					
SUMP					
BLOWER					

	INLET	OUTLET	DIFF
GAC #1 (PSI)			
GAC #2 (PSI)			
AIR DRIER (PSI)			
AS Blower (H_2O")			
Air Temp (^oF)			
Water Temp (^oF)			
V-GAC #1 (H_20")			
V-GAC #2 (H_20")			

pH	System Probe DAILY	Lab Meter WEEKLY
Reactor Tank 1		
Reactor Tank 2		
AS. Feed		
PLANT DISCHARGE - **pH**		
PLANT DISCHARGE - **Temp.**		

SAND FILTER DEPTH TO WATER (INCHES)		
	Measurement 1	Measurement 2
	AM	If needed
Treat. Train 1		
Treat. Train 2		

Additional comments:

NM = Not Measured NIS = Not in service
OL = Off Line
SB = Standby

Supervisors Signature: Date

Claremont Polychemical Superfund Site
Old Bethpage New York
March 2008

SYSTEM	UNITS	EQUIPMENT	ACTION	FREQUENCY						COMMENTS
					3-Mar	10-Mar	17-Mar	24-Mar	31-Mar	
EXTRACTION WELLS	3	PUMPS	HOUR READINGS	DAILY						
		MOTORS	AMP DRAW	MONTHLY						
EQUALIZATION TANK	1	TANK	INSPECT	WEEKLY						
	1	MIXER								not in service
	1	INFLUENT STRAINER	INSPECT	MONTHLY						Inspected and Cleaned Oct. 31, 2006
INFLUENT PUMPS	3	SUCTION VALVES	EXERCISE	MONTHLY						
	3	DISCHARGE VALVES	EXERCISE	MONTHLY						
	3	CHECK VALVES	LUBRICATE	MONTHLY						
			INSPECT	QUARTERLY						
	3	PUMPS	INSPECT	WEEKLY						11/07 Hole in P3 pump head - off line
	3	PUMP MOTORS	INSPECT/ROTATE	WEEKLY						Pumps rotated
			LUBRICATE	MONTHLY						P-1-4-3 new motor was installed Dec.15,2006
			AMP DRAW	MONTHLY						Amp Draws taken
	2	FLOW DIRECTION VALVES	EXERCISE	MONTHLY						
	2	FLOW CONTROL VALVES/ACTUATORS	INSPECT	WEEKLY						Air supply off, valve 1 leaks
	2	MAGNETIC FLOW METERS	INSPECT	WEEKLY						
			CALIBRATE	YEARLY						
	6	PRESSURE GAUGE VALVES	EXERCISE	MONTHLY						
REACTION TANK # 1	1	MAIN DRAIN VALVE	EXERCISE	MONTHLY						Tanks are filled with water - no test
	1	MIXER	INSPECT	MONTHLY	DO NOT exercise the mixer until EQ tank has been cleaned out;					Last exercised 11/20/2005
			LUBRICATE	SEMI-ANNUALLY						Last lubricated Nov 2004; has been idle since
	1	pH PROBE	CHECK ACCURACY	WEEKLY						Probe replaced Nov 2004
			INSPECT	MONTHLY						
			CALIBRATE	MONTHLY						Calibrated Feb. 29,2008
REACTION TANK # 2	1	MAIN DRAIN VALVE	EXERCISE	MONTHLY						Tanks are filled with water, valve not tested
	1	MIXER	INSPECT	MONTHLY	DO NOT exercise the mixer until EQ tank has been cleaned out					Last exercised 11/20/2005
	1	pH PROBE	CHECK ACCURACY	WEEKLY						Probe replaced Nov 2004
			INSPECT	MONTHLY						
			CALIBRATE	MONTHLY						Calibrated Feb. 29,2008
CAUSTIC FEED		CHEMICAL DRUM	INVENTORY	WEEKLY						ok
	1	POLY TANK	INSPECT	WEEKLY						
			CLEAN	AS NEEDED						
	1	MIXER	INSPECT	WEEKLY						
	2	PUMPS	INSPECT	WEEKLY						New caustic LMI pump installed 10-02-07
		PIPING / TUBING	INSPECT	WEEKLY						
			CLEAN	AS NEEDED						
POLYMER FEED		CHEMICAL BAGS	INVENTORY	MONTHLY						The polymer feed system is currently offline and mothballed. Equipment is checked monthly to make sure that the system is fully functional and ready for service should water characteristics change and require the system to go back into service. M-4-5-1 mixer is currently out of service
	2	POLY TANK	INSPECT	MONTHLY						
	2	MIXER	INSPECT/EXERCISE	MONTHLY						
			CLEAN	AS NEEDED						
	2	DRAIN VALVE	EXERCISE	MONTHLY						
	2	WATER SUPPLY VALVES	EXERCISE	MONTHLY						

Claremont Polychemical Superfund Site
Old Bethpage New York
March 2008

SYSTEM	UNITS	EQUIPMENT	ACTION	FREQUENCY						COMMENTS
					3-Mar	10-Mar	17-Mar	24-Mar	31-Mar	
	1	WATER FILTER	INSPECT	MONTHLY						
	3	PERISTALTIC PUMPS	EXERCISE	MONTHLY						
	19	SYSTEM VALVES	EXERCISE	MONTHLY						
POTASSIUM		CHEMICAL DRUMS	INVENTORY	MONTHLY						The potassium permangante feed system is currently mothballed. Equipment is checked monthly to make sure the system is ready for service should the groundwater characteristics change and require the system to back online. Before this system can go back online, significant work will need to be done with the PID controllller in the local control panel.
PERMANGANATE	1	POLY TANK	INSPECT	MONTHLY						
FEED	1	MIXER	INSPECT/EXERCISE	MONTHLY						
			CLEAN	AS NEEDED						
	1	DRAIN VALVE	EXERCISE	MONTHLY						
	2	METERING PUMPS	INSPECT	MONTHLY						
	7	SYSTEM VALVES	EXERCISE	MONTHLY						
FLASH/FLOC TANK # 1	1	SAMPLE PORT VALVE	EXERCISE	MONTHLY						The flash and flocculation tanks and associated equipment are currently offline. Due to lack of solids in the groundwater, metals precipiation is not required at this time. The systems are checked monthly to ensure that they are fully functional in the event that they are required to be returned to service.
	1	DRAIN VALVE	EXERCISE	MONTHLY						
	1	SLUDGE PUMP INF. VALVE	EXERCISE	MONTHLY						
	2	MIXER	EXERCISE	MONTHLY						
	1	SLUDGE PUMP EFF. VALVE	EXERCISE	MONTHLY						
	2	GAUGE VALVES	EXERCISE	MONTHLY						
FLASH/FLOC TANK # 2	1	SAMPLE PORT VALVE	EXERCISE	MONTHLY						
	1	DRAIN VALVE	EXERCISE	MONTHLY						
	1	SLUDGE PUMP INF. VALVE	EXERCISE	MONTHLY						
	2	MIXER	EXERCISE	MONTHLY						
	1	SLUDGE PUMP EFF. VALVE	EXERCISE	MONTHLY						
	2	GAUGE VALVES	EXERCISE	MONTHLY						
CLARIFIER # 1	1	BAFFLES	INSPECT	WEEKLY						sludge building up
			CLEAN	WEEKLY						
	2	SLUDGE PUMPS	INSPECT	WEEKLY						
			EXERCISE	MONTHLY						
	3	SAMPLE PORT VALVES	EXERCISE	WEEKLY						
	1	DRAIN VALVE	EXERCISE	MONTHLY						
	1	WEIRS	INSPECT	WEEKLY						
CLARIFIER # 2	1	BAFFLES	INSPECT	WEEKLY						Sludge building up
			CLEAN	WEEKLY						
	2	SLUDGE PUMPS	INSPECT	WEEKLY						
			EXRECISE	MONTHLY						
	3	SAMPLE PORT VALVES	EXERCISE	WEEKLY						
	1	DRAIN VALVE	EXERCISE	MONTHLY						
	1	WEIRS	INSPECT	WEEKLY						
SAND FILTER # 1	4	DRAIN VALVES	EXERCISE	MONTHLY						
	8	RISERS	INSPECT	WEEKLY						Power Washed Sept. 18. 2007
SAND FILTER # 2	4	DRAIN VALVES	EXERCISE	MONTHLY						
	8	RISERS	INSPECT	WEEKLY						
PNEUMATIC SYSTEM	1	AIR COMPRESSOR MOTORS	CHECK OIL LEVEL	WEEKLY						System was put in an Off-Line mode to save wear on units (1-8-08). Compressor is activated as needed
	1		CHANGE OIL / FILTER	QUARTERLY						

Claremont Polychemical Superfund Site
Old Bethpage New York
March 2008

SYSTEM	UNITS	EQUIPMENT	ACTION	FREQUENCY						COMMENTS
					3-Mar	10-Mar	17-Mar	24-Mar	31-Mar	
	2	COMPRESSOR AIR FILTER	INSPECT	WEEKLY						
			CHANGE	QUARTERLY						Changed Jan 18, 2006
	2	COMPRESSOR BELTS	CHECK BELT TENSION	WEEKLY						New Belts in stalled at # one Motor (11-21-07)
			CHANGE	AS NEEDED						
	1	AIR COMP. TANK	INSPECT	WEEKLY						
			CHECK DRAIN / FILTER	DAILY						
	2	AIR COMP. TANK VALVES	EXERCISE	MONTHLY						
	8	PRESSURE RELIEF VALVES	INSPECT	WEEKLY						
	3	AFTER COOLER VALVES	EXERCISE	MONTHLY						
	1	AFTER COOLER DRAIN	INSPECT	DAILY						
	4	AIR DRYER VALVES	EXERCISE	MONTHLY						
	1	AIR DRYER DRAIN	INSPECT	WEEKLY						Dryer was repaired & installed Feb. 07, 2007
	2	COALESING FILTER	DRAIN	WEEKLY						
	2		REPLACE C'TRGE	QUARTERLY						Replaced Jan 27, 2006
	4	COALESIG FILTER VALVES	EXERCISE	MONTHLY						
	15	PLANT REGULATORS/TRAPS	DRAIN	DAILY						
AIR STRIPPER FEED	2	TANK	INSPECT	WEEKLY						
	1	pH PROBE	CHECK ACCURACY	WEEKLY						probe needs cleaning as calibration is not taking
			CALIBRATE	AS NEEDED						Checked Feb. 29,2008
	2	pH PROBE VALVES	EXERCISE	MONTHLY						
	3	PUMP	INSPECT	WEEKLY						Feb-13-06 New Glycerine-filled gauge installed
	3	PUMP MOTOR	INSPECT/ROTATE	WEEKLY						
			LUBRICATE	AS NEEDED						
	3	CHECK VALVES	LUBRICATE	MONTHLY						
			INSPECT	QUARTERLY						
	1	FLOW CONTROL VALVES/ACTUATORS	INSPECT	WEEKLY						actuators removed june 2007
	2	TANK INFLUENT VALVES	EXERCISE	MONTHLY						
	2	TANK EFFLUENT VALVES	EXERCISE	MONTHLY						
	2	TANK DRAIN	EXERCISE	MONTHLY						tank full - not tested
	2	LEVEL INDICATOR	INSPECT	WEEKLY						
	2	LEVEL IND. ISOLATION VALVE	EXERCISE	MONTHLY						
	5	PUMP INFLUENT VALVES	EXERCISE	MONTHLY						
	3	PUMP EFFLUENT VALVES	EXERCISE	MONTHLY						
	1	SAMPLE PORT VALVE	EXERCISE	MONTHLY						
HYDROCHLORIC FEED		CHEMICAL DRUM	INVENTORY	WEEKLY						The hydrochloric acid feed system is currently offline and mothballed. Equipment is checked monthly against the chance that system is required to be returned to service. On July 30. 2007 new LMI pump was installed @ p-5-3-2 .
	1	MIXER	INSPECT	MONTHLY						
			CLEAN	AS NEEDED						
	2	PUMPS	INSPECT	MONTHLY						
		PIPING / TUBING	INSPECT	MONTHLY						
			CLEAN	AS NEEDED						
AIR STRIPPER TOWER	1	FIBERGLASS TOWER	INSPECT	WEEKLY						peeling paint
	1	HEATER	INSPECT	WEEKLY						

Claremont Polychemical Superfund Site
Old Bethpage New York
March 2008

SYSTEM	UNITS	EQUIPMENT	ACTION	FREQUENCY						COMMENTS
					3-Mar	10-Mar	17-Mar	24-Mar	31-Mar	
	1	GAUGES / TUBING	INSPECT	WEEKLY						
			DRAIN CONDENSATE	AS NEEDED						Belts
	1	BLOWER	INSPECT BELTS	WEEKLY						New belts installed 10/01/07, Tightened 2/29/08
			GREASE BEARINGS	MONTHLY						BEARINGS GREASED - 11-05-07
	1	PRESSURE GAUGE	INSPECT	WEEKLY						
	1	SUMP	DRAIN	AS NEEDED						
		OFF GAS PIPING	INSPECT	WEEKLY						
	2	OFF GAS PIPING VALVES	EXERCISE	MONTHLY						
VAPOR GAC UNITS	4	GAUGES	INSPECT	WEEKLY						
			DRAIN CONDENSATE	AS NEEDED						Carbon Change GAC #2 (12-19-07)
	4	GAUGE VALVES	EXERCISE	MONTHLY						
		TUBING	INSPECT	WEEKLY						New Tubing #1 (12-12-07), #2 needs replacement
			REPLACE	AS NEEDED						condensation problems
AQUEOUS GAC FEED	3	PUMP	INSPECT	WEEKLY						Feb 10, 2006 Replace pressure gauge (P-2-9-2)
	3	PUMP MOTORS	INSPECT/ROTATE	WEEKLY						Pump Motors rotated 2-21-08
			LUBRICATE	AS NEEDED						
			AMP DRAW	MONTHLY						Amp Draws Taken 2-29-08
	3	CHECK VALVES	LUBRICATE	MONTHLY						Broken Gland Repaired 1 -14- 08
			INSPECT	QUARTERLY						
	2	POLY TANK	INSPECT	WEEKLY						
	2	TANK INFLUENT VALVES	EXERCISE	MONTHLY						
	2	TANK EFFLUENT VALVES	EXERCISE	MONTHLY						
	2	TANK DRAIN	EXERCISE	MONTHLY						
	1	WATER LEVEL ISOLATION	EXERCISE	MONTHLY						
	3	PUMP SUCTION VALVE	EXERCISE	MONTHLY						New shut off valves installed 10/23/07
	3	PUMP DISCHARGE VALVE	EXERCISE	MONTHLY						New shut off valves installed 11/15/07
	2	FLOW CONTROL VALVES/ACTUATORS	INSPECT	WEEKLY						Actuators (A/S) & (C./F) out of service (June 2007)
	2	AIR STRIP. BYPASS VALVE	EXERCISE	MONTHLY						This has been blocked
	1	SAMPLE PORT VALVE	EXERCISE	MONTHLY						
AQUEOUS GAC VESSELS	3	INFLUENT VALVES	EXERCISE	MONTHLY						
	2	PRESSURE RELIEF VALVES	INSPECT	MONTHLY						
	3	BACKWASH VALVES	EXERCISE	MONTHLY						
	2	EFFLUENT VALVES	EXERCISE	MONTHLY						
	2	SAMPLE PORT VALVE	EXERCISE	MONTHLY						
	4	GAUGE ISOL. VALVES	EXERCISE	MONTHLY						
TREATED WATER	2	TANK	INSPECT	WEEKLY						Tanks were powerwashed at the base 10-31-07
SYSTEM	2	DRAIN VALVE	EXERCISE	AS NEEDED						
	2	PUMPS	INSPECT	WEEKLY						
	2	PUMP MOTORS	INSPECT	WEEKLY						
			LUBRICATE	AS REQUIRED						
			AMP DRAW	QUARTERLY						Amp Draws Taking 2/29/08
	2	CHECK VALVES	LUBRICATE	MONTHLY						

Claremont Polychemical Superfund Site
Old Bethpage New York
March 2008

SYSTEM	UNITS	EQUIPMENT	ACTION	FREQUENCY						COMMENTS
					3-Mar	10-Mar	17-Mar	24-Mar	31-Mar	
			INSPECT	QUARTERLY						
	3	PUMP INFLUENT VALVES	EXERCISE	MONTHLY						
	4	PUMP EFFLUENT VALVES	EXERCISE	MONTHLY						
	3	RECYCLE FLOW VALVES	EXERCISE	MONTHLY						
	1	BACKWASH FEED VALVE	EXERCISE	MONTHLY						
	1	LEVEL INDICATOR	INSPECT	WEEKLY						Insulation and heater Installed 12-21-07
	1	LEVEL IND. ISOLATION VALVE	EXERCISE	MONTHLY						Insulationand heater Installed 12-21-07
		Krohne Mag meter	Inspect	weekly						Backwash line below Krohne Meter has leak 11-20-07
	4	PROP. FLOW METER	INSPECT	WEEKLY						
	8	METER ISOL. VALVES	EXERCISE	MONTHLY						
FLOOR DRAINS &	1	SUMP PIT W/ PUMP	INSPECT	WEEKLY						Carbon build up, pump clogged
PIT	12	FLOOR DRAINS	INSPECT	WEEKLY						
	2	FLOW CONTROL VALVES	EXERCISE	MONTHLY						
RECYCLE SYSTEM	2	PUMPS	INSPECT	WEEKLY						
		PUMP MOTORS	INSPECT	WEEKLY						
			LUBRICATE	AS REQUIRED						
			AMP DRAW	MONTHLY						Amp Draws Taking 2/29/08
	2	CHECK VALVES	LUBRICATE	MONTHLY						
			INSPECT	QUARTERLY						
	2	PUMP INFLUENT VALVES	EXERCISE	MONTHLY						
	3	PUMP EFFLUENT VALVES	EXERCISE	MONTHLY						
SLUDGE STORAGE	1	TANK	INSPECT	WEEKLY						
TANK	2	DRAIN VALVE	EXERCISE	MONTHLY						New valve and drainline installed Jan 20008
	4	DECANT VALVES	EXERCISE	MONTHLY						
	1	SAMPLE PORT VALVE	EXERCISE	MONTHLY						
	1	SLUDGE PRESS PUMP	EXERCISE	MONTHLY						
	1	LEVEL INDICATOR	INSPECT	WEEKLY						
	2	LEVEL INDIC. VALVE	EXERCISE	MONTHLY						
SLUDGE PRESS	1	SLUDGE PRESS	INSPECT	MONTHLY						The sludge press has never been used and is currently mothballed.
			EXERCISE	MONTHLY						
	1	INFLUENT VALVE	EXERCISE	MONTHLY						
	4	EFFLUENT VALVES	EXERCISE	MONTHLY						
HVAC &	1	MOTOR	INSPECT	ANNUALLY						Last inspected Dec 2005
AIR HANDLING UNIT	3	BELTS	INSPECT	SEMI-ANNUALLY						Last inspected Dec 2005
	1	MOTOR BEARING	LUBRICATE	SEMI-ANNUALLY						Inspected and Lubricated (12-04-07)
	1	BLOCK BEARING (SOUTH)	LUBRICATE	SEMI-ANNUALLY						Inspected and Lubricated (12-04-07)
		Filters								New filters Feb 2008
	1	BEARING (NORTH)	LUBRICATE	SEMI-ANNUALLY						Inspected and Lubricated (12-04-07)
CONTROL ROOM	1	MCC UNIT	CHECK LIGHTBULBS	WEEKLY						
	1	MCP	CHECK LIGHTBULBS	WEEKLY						
LABORATORY	N/A	BOTTLES	INVENTORY	MONTHLY						
	N/A	CHEMICALS	INVENTORY	MONTHLY						

Claremont Polychemical Superfund Site
Old Bethpage New York
March 2008

SYSTEM	UNITS	EQUIPMENT	ACTION	FREQUENCY						COMMENTS
					3-Mar	10-Mar	17-Mar	24-Mar	31-Mar	
	N/A	COOLERS	INVENTORY	MONTHLY						

COMMENTS:

FF - FULLY FUNCTIONAL
IOS - INTENTIONALLY OUT OF SERVICE
NS - NEEDS SERVICE (NORMAL MAINTENANCE)
RR - REPAIRS REQUIRED
NR - NOT REQUIRED
NA - NOT APPLICABLE

WEEKLY MAINTENANCE TO BE PERFORMED AT THE BEGINNING OF THE WEEK.
MONTHLY MAINTENANCE TO BE PERFORMED BY SECOND/THIRD WEEK.
ANNUAL / SEMI ANNUAL MAINTENANCE TO BE PERFORMED IN MARCH AND SEPTEMBER AS SCHEDULE PERMITS.
MAINTENACE PERFORMED AS NEEDED WILL BE INDICATED WITH A DATE AFTER THE INSPECTION

Table 10 – Maintenance and Inspection Schedule

Process	Equipment	Manufacturer	Equipment ID	Maintenance Task	Frequency
Extracted Water	Extraction Well Pumps	Groundfos/Franklin	P-1-1-1	Amp Draw	Monthly
Extracted Water	Extraction Well Pumps	Siemens	P-1-1-1	Check Motor Starter/Contactors	Bi-Annually
Extracted Water	Extraction Well Pumps	Groundfos/Franklin	P-1-1-3	Amp Draw	Monthly
Extracted Water	Extraction Well Pumps	Siemens	P-1-1-3	Check Motor Starter/Contactors	Bi-Annually
Extracted Water	Extraction Well Pumps	Groundfos/Franklin	P-1-1-2	Amp Draw	Monthly
Extracted Water	Extraction Well Pumps	Siemens	P-1-1-2	Check Motor Starter/Contactors	Bi-Annually
Extracted Water	Flow meters	Signet	FE/FT-1-1-1	Inspect	Monthly
Extracted Water	Flow meters	Signet	FE/FT-1-1-1	Loop Calibrate	As necessary
Extracted Water	Flow meters	Signet	FE/FT-1-1-2	Inspect	Monthly
Extracted Water	Flow meters	Signet	FE/FT-1-1-2	Loop Calibrate	As necessary
Extracted Water	Flow meters	Signet	FE/FT-1-1-3	Inspect	Monthly
Extracted Water	Flow meters	Signet	FE/FT-1-1-3	Loop Calibrate	As necessary
Equalization System	Equalization Tank	Peabody Tec-Tank	T-1-3-1	Inspect-external	Weekly
Equalization System	Equalization Tank	Peabody Tec-Tank	T-1-3-1	Inspect Internal	Upon clean out
Equalization System	EQ Tank Mixer	Chemineer	M-1-3-1	Lubricate - Motor	Bi-annually
Equalization System	EQ Tank Mixer	Chemineer	M-1-3-1	Lubricate - Gear Drive	Bi-annually
Equalization System	Level Sensor	Rosemount	LE/LT-1-3-1	calibrate	As necessary
Equalization System	Basket Strainer	Hayward		Clean	As necessary
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-1	Lubricate	Monthly
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-1	inspect- Impeller and casing	As necessary
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-1	Amp Draw	Monthly
Clarification System	Influent Pumps	Siemens	P-1-4-1	Check Motor Starter/Contactors	Bi-Annually
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-2	Lubricate	Monthly
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-2	inspect- Impeller and casing	As necessary
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-2	Amp Draw	Monthly
Clarification System	Influent Pumps	Siemens	P-1-4-2	Check Motor Starter/Contactors	Bi-Annually
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-3	Lubricate	Monthly
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-3	inspect- Impeller and casing	As necessary
Clarification System	Influent Pumps	Ingersol-Dressler	P-1-4-3	Amp Draw	Monthly

Clarification System	Influent Pumps	Siemens	P-1-4-3	Check Motor Starter/Contactors	Bi-Annually
Clarification System	Check Valves	Golden Anderson	SC-1-4-1	Inspect- glands for leakage	Weekly
Clarification System	Check Valves	Golden Anderson	SC-1-4-1	Inspect - Internals	As necessary
Clarification System	Check Valves	Golden Anderson	SC-1-4-2	Inspect- glands for leakage	Weekly
Clarification System	Check Valves	Golden Anderson	SC-1-4-2	Inspect - Internals	As necessary
Clarification System	Check Valves	Golden Anderson	SC-1-4-3	Inspect- glands for leakage	Weekly
Clarification System	Check Valves	Golden Anderson	SC-1-4-3	Inspect - Internals	As necessary
Clarification System	Flow Control Valve	Milliken	FCV-1-6-1	Inspect- Valve Leakage	Weekly
Clarification System	Flow Control Valve	Milliken	FCV-1-6-1	Inspect- Valve Leakage	Weekly
Clarification System	Flowmeter	Brooks	FE/FT-1-6-1	Inspect	yearly
Clarification System	Flowmeter	Brooks	FE/FT-1-6-1	4-20 mA loop Calibration	As necessary
Clarification System	Flowmeter	Brooks	FE/FT-1-6-2	Inspect	yearly
Clarification System	Flowmeter	Brooks	FE/FT-1-6-2	4-20 mA loop Calibration	As necessary
Clarification System	Reaction Tank	CSK	T-1-8-1	Inspect	Weekly
Clarification System	Reaction Tank	CSK	T-1-8-2	Inspect	Weekly
Clarification System	pH Transmitter	Yokogawa	AIC-1-8-1	Calibrate	weekly
Clarification System	pH Transmitter	Yokogawa	AIC-1-8-2	Calibrate	weekly
Clarification System	pH Sensor	Yokogawa	AIT-1-8-1	Inspect	Weekly
Clarification System	pH Sensor	Yokogawa	AIT-1-8-1	Clean	As necessary
Clarification System	pH Sensor	Yokogawa	AIT-1-8-2	Inspect	Weekly
Clarification System	pH Sensor	Yokogawa	AIT-1-8-2	Clean	As necessary
Clarification System	Reaction tank Mixer	Sharpe	M-1-8-1	Lubricate Motor	Bi-Annually
Clarification System	Reaction tank Mixer	Sharpe	M-1-8-1	Lubricate Speed Reducer	Bi-Annually
Clarification System	Reaction tank Mixer	Sharpe	M-1-8-2	Lubricate Motor	Bi-Annually
Clarification System	Reaction tank Mixer	Sharpe	M-1-8-2	Lubricate Speed Reducer	Bi-Annually
Clarification System	Flash Mix Tank	CSK	T-1-9-1	Inspect	Weekly
Clarification System	Flash Mix Tank	CSK	T-1-9-2	Inspect	Weekly
Clarification System	Flash Tank Mixer	Sharpe	M-1-9-1	Inspect	Weekly
Clarification System	Flash Tank Mixer	Sharpe	M-1-9-1	Lubricate - mixer	36 months
Clarification System	Flash Tank Mixer	Sharpe	M-1-9-1	Lubricate Motor	Bi-Annually
Clarification System	Flash Tank Mixer	Sharpe	M-1-9-2	Inspect	Weekly
Clarification System	Flash Tank Mixer	Sharpe	M-1-9-2	Lubricate - mixer	36 months

Clarification System	Flash Tank Mixer	Sharpe	M-1-9-2	Lubricate Motor	Bi-Annually
Clarification System	Flocculation Tank	CSK	T-1-10-1	Inspect	Weekly
Clarification System	Flocculation Tank	CSK	T-1-10-2	Inspect	Weekly
Clarification System	Flocculation Tank Mixer	Sharpe	M-1-10-1	Inspect	Weekly
Clarification System	Flocculation Tank Mixer	Sharpe	M-1-10-1	Lubricate- motor	Bi-Annually
Clarification System	Flocculation Tank Mixer	Sharpe	M-1-10-1	Lubricate-Gearbox	Bi-Annually
Clarification System	Flocculation Tank Mixer	Sharpe	M-1-10-2	Inspect	Weekly
Clarification System	Flocculation Tank Mixer	Sharpe	M-1-10-2	Lubricate- motor	Bi-Annually
Clarification System	Flocculation Tank Mixer	Sharpe	M-1-10-2	Lubricate-Gearbox	Bi-Annually
Clarification System	Variable Frequency Drive	Reliance	VFD-1-10-1	Inspect	As necessary
Clarification System	Variable Frequency Drive	Reliance	VFD-1-10-2	Inspect	As necessary
Clarification System	Lamella Clarifier	CSK	JCL-1-12-1	Inspect-external	Weekly
Clarification System	Lamella Clarifier	CSK	JCL-1-12-1	Inspect- Weir	Weekly
Clarification System	Lamella Clarifier	CSK	JCL-1-12-1	Inspect - inclined plates	weekly
Clarification System	Lamella Clarifier	CSK	JCL-1-12-1	Clean inclined plates	As necessary
Clarification System	Lamella Clarifier	CSK	JCL-1-12-1	Drop Clarifier - check internals	As necessary
Clarification System	Lamella Clarifier	CSK	JCL-1-12-2	Inspect-external	Weekly
Clarification System	Lamella Clarifier	CSK	JCL-1-12-2	Inspect- Weir	Weekly
Clarification System	Lamella Clarifier	CSK	JCL-1-12-2	Inspect - inclined plates	Weekly
Clarification System	Lamella Clarifier	CSK	JCL-1-12-2	Clean inclined plates	As necessary
Clarification System	Lamella Clarifier	CSK	JCL-1-12-2	Drop Clarifier - check internals	As necessary
Clarification System	Sludge Pump	Wilden	P-1-12-1	Inspect	Annually
Clarification System	Sludge Pump	Wilden	P-1-12-2	Inspect	Annually
Clarification System	Sludge Recycle Pump	Wilden	P-1-11-1	Inspect	Annually
Clarification System	Sludge Recycle Pump	Wilden	P-1-11-2	Inspect	Annually
Gravity Filter	Gravity Filter	Volcano	M-1-14-1	Inspect Tank	Weekly
Gravity Filter	Gravity Filter	Volcano	M-1-14-2	Inspect Tank	Weekly
Air stripper	Air Stripper Feed Tank	IMG	T-2-1-1	Inspect-external	weekly
Air stripper	Air Stripper Feed Tank	IMG	T-2-1-1	inspect-internal	As necessary
Air stripper	Air Stripper Feed Tank	IMG	T-2-1-1	clean tank bottoms	as needed
Air stripper	Air Stripper Feed Tank	IMG	T-2-1-2	Inspect-external	weekly

Air stripper	Air Stripper Feed Tank	IMG	T-2-1-2	inspect-internal	As necessary
Air stripper	Air Stripper Feed Tank	IMG	T-2-1-2	clean tank bottoms	as needed
Air stripper	Level Sensor	Rosemount	LE/LT-2-1-1	calibrate	As necessary
Air stripper	Level Sensor	Rosemount	LE/LT-2-1-2	calibrate	As necessary
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-1	Lubricate	Monthly
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-1	inspect- Impeller and casing	As necessary
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-1	Amp Draw	Monthly
Air stripper	Air Stripper Feed Pump	Siemens	P-2-3-1	Check Motor Starter/Contactors	Bi-Annually
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-2	Lubricate	Monthly
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-2	inspect- Impeller and casing	As necessary
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-2	Amp Draw	Monthly
Air stripper	Air Stripper Feed Pump	Siemens	P-2-3-2	Check Motor Starter/Contactors	Bi-Annually
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-3	Lubricate	Monthly
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-3	inspect- Impeller and casing	As necessary
Air stripper	Air Stripper Feed Pump	Ingersol-Dressler	P-2-3-3	Amp Draw	Monthly
Air stripper	Air Stripper Feed Pump	Siemens	P-2-3-3	Check Motor Starter/Contactors	Bi-Annually
Air stripper	Check Valves	Golden Anderson	SC-2-3-1	Inspect- glands for leakage	Weekly
Air stripper	Check Valves	Golden Anderson	SC-2-3-1	Inspect - Internals	As necessary
Air stripper	Check Valves	Golden Anderson	SC-2-3-2	Inspect- glands for leakage	Weekly
Air stripper	Check Valves	Golden Anderson	SC-2-3-2	Inspect - Internals	As necessary
Air stripper	Check Valves	Golden Anderson	SC-2-3-3	Inspect- glands for leakage	Weekly
Air stripper	Check Valves	Golden Anderson	SC-2-3-3	Inspect - Internals	As necessary
Air stripper	Level Control Valve	Milliken	LCV-2-1-1	Inspect- Valve Leakage	Weekly
Air stripper	pH Transmitter	Yokogawa	AIT-2-2-1	Calibrate	weekly
Air stripper	pH Sensor	Yokogawa	AE-2-2-1	Inspect	As necessary
Air stripper	pH Sensor	Yokogawa	AE-2-2-1	Clean	As necessary
Air stripper	Air Stripper	CarbonAir	M-2-5-1	Inspect-High Level float	Yearly
Air stripper	Air Stripper	CarbonAir	M-2-5-1	Inspect-Packing	As necessary
Air stripper	Air Stripper	CarbonAir	M-2-5-1	Inspect- Sump	As necessary
Air stripper	Air Stripper	CarbonAir	M-2-5-1	Inspect - Demister pad	As necessary
Air stripper	Air Stripper	CarbonAir	M-2-5-1	Inspect tower for external damage	Weekly
Air stripper	Blower	New York	M-2-6-1	Lubricate	Monthly

Air stripper	Blower	New York	M-2-6-1	check Belts	Monthly
Air stripper	Blower	New York	M-2-6-1	amp draw	Monthly
Air stripper	Blower	New York	M-2-6-1	Check Motor Starter/Contactors	Bi-Annually
Vapor Carbon	V-GAC	CarbonAir	M-2-7-1	Drain condensation	Weekly
Vapor Carbon	V-GAC	CarbonAir	M-2-7-2	Drain condensation	weekly
Liquid Carbon	L-GAC Feed Tank	IMG	T-2-8-1	Inspect-external	weekly
Liquid Carbon	L-GAC Feed Tank	IMG	T-2-8-1	inspect-internal	As necessary
Liquid Carbon	L-GAC Feed Tank	IMG	T-2-8-1	clean tank bottoms	as needed
Liquid Carbon	L-GAC Feed Tank	IMG	T-2-8-2	Inspect-external	weekly
Liquid Carbon	L-GAC Feed Tank	IMG	T-2-8-2	inspect-internal	As necessary
Liquid Carbon	L-GAC Feed Tank	IMG	T-2-8-2	clean tank bottoms	as needed
Liquid Carbon	Level Sensor	Rosemount	LE/LT-2-8-1	Calibrate	As necessary
Liquid Carbon	Level Sensor	Rosemount	LE/LT-2-8-2	Calibrate	As necessary
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-1	Lubricate	Monthly
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-1	inspect- Impeller and casing	As necessary
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-1	Amp Draw	Monthly
Liquid Carbon	L-GAC Feed Pumps	Siemens	P-2-9-1	Check Motor Starter/Contactors	Bi-Annually
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-2	Lubricate	Monthly
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-2	inspect- Impeller and casing	As necessary
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-2	Amp Draw	Monthly
Liquid Carbon	L-GAC Feed Pumps	Siemens	P-2-9-2	Check Motor Starter/Contactors	Bi-Annually
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-3	Lubricate	Monthly
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-3	inspect- Impeller and casing	As necessary
Liquid Carbon	L-GAC Feed Pumps	Ingersol-Dressler	P-2-9-3	Amp Draw	Monthly
Liquid Carbon	L-GAC Feed Pumps	Siemens	P-2-9-3	Check Motor Starter/Contactors	Bi-Annually
Liquid Carbon	Check Valves	Golden Anderson	SC-2-9-1	Inspect- glands for leakage	Weekly
Liquid Carbon	Check Valves	Golden Anderson	SC-2-9-1	Inspect - Internals	As necessary
Liquid Carbon	Check Valves	Golden Anderson	SC-2-9-2	Inspect- glands for leakage	Weekly
Liquid Carbon	Check Valves	Golden Anderson	SC-2-9-2	Inspect - Internals	As necessary
Liquid Carbon	Check Valves	Golden Anderson	SC-2-9-3	Inspect- glands for leakage	Weekly
Liquid Carbon	Check Valves	Golden Anderson	SC-2-9-3	Inspect - Internals	As necessary
Liquid Carbon	Flow Control Valve	Milliken	LCV-2-8-1	Inspect- Valve Leakage	Weekly

Liquid Carbon	Flow Control Valve	Milliken	LCV-2-8-2	Inspect- Valve Leakage	Weekly
Liquid Carbon	CA Vessel	Oehler	T-2-10-1	Inspect- External	Weekly
Liquid Carbon	CA Vessel	Oehler	T-2-10-1	Inspect- Internal	Each Carbon Change
Liquid Carbon	CA Vessel	Oehler	T-2-10-2	Inspect- External	Weekly
Liquid Carbon	CA Vessel	Oehler	T-2-10-2	Inspect- Internal	Each Carbon Change
Liquid Carbon	Pressure Control Valve	Kunkle	PCV-2-10-1	Inspect	Annually
Liquid Carbon	Pressure Control Valve	Kunkle	PCV-2-10-2	Inspect	Annually
Treat Water Storage	Treated Water Tank	Peabody Tec-Tank	T-2-11-1	Inspect-external	Weekly
Treat Water Storage	Treated Water Tank	Peabody Tec-Tank	T-2-11-1	Inspect Internal	Upon clean out
Treat Water Storage	Treated Water Tank	Peabody Tec-Tank	T-2-11-2	Inspect-external	Weekly
Treat Water Storage	Treated Water Tank	Peabody Tec-Tank	T-2-11-2	Inspect Internal	Upon clean out
Treat Water Storage	Level Sensor	Rosemount	LE/LT-2-11-1	calibrate	As necessary
Treat Water Storage	Level Sensor	Rosemount	LE/LT-2-11-2	calibrate	As Necessary
Injection system	Injection Pump	Ingersol-Dressler	P-2-12-1	Lubricate	Monthly
Injection system	Injection Pump	Ingersol-Dressler	P-2-12-1	inspect- Impeller and casing	As necessary
Injection system	Injection Pump	Ingersol-Dressler	P-2-12-1	Amp Draw	Monthly
Injection system	Injection Pump	Siemens	P-2-12-1	Check Motor Starter/Contactors	Bi-Annually
Injection system	Injection Pump	Ingersol-Dressler	P-2-12-2	Lubricate	Monthly
Injection system	Injection Pump	Ingersol-Dressler	P-2-12-2	inspect- Impeller and casing	As necessary
Injection system	Injection Pump	Ingersol-Dressler	P-2-12-2	Amp Draw	Monthly
Injection system	Injection Pump	Siemens	P-2-12-2	Check Motor Starter/Contactors	Bi-Annually
Injection system	Check Valves	Golden Anderson	SC-2-12-1	Inspect- glands for leakage	Weekly
Injection system	Check Valves	Golden Anderson	SC-2-12-1	Inspect - Internals	As necessary
Injection system	Check Valves	Golden Anderson	SC-2-12-2	Inspect- glands for leakage	Weekly
Injection system	Check Valves	Golden Anderson	SC-2-12-2	Inspect - Internals	As necessary
Injection	Magnetic Flow Meter	Krohne		calibrate	As necessary
Injection system	Flow Meters	Signet	FE/FT-2-14-1	inspect	yearly
Injection system	Flow Meters	Signet	FE/FT-2-14-1	calibrate	yearly
Injection system	Flow Meters	Signet	FE/FT-2-14-2	inspect	yearly
Injection system	Flow Meters	Signet	FE/FT-2-14-2	calibrate	yearly
Injection system	Flow Meters	Signet	FE/FT-2-14-3	inspect	yearly

Injection system	Flow Meters	Signet	FE/FT-2-14-3	calibrate	yearly
Injection system	Flow Meters	Signet	FE/FT-2-14-4	inspect	yearly
Injection system	Flow Meters	Signet	FE/FT-2-14-4	calibrate	yearly
Injection system	Well Level Sensors	KPSI	LSHH-2-15-1	inspect	As necessary
Injection system	Well Level Sensors	KPSI	LSHH-2-15-2	inspect	As necessary
Injection system	Well Level Sensors	KPSI	LSHH-2-15-3	inspect	As necessary
Injection system	Well Level Sensors	KPSI	LSHH-2-15-4	inspect	As necessary
Water Recycle Sys.	Recycle Tank	IMG	T-3-4-1	Inspect-external	weekly
Water Recycle Sys.	Recycle Tank	IMG	T-3-4-1	inspect-internal	As necessary
Water Recycle Sys.	Recycle Tank	IMG	T-3-4-1	clean tank bottoms	as needed
Water Recycle Sys.	Recycle Pumps	Ingersol-Dressler	P-3-5-1	Lubricate	Monthly
Water Recycle Sys.	Recycle Pumps	Ingersol-Dressler	P-3-5-1	inspect- Impeller and casing	As necessary
Water Recycle Sys.	Recycle Pumps	Ingersol-Dressler	P-3-5-1	Amp Draw	Monthly
Water Recycle Sys.	Recycle Pumps	Siemens	P-3-5-1	Check Motor Starter/Contactors	Bi-Annually
Water Recycle Sys.	Recycle Pumps	Ingersol-Dressler	P-3-5-2	Lubricate	Monthly
Water Recycle Sys.	Recycle Pumps	Ingersol-Dressler	P-3-5-2	inspect- Impeller and casing	As necessary
Water Recycle Sys.	Recycle Pumps	Ingersol-Dressler	P-3-5-2	Amp Draw	Monthly
Water Recycle Sys.	Recycle Pumps	Siemens	P-3-5-2	Check Motor Starter/Contactors	Bi-Annually
Water Recycle Sys.	Check Valves	Golden Anderson	SC-3-5-1	Inspect- glands for leakage	Weekly
Water Recycle Sys.	Check Valves	Golden Anderson	SC-3-5-1	Inspect - Internals	As necessary
Water Recycle Sys.	Check Valves	Golden Anderson	SC-3-5-2	Inspect- glands for leakage	Weekly
Water Recycle Sys.	Check Valves	Golden Anderson	SC-3-5-2	Inspect - Internals	As necessary
Water Recycle Sys.	Level Sensor	Rosemount	LE/LT-2-4-1	calibrate	As necessary
Sludge systems	Sludge Holding Tank		T-3-1-1	Inspect	Weekly
Sludge systems	Level Sensor	Rosemount	LE/LT-3-1-1	calibrate	As necessary
Sludge systems	Filter Press Feed Pump	Wilden	P-3-2-1	Inspect	Annually
Sludge systems	Filter Press	Aqua Care Sys	M-3-2-1	Inspect handle area	As necessary
Sludge systems	Filter Press	Aqua Care Sys	M-3-2-1	Inspect Hydraulic Ram	As necessary
Sludge systems	Filter Press	Aqua Care Sys	M-3-2-1	Inspect Hydraulic Oil Level	As necessary
Sludge systems	Filter Press	Aqua Care Sys	M-3-2-1	Inspect Hydraulic oil Lines	As necessary
Sludge systems	Filter Press	Aqua Care Sys	M-3-2-1	Inspect Air Lines	As necessary
Sludge systems	Filter Press	Aqua Care Sys	M-3-2-1	Inspect Cloths	As necessary

Sludge systems	Filter Press	Aqua Care Sys	M-3-2-1	Change Hydraulic Oil	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	Check Oil	Daily
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	Check Oil	Daily
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	Clean cylinder head	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	Clean cylinder head	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	clean motor	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	clean motor	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	clean fan blade	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	clean fan blade	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	Clean air lines	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	Clean air lines	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	clean intercooler	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	clean intercooler	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	Remove and Clean Air Filters	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	Remove and Clean Air Filters	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	Check V-Belts	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	Check V-Belts	As necessary
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	Change Oil	every 90 days or 500 hours
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	Change Oil	every 90 days or 500 hours
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	check entire system for air leakage	every 90 days or 500 hours
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	check entire system for air leakage	every 90 days or 500 hours
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	Tighten nuts and cap screws	every 90 days or 500 hours
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	Tighten nuts and cap screws	every 90 days or 500 hours
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-1	inspect and clean Compressor valves	every 90 days or 500 hours
Air Compressor	Air Compressor- Pumps	Champion	M-2-4-2	inspect and clean Compressor valves	every 90 days or 500 hours
Air Compressor	After Cooler	Airtek	AC-	check Auto-drain	Weekly
Air Compressor	Coalescing Filter			Change Coalescing filters	As necessary

Air Compressor	Coalescing Filter			Drain condensate	weekly
Air Compressor	Air Dryer	Atlas-Copco		cleaned Finned Condenser	As necessary
Air Compressor	Air Dryer	Atlas-Copco		Inspect and Clean inner components of condensate trap	bi-annually
Air Compressor	Air Filters/Oilers/Regulators	Speedaire		Clean	annually
KMnO4	Pot. Permanganate Storage Tank	IMG	T-900	Inspect-external	weekly
KMnO4	Pot. Permanganate Storage Tank	IMG	T-900	inspect-internal	As necessary
KMnO4	Pot. Permanganate Storage Tank	IMG	T-900	clean tank bottoms	as needed
KMnO4	Level Sensor	Drexelbrook	LE/LT-5-1-1	Calibrate	As necessary
KMnO4	Mixer	Sharpe	M-5-1-1	Lubricate - gearbox	36 months
KMnO4	Mixer	Sharpe	M-5-1-1	Lubricate - motor	annually
KMnO4	Feed Pump	LMI Metronics	P-5-1-1	Inspect fittings	Monthly
KMnO4	Feed Pump	LMI Metronics	P-5-1-2	calibrate	Yearly
NaOH	Sodium Hydroxide Storage Tank	IMG	T-1000	Inspect-external	weekly
NaOH	Sodium Hydroxide Storage Tank	IMG	T-1000	inspect-internal	As necessary
NaOH	Sodium Hydroxide Storage Tank	IMG	T-1000	clean tank bottoms	as needed
NaOH	Level Sensor	Drexelbrook	LE/LT-5-2-1	Calibrate	Yearly
NaOH	Mixer	Sharpe	M-5-2-1	Lubricate - gearbox	36 months
NaOH	Mixer	Sharpe	M-5-2-1	Lubricate - motor	12 months
NaOH	Feed Pump	LMI Metronics	P-5-2-1	Inspect fittings	Monthly
NaOH	Feed Pump	LMI Metronics	P-5-2-1	calibrate	Yearly
HCl	Hydrochloric Acid Storage Tank	IMG	T-1200	Inspect-external	weekly
HCl	Hydrochloric Acid Storage Tank	IMG	T-1200	inspect-internal	As necessary
HCl	Hydrochloric Acid Storage Tank	IMG	T-1200	clean tank bottoms	as needed
HCl	Level Sensor	Drexelbrook	LE/LT-5-3-1	Calibrate	Yearly
HCl	Mixer	Sharpe	M-5-3-1	Lubricate - gearbox	36 months

HCl	Mixer	Sharpe	M-5-3-1	Lubricate - motor	12 months
HCl	Feed Pump	LMI Metronics	P-5-3-1	Inspect fittings	Monthly
HCl	Feed Pump	LMI Metronics	P-5-3-1	calibrate	Yearly
Polymer	Polymer Storage Tank	IMG	T-1100	Inspect-external	weekly
Polymer	Polymer Storage Tank	IMG	T-1100	inspect-internal	As necessary
Polymer	Polymer Storage Tank	IMG	T-1100	clean tank bottoms	as needed
Polymer	Polymer Storage Tank	IMG	T-1101	Inspect-external	weekly
Polymer	Polymer Storage Tank	IMG	T-1101	inspect-internal	monthly
Polymer	Polymer Storage Tank	IMG	T-1101	clean tank bottoms	as needed
Polymer	Level Sensor	Drexelbrook	LE/LT-5-4-1	Calibrate	Yearly
Polymer	Level Sensor	Drexelbrook	LE/LT-5-4-2	Calibrate	as needed
Polymer	Mixer	Sharpe	M-5-4-1	Lubricate - gearbox	36 months
Polymer	Mixer	Sharpe	M-5-4-2	Lubricate - motor	6 months
Polymer	Feed Pump	Vector	P-5-4-1	Inspect fittings	Monthly
Polymer	Feed Pump	Vector	P-5-4-1	Replace hose	Bi-Annually
Polymer	Feed Pump	Vector	P-5-4-1	calibrate	Yearly
Polymer	Feed Pump	Vector	P-5-4-2	Inspect fittings	Monthly
Polymer	Feed Pump	Vector	P-5-4-2	Replace hose	Bi-Annually
Polymer	Feed Pump	Vector	P-5-4-2	calibrate	Yearly
Polymer	Feed Pump	Vector	P-5-4-3	Inspect fittings	Monthly
Polymer	Feed Pump	Vector	P-5-4-3	Replace hose	Bi-Annually
Polymer	Feed Pump	Vector	P-5-4-3	calibrate	Yearly
Water Recycle	Sump Tank			Inspect	monthly
Water Recycle	Sump Pump	Goulds		Inspect	quarterly
Water Recycle	Sump Pump	Goulds		Amp Draw	monthly
HVAC	Air Handler/ Heater	WeatheRite		Check Filter Replace as required	quarterly
HVAC	Air Handler/ Heater	WeatheRite		Check Blower belt tension	Quarterly
HVAC	Air Handler/ Heater	WeatheRite		Check Bearings/ lubricate	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		Check and Clean Blower Wheels	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		Check All Signals and Safety sequences	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		Lubricate Motors	Bi-Annually

HVAC	Air Handler/ Heater	WeatheRite		Check Amperage	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		Check Electrical Connectors for tightness	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		Clean all controls	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		Check ignition electrodes for proper gap	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		check and clean dampers	Bi-Annually
HVAC	Air Handler/ Heater	WeatheRite		lightly grease all door latches	Bi-Annually

Note: schedules for equipment assumes that equipment is online and in use.

Table 11 – PLC Control Logic Relationships

Equipment	Manufacturer	Relationship to PLC Logic
Extraction Well Pump	Grundfos	Controlled by PLC utilizing EQ Tanks Level sensor/Transmitter Information
Extraction Well Flow Sensor/Transmitter	Signet	Flows are recorded and displayed on the HMI, Instantaneous, and 24 Hour readings
EQ Tank Mixer	Sharpe	On/Off Controlled by PLC utilizing EQ tank Level Sensor/Transmitter Information
EQ Tank Level Sensor/Transmitter	Rosemount	Transmits tank level information to the PLC, Displays level on HMI. Signal used by PLC to control EQ tank Mixer, Extraction Pump On and Off operation and Influent Feed Pump Off and On Operation
Influent Feed Pumps	Flowserve	On/Off Controlled by PLC utilizing EQ tank Level Sensor/Transmitter Information
Influent pumps	Milliken/El-O-Matic	Controlled By PLC in Auto mode, the variable frequency drives will adjust pump speed to meet inputted flow requirements.
Influent Feed Flowmeter/Transmitter	Brooks	Transmits Flow-rate to the PLC which integrates and adjusts the Influent pump variable speed drives
Reaction Tank pH Meter/Transmitter	Yokogawa	Read and transmit tank solution pH to the PLC. Readings displayed on the HMI, PLC will integrate the pH reading and adjust the speed of the Caustic Metering pump to attain a set pH. That pH Level is set by the operator at the HMI.
Caustic Tank Level Sensor/transmitter	Drexel Brook	Signal to PLC, Low level and High Level Alarms, Level Displayed on HMI.
Caustic Metering Pump	LMI	Speed of operation controlled by the PLC, to maintain a set pH Level
Potassium Permanganate Tank Mixer	Sharpe	Controlled by plc logic at LCP

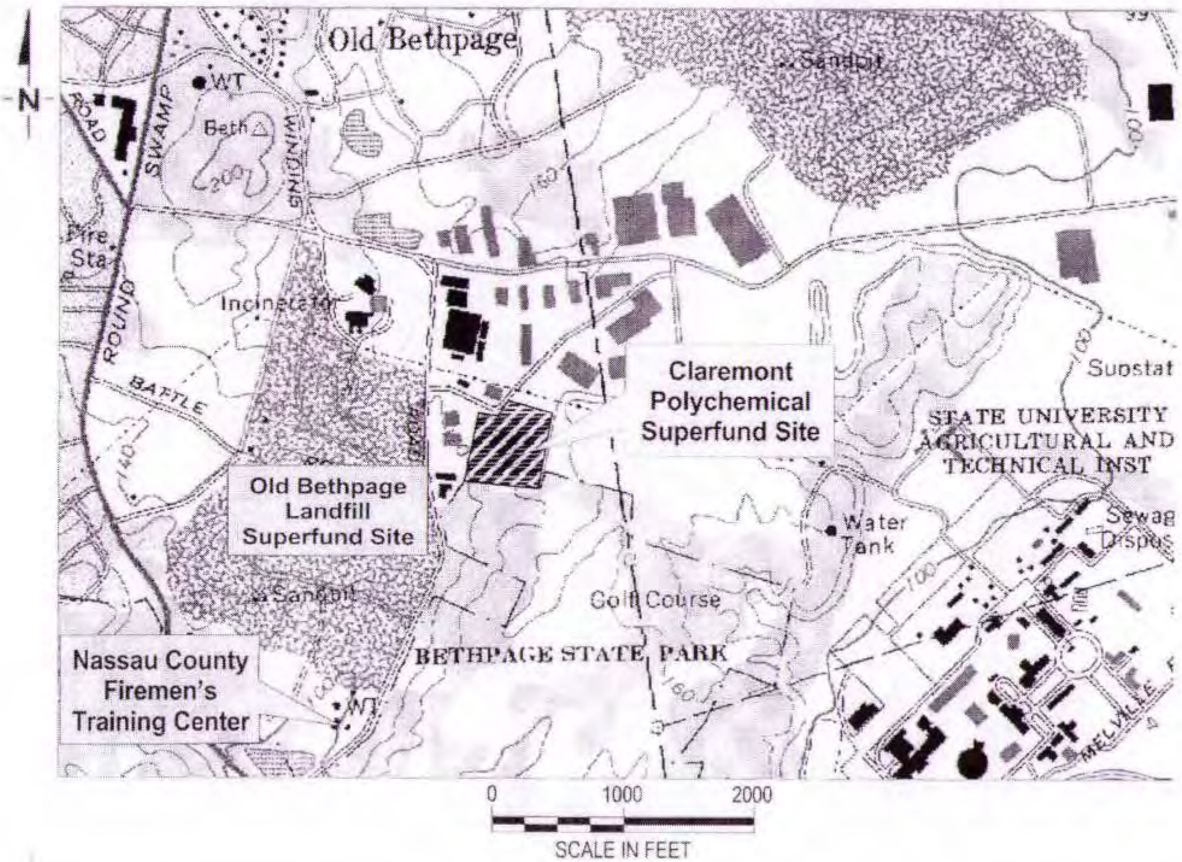
Potassium Permanganate Level Sensor/Transmitter	Drexel Brook	Signals PLC for mixer, water fill, and pump controls
Potassium Permanganate Metering Pump	LMI	Controlled by PLC and plant flow
Polymer Tank Mixer	Sharpe	Controlled by plc logic at LCP
Polymer Tank Level Sensor	Drexel Brook	Signals PLC for mixer, water fill, and pump controls
Polymer Metering Pump	LMI	Controlled by PLC and plant flow
Flash Mix Tank Mixer	Lightening	Out of Service
Flocculation Tank Variable speed drive mixer	Reliance/Lightening	Out of Service
Sludge Recycle/Seed Diaphragm Pump	Wilden	Currently run in Manual mode
Sludge Transfer Diaphragm Pump	Wilden	Currently run in Manual mode
Sludge Holding Tank Level Sensor/Transmitter	Rosemount	Signal to PLC, Low Level and High Level Alarms, Level displayed on the HMI
Filter Press		Out of Service
Air Stripper Feed Tank Level Sensor/Transmitter	Rosemount	Transmits tank level information to the PLC, Displays level on HMI, Signal Used by PLC to control Air Stripper Feed Pump On and Off operation and pump speed
Air Stripper Feed Pumps	Flowserve	On/Off Controlled by PLC utilizing Air Stripper Feed tank Level Sensor/Transmitter Information. Tank Level is transmitted to PLC which adjusts the VFD to control pump speed
Air Stripper Duct Heater Temperature Controller	Comp-Cal	The PID will control the heat to maintain a preset temperature.
Liquid Phase Carbon Feed Tank Level Sensor/Transmitter	Rosemount	Transmits tank level information to the PLC, the level displays on the HMI, The Signal is used by the PLC for Liquid Phase pump On and Off operation, the signal is also used by the PLC to adjust the VFD to control pump speed
Liquid Phase Carbon Pumps	Flowserve	Controlled by the PLC utilizing the Liquid Phase Carbon Level Sensor/Transmitter Information
Treated Water Tank Level Sensor/Transmitters	Rosemount	Level transmitted to the PLC and Displayed on the HMI, The signal is used to control the Injection Pump Off on Decisions

Injection Pumps	Flowserve	On Off controlled by PLC utilizing the Level signal from the Treated Water Tank
Effluent Flow Meter	Krohne	Sends Flow signal to PLC which Displays the Instantaneous Reading on the HMI, There is also a local display with instantaneous and totalized flow
Injection wells individual flow meters	Signet	Sends Signal to the PLC and is displayed on the HMI as instantaneous and Totalized flow.
Injection Well Level Sensor/Transmitter		Signal to PLC determines High Level and Low level alarms.
Recycle Tank Level Sensor/Transmitter	Rosemount	Tank level is transmitted to the PLC and displayed on the HMI. It is used to control the water recycle pumps On and Off operation.
Recycle Pump	Flowserve	Operation controlled by the PLC, Utilizing signal from Recycle Tank Level sensor
Sump Level Float		Controls sump pump operation
Sump Pump		In auto mode operation is controlled by the sump level floats.

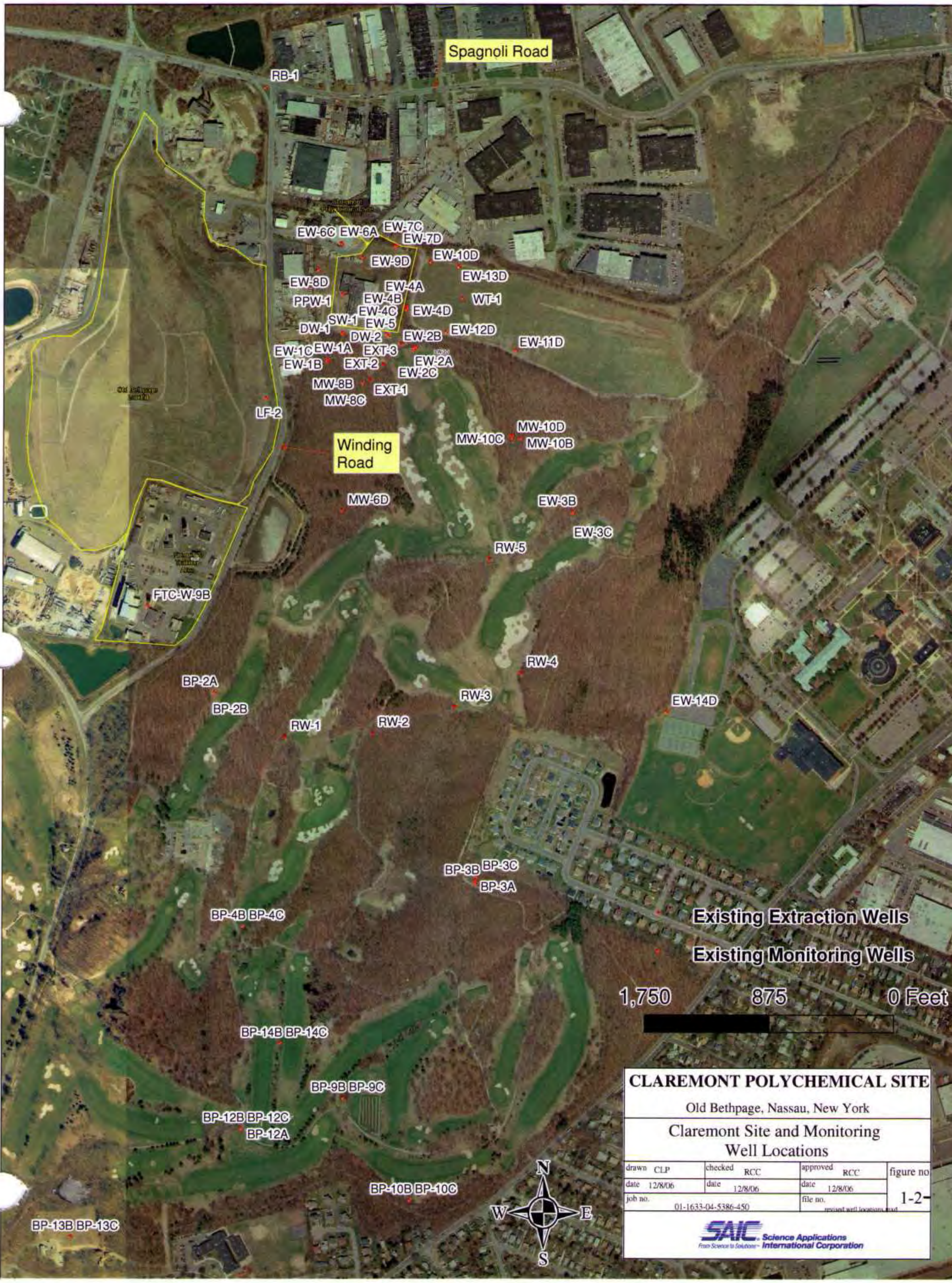
Refer to Section 8 for system control details

FIGURES

Figure 1-1: The Claremont Polychemical Superfund Site and the Surrounding Area.



(Note: This figure is adapted from the USGS topographic map, Huntington Quadrangle, 7.5 minute series.)



CLAREMONT POLYCHEMICAL SITE

Old Bethpage, Nassau, New York

Claremont Site and Monitoring Well Locations

drawn CLP	checked RCC	approved RCC	figure no
date 12/8/06	date 12/8/06	date 12/8/06	1-2-
job no. 01-1633-04-5386-450		file no. revised well locations.mxd	

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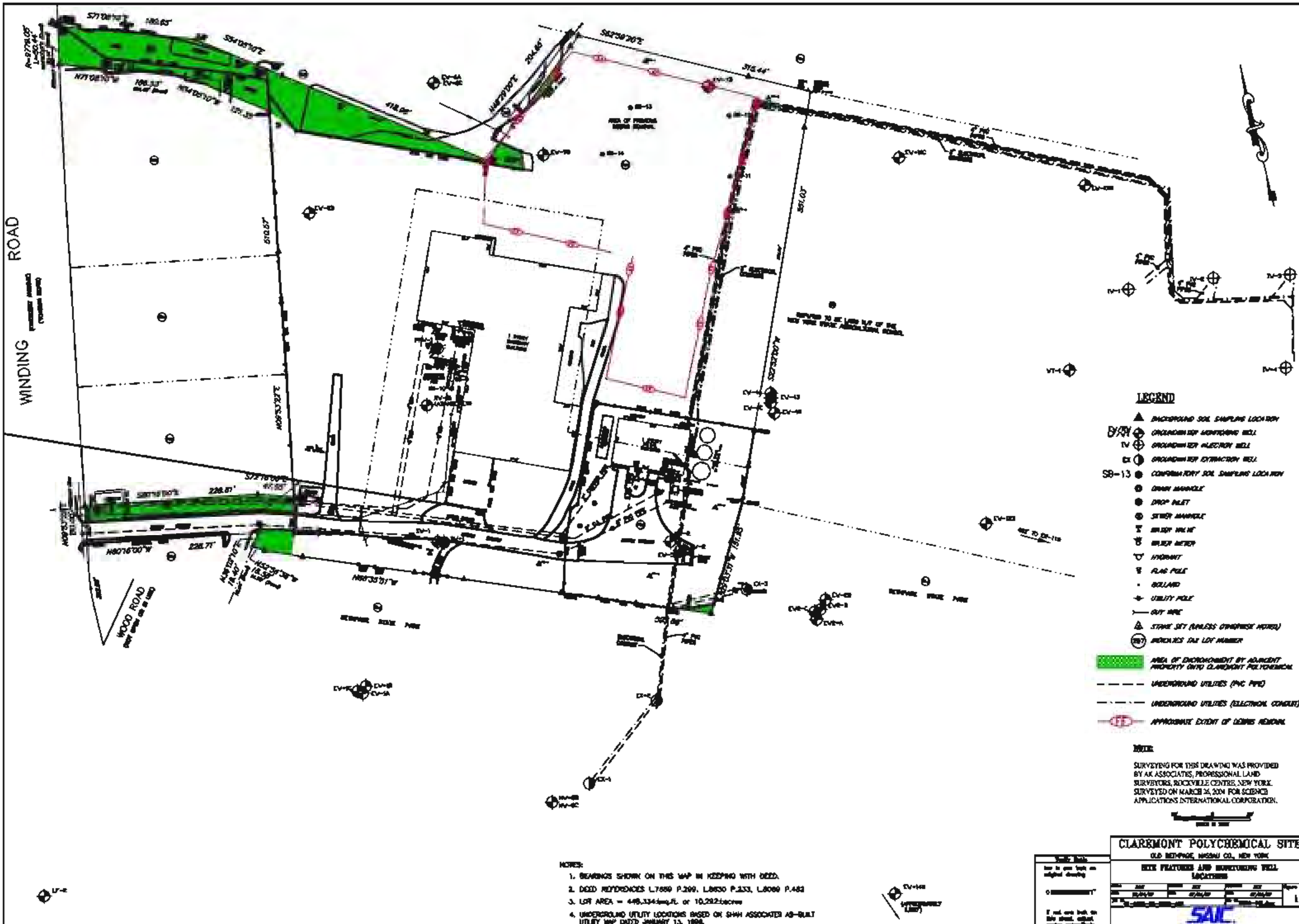
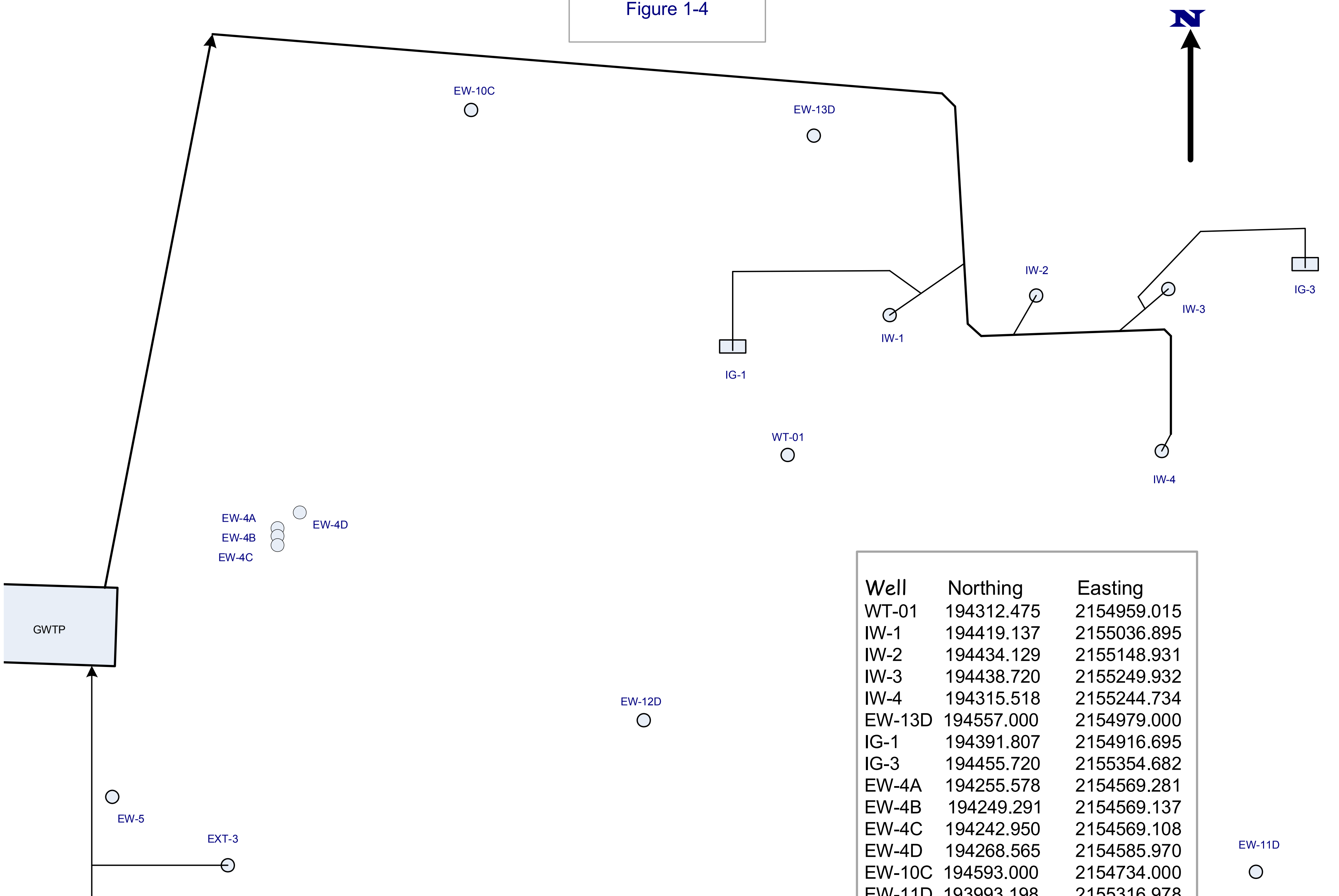
From Science to Solutions



WINDING ROAD
WOOD ROAD
S71°08'10"E
N71°08'10"W
S54°05'10"E
N54°05'10"W
S62°39'20"E
S72°16'00"E
N80°16'00"W
N86°35'51"W
N09°53'22"E
S09°53'22"W
418.08'
315.44'
512.57'
228.71'
SB-13
EV-1
CX-1
LEGEND
BACKGROUND SOIL SAMPLING LOCATION
GROUNDWATER MONITORING WELL
GROUNDWATER INJECTION WELL
GROUNDWATER EXTRACTION WELL
CONFIRMATORY SOIL SAMPLING LOCATION
DRAIN MANHOLE
DROP INLET
SEWER MANHOLE
WATER VALVE
WATER METER
HYDRANT
FLAG POLE
BOLLARD
UTILITY POLE
GUY WIRE
STAKE SET (UNLESS OTHERWISE NOTED)
INDICATES TAX LOT NUMBER
AREA OF ENCROACHMENT BY ADJACENT PROPERTY ONTO CLAREMONT POLYCHEMICAL
UNDERGROUND UTILITIES (PVC PIPE)
UNDERGROUND UTILITIES (ELECTRICAL CONDUIT)
APPROXIMATE EXTENT OF DEBRIS REMOVAL
NOTE:
SURVEYING FOR THIS DRAWING WAS PROVIDED BY AK ASSOCIATES, PROFESSIONAL LAND SURVEYORS, ROCKVILLE CENTRE, NEW YORK. SURVEYED ON MARCH 26, 2004 FOR SCIENCE APPLICATIONS INTERNATIONAL CORPORATION.
NOTES:
1. BEARINGS SHOWN ON THIS MAP IN KEEPING WITH DEED.
2. DEED REFERENCES L.7659 P.299, L.8630 P.233, L.8069 P.482
3. LOT AREA = 448,334±sq.ft. or 10.292±acres
4. UNDERGROUND UTILITY LOCATIONS BASED ON SHAH ASSOCIATES AS-BUILT UTILITY MAP DATED JANUARY 13, 1998.
CLAREMONT POLYCHEMICAL SITE
OLD BETHPAGE, NASSAU CO., NEW YORK
SITE FEATURES AND MONITORING WELL LOCATIONS
1
SAIC

Figure 1-4



Well	Northing	Easting
WT-01	194312.475	2154959.015
IW-1	194419.137	2155036.895
IW-2	194434.129	2155148.931
IW-3	194438.720	2155249.932
IW-4	194315.518	2155244.734
EW-13D	194557.000	2154979.000
IG-1	194391.807	2154916.695
IG-3	194455.720	2155354.682
EW-4A	194255.578	2154569.281
EW-4B	194249.291	2154569.137
EW-4C	194242.950	2154569.108
EW-4D	194268.565	2154585.970
EW-10C	194593.000	2154734.000
EW-11D	193993.198	2155316.978
EW-12D	194110.000	2154849.000
EXT-3	193997.321	2154530.799
EW-5	194051.026	2154443.232

SAIC – Claremont Polychemical Site	Rev. Date: 11-17-09	File Name: O&M Specs/TW System/Well Field Layout	
Drawing Title: Well Field Layout	Rev. No.: A	Scale: 1 in. = 100 ft.	Drawing No.: CPS-Dwg-035

Figure 2-1 Project Organizational Chart

Claremont Polychemical Superfund Site